Mapping of informal dairy value chain actors in selected districts of Assam

Prepared under the

Assam Agribusiness & Rural Transformation Project (APART)

ARIAS Society, Khanapara, Guwahati

For

Dairy Development, Assam

The International Livestock Research Institute (ILRI)

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GOVERNMENT OF ASSAM
Assam Rural Infrastructure and Agricultural Services Society

ANIMAL HUSBANDRY & VETERINARY DEPARTMENT
Government of Assam

ILRI
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Team Leader and Resident Consultant, ILRI-APART
International Livestock Rsearch Institute

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Abbreviations

AGVB	:	Assam Gramin Vikash Bank
AI	:	Artificial insemination
APART	:	World Bank Agribusiness Project on Agriculture and Rural Transformation
ARIAS	:	Assam Rural Infrastructure and Agricultural Services
BMC	:	Bulk milk cooler
BVO	:	Block veterinary officer
CAHW	:	Community animal health worker
CBI	:	Central Bank of India
CP	:	Cottage processor
DCS	:	Dairy Cooperative Society
DDD	:	Dairy Development Department
DDL	:	Disease diagnostic laboratory
DES	:	Dairy Equipment Supplier
DUSS	:	Dugdha Utpadak Samabai Samiti
DVO	:	District veterinary officer
FAO	:	Food and Agriculture Organization of the United Nations
FGD	:	Focus Group Discussion(s)
Ha	:	Hectare(s)
HH	:	Household(s)
IDBI	:	Industrial Bank of India
ILRI	:	International Livestock Research Institute
INR	:	Indian rupee(s)
KG	:	Kilogram(s)
KII	:	Key Informant Interview(s)
KM	:	Kilometre(s)
LDGB	:	Langpi Dehangi Grameen Bank
LPD	:	Litres per day
MB	:	Municipality board
NLM	:	National Livestock Mission
No.	:	Number
OBC	:	Other Backward Class
PNB	:	Punjab National Bank
SBI	:	State Bank of India
SC	:	Scheduled Caste
SHG	:	Self-help group
SM	:	Sweet maker
SOP	:	Standard Operating Procedures
ST	:	Scheduled Tribe
UBI	:	United Bank of India
VFA	:	Veterinary field assistant
VO	:	Veterinary officer

Executive summary

Importance of dairy farming (based on information from secondary sources)

- We conducted 415 Focus Group Discussions (FGD) and 466 Key Informant Interviews (KII) in the 98 APART dairy clusters spread over 16 districts of Assam.
- There are a total of 2.7 million cattle and 0.12 million buffalo owning households (HH) as per the 19thLivestock Census, 2012, in the APART districts (all villages) of Assam.
- There are a total of 7.3 million cattle and 0.28 million buffalo in the APART districts, and 10.3 cattle and 0.44 million buffalo in the state as whole. In the APART project districts, cattle and buffalo population account for 70.87% and 63.64% of the state's cattle and buffalo population, respectively.
- As of 2015–16, the total annual milk production from cattle and buffalo are 740.1 and 123 million litres respectively in Assam, or about 72 litres per cow and 280 per buffalo cow per year.

The dairy farming system in project districts (based on information from primary survey)

- Out of a total of about 0.22 million HH in the APART cluster villages, 0.13 million HH (almost 57%) own at least one dairy animal.
- Out of the total farm HH with dairy animals, 78%, 14% and 6% rear local, improved and both local and improved cattle respectively. The remaining 2% of farm HH rear buffaloes only.
- Farm HH rearing local, improved cattle and buffaloes keep on average 3.2, 2.7 and 1.9 adult animal heads respectively.
- The most common feeding system is partly stall-fed condition, with 68% of HH practicing it. Another 26% of farm HH keep their animals in a fully stall-fed condition. The remaining 5.53% of farm families rear in a *khuti* system, keeping their animals mostly in the river blocks of districts like Sivasagar, Dhubri and Darrang.
- The milk production across the APART districts is 0.36 million litres. Almost 53.53% of the total milk produced comes from the improved animal stock of the APART districts.

Input and infrastructure services (based on information from primary survey)

- In the APART clusters, there are 703, 425 and 10,482 HH per local veterinarian (private and government combined), VFA and community animal health worker (CAHW), respectively.
- There are 14 disease diagnostic laboratories (DDLs) providing farm families access to animal healthcare services. However, farmers tend to have least use of these laboratories.
- On average, farmers are 3.72 kilometers (km) away from local veterinarians (veterinarian residence/service station). When providing in-station services, VFAs are based at the dispensary/subcentre an average of 3.28 km away from a dairy farmer. However, the majority of VFAs provide door-to-door service to farmers.
- Commercial feed is available from local grocery shops (no feed suppliers to the farmers). Most of the clusters are found to have access to such grocery shops selling feed.
- There are a total of 18 feed mills in the APART districts, the majority found in Kamrup district.
- In order to facilitate storage/processing facilities of the produced milk either through public or private initiatives, 50 dairy plants/chilling plants/bulk milk coolers (BMCs) are found in the APART districts. However, a few of them are currently nonfunctional.
- Among the cluster villages across project districts, 58% have blacktop roads while 21% of villages have gravel and/or earthen roads.

Marketing of milk

- The milk marketing pattern of farmers varies with the type of animal stock held as a part of the produce

is also kept for self-consumption. A farm HH having improved cattle stock sells almost 84% of the milk, while farmers with local cattle and buffalo sell 49% and 45% of the milk produced on the farm, respectively.

- There are four main milk marketing channels in the APART clusters: local sale (to neighbors or retail milk markets in the vicinity), to traders, to Dairy Cooperative Societies (DCS) and to private processors directly.
- Among the total milk producers in the APART clusters, 40.25% of producers sell milk locally, 32.94% sells to traders, 8.78% sell to DCS and 18.03% sell to private processors directly.
- Among the marketing channels, farmers fetch the highest average milk price when sold locally (43.66 Indian rupees (INR) per litre) followed by private processor (INR 41.16/litre). The price received by farmers is INR 38/litre and INR 36/litre when milk is sold directly to vendors and DCS, respectively.

Gender issues

- Cattle rearing tasks are almost equally performed by men and women members of the HH in the project districts. On average, around 39% of the income from dairy farming is controlled by the women of the HH.
- On the other hand, women are absent from the other nodes of the dairy value chains. There are very few female local veterinarians (one each in seven clusters) in the APART districts, while no female VFA is found in any of the project clusters.
- There are no female market actors such as milk traders, CPs and SMs in the surveyed clusters of the project.

Value chain market actors

- There are 0.13 million dairy farming HH in the APART districts. The total number of commercial farmers (farmers that produce milk for the market based on rearing of improved cattle or buffalo) is almost 14,400, constituting 11.50% of the total farming HH. This necessitates 576 training sessions to cover the market actors.
- There are a total of 1,600 SMs, 190 CPs, and 2,136 milk traders across the APART districts of Assam.

Recommendations

While targeting for interventions under the APART project, various operational factors may be considered. These factors are presence of minimum number of value chain actors, flow of milk among the market actors, geographical proximity between clusters/villages (in the interest of clubbing two or three contiguous clusters/villages), access to inputs and veterinary services, presence of entrepreneurs, socio-political situation of the clusters, institutional environment and infrastructure (e.g. roads). The clusters favoured by the presence of these factors should be prioritized in organizing training to value chain actors to obtain a better training outcome.

1. Introduction

1.1 Background

Global livestock product markets are growing rapidly and so also is the importance of developing livestock product value chains.[1] It is estimated that the demand for livestock products will double by the year 2020 (FAO 2013). A significant proportion of this increasing demand for livestock products may come from developing countries driven by rising income of the people, growing urbanization and population growth (Brown et al. 1999; Sharma 2004; Birthal and Rao 2004; FAO 2006). According to Dalal and Pathak (2010), demand side factors like urbanization and per capita income have stronger influence on the production of milk, the most important component of livestock products. As agriculture becomes more commercialized, the consumption pattern in the rural areas too under goes changes due to growth in income and rural-urban close cultural links (Sidhu and Bhullar 2004). Milk and milk products are highly elastic goods; therefore, increased income may exert a significant spike in the demand for milk and milk products. As Singh and Dutta (2013) report, the distribution of dairy cattle is far more equal among the farm HH than that of farm land suggesting that with efficient input and output support services, dairying can serve as a major economic activity for the small, marginal and landless farmers. Overall, dairying provides farming HH with a continuous stream of outputs or income, and animals are reproducible assets which can quickly be multiplied to accumulate wealth.

According to Khan et al. (2016), the importance of the dairy sector goes beyond its income contribution, as it not only provides a source for food and nutrition but also makes important contributions towards social development and environmental conservation. However, the increasing volatility in food prices and stringent food safety standards in the global food markets affect the performance of small holder dairy production systems. In the wake of rising food-borne diseases, controlling interventions have become a need of the hour. Today the public is increasingly anxious about the reliability of the entire agri-food system from input supply, production, distribution to consumption. In response to these rising public concerns, government and industry actors have tightened food safety regulations through an evolution from a simple collection of risk-reducing standards to a proliferation of complex public-private standards (on not only food safety concerns but also encompassing product quality and social and environmental issues) (Gereffi and Lee 2009; Henson and Reardon 2005).The dairy value chain approach brings different actors, including farmers, agree gators, traders or vendors, processors and financial institutions together to gain control over the production, marketing, processing and distribution to realize scale economies, reduce transaction costs and minimize uncertainties in supplies and the quality of inputs and outputs (Meyer 2007; Trienekens 2011).

In the Assam context, dairying is an important component of mixed farming systems. About 82% of rural HH in the state keep cattle or buffalo (ILRI 2007; Kumar and Staal 2010). Dairying in Assam is characterized mostly by rural small holder's production using nondescript cattle and buffalo with pockets of specialized dairy production using improved dairy animals in the peri-urban areas and in certain rural zones having better market access (Sarker 2002; Bayan 2018). However, production and marketing of dairy products in the state are constrained due to a poorly structured dairy value chain emanating largely from low processing capacity and unorganized dairying in noncompliance to food safety standards. In a context where 97% of the total milk production passes through unorganized market actors, the development of informal dairy value chains is an important policy priority. With a special focus on bringing the informal dairy value chain actors into the registered norms of hygiene practices of the Food Safety and Standard Authority of India, this report maps the various informal market actors (input suppliers, veterinary service providers, producers, milk traders/vendors, SMs and CPs, distributors and consumers) in the selected project districts of the state.

The present report is thus designed to firstly show a macro picture of the bovine population and milk production scenario of the state and in the project districts followed by a detailed analysis and presentation of the primary

1 As Hellin and Meijer (2006) define, 'A value chain is the full range of activities which are required to bring a product or service from conception through the different phases of production (involving a combination of physical transformation and the input of various producer services) delivery to find customers and find disposal after use.'

information gathered through the KII and FGD in each cluster villages of the project districts. After the cluster-level analysis in each district, policy recommendations are given based on the findings for the sake of follow-up interventions of the directorate of DDD. The report concludes with an overall note on the dairy sector scenario of the project districts of Assam with few long-term policy suggestions for the overall improvement of dairying in the state with an anthropogenic approach.

1.2 Objectives of the study

The present study report is based on the following broad objectives

- To give the background of the dairy sector of the state with a focus on status and dynamics of bovine population and milk production for the state of Assam and in the project districts.
- To identify and map various market actors including input suppliers, producers, traders/vendors, processors and distributors in the selected clusters in each project district and establish linkages among the market actors.
- To give district-specific recommendations based on the findings of the primary survey in the project districts.

1.3 Data source and data collection

As a starting point, literature was reviewed on dairy development in a smallholder dairy production system through a value chain approach. The actors in the dairy value chain were identified in the state of Assam context and KII were conducted to elicit information on the general profile of the respondents, milk marketing, production system, service provisioning and the role of enabling environment such as institutions, knowledgeand infrastructure. To have more in-depth understanding of the production system and related issues, FGDwere conducted in almost 90% of the selected cluster villages in each district. Information on the remaining 10% of village's was obtained through either KII or FGD by convergence.

The ILRI study team visited the listed cluster villages in each project district of Assam, namely Golaghat, Sonitpur, Morigaon, Jorhat, Nalbari, Lakhimpur, Kokrajhar, Sivsagar, Goalpara, Karbi Anglong, Darrang, Barpeta, Nagaon, Dhubri, Kamrup and Cachar. In the first stage, the ILRI team conducted KII with the district dairy development officer, DVO and/or other veterinary officer/block veterinary officer of the veterinary dispensary attached to the town. Effort was expended to identify the villages chained to the major district town in terms of milk flow to its SMs, CPs and consumers of raw milk through informal milk vendors. In the second stage, a few prominent sweet shops (with regards to milk handling capacity) were visited and KII wereconducted to primarily elicit information on the locations/villages that were major milk producers to the town, the informal milk vendors supplying milk to them, their average monthly milk handling and the money value of monthly milk and milk product sales, and the total number of SMs, CPs and milk traders in the town as assumed by the informants. Based on the KII of sweet shops, milk vendors were identified and KII were conducted with them to confirm the villages as source of milk to the town. These informal market actors (sweet shop and milk vendors) were met on a snowball sampling method to cover as many market actors as possible. Finally, a list of villages within a radius of 10-12 km of the major district towns were discussed and confirmed with the district dairy development officer/DVOas a suitable source of milk to the town. In the process, a few new district town-linked villages were added in some of the project districts along with the identified existing villages. Subsequently, the ILRI survey team visited the villages and conducted FGD to elicit information on milk production, marketing and input and service provisioning of the dairy farmers in the village. After completing the town cluster, the villages in the listed dairy clusters were visited in the subsequent days. The next best town cluster of the district was selected and followed the same process of market actors and village selection. Clusters with a town/market area where the number of milk vendors and sweet shops were found to be relatively low were also reported with the help of KII and FGD which, however, may constitute a less priority cluster to organize training and other components of project interventions due to cost ineffectiveness.

Thus, a total of 466 KII and 415 FGD were conducted in the APART project districts of Assam. A district break up

of number of FGD and KII is presented in Table 13.

Table 1: Number (no.) of FGD and KII conducted in the project districts

District	No. of FGD	No. of KII
Golaghat	16	10
Sonitpur	27	30
Morigaon	7	12
Jorhat	44	18
Nalbari	16	18
Lakhimpur	17	20
Kokrajhar	23	14
Sivasagar	14	13
Goalpara	33	17
KarbiAnglong	10	12
Darrang	56	48
Barpeta	26	26
Nagaon	86	120
Dhubri	8	15
Kamrup	19	76
Cachar	13	17
Total	**415**	**466**

1.4 Data analysis

Data from the literature review and other published secondary sources provided background information on dairy development in Assam. Qualitative and quantitative analyses were conducted which included dairy value chain maps in each project district, presentation on production system (HH and village-level bovine population and breeds, rearing practices, production and yield across breeds) milk marketing (selling behaviour and sources), gendered aspects in dairying, access to services (veterinary, input and financial), enabling environment, actor-level information, physical environment (e.g. approach road quality and distance to all-weather road as an indicator of ease of transportation) and identification of entrepreneurs at cluster level. At the value chain actor level, average milk handling, type of product sale and sales revenue are also presented. The report presents simple tabular analysis using ratios, mean and variance for the quantitative part of the study. The qualitative information is presented as text gained through communication with the value chain actors through KII and FGD participants.

1.5 Limitations of the study

The study confronted a few limitations at various stages as indicated below

- The information related to production and other parameters was gathered through representative participants in FGD rather than complete house-to-house enumeration. If respondent's bias creeps in, there is little scope for validation through other published data sources.
- An attempt was made to validate the information gathered based on secondary data sources such the Livestock Census, 2012 and Integrated Sample Survey Reports (various issues). However, since the livestock census report issix years old, certain parameters may be found unmatched with the primary data findings.
- The APART project implementation plan indicates block to be a cluster but at the same time, urban and peri-urban areas with operation of informal milk market actors in a radius of 10–12 kmare the target zone. In the field it was determined that there are many villages where milk is delivered to the district

urban centres beyond the 10–12 km radius area. In addition, in order to qualify as a selected cluster, 5,000–6,000 litres per day (LPD) must be handled by the market actors. Thus, eventually ILRI surveyors visited all of the listed villages which resulted in a trade-off on the need for intensive study of the important clusters versus the wide area coverage in search of suitable clusters.

2. Bovine population status and dynamics

In this section, we present the bovine population and milk production distribution and dynamics in the APARTproject districts in Assam across various years to show how bovine population and milk production has changed overtime.

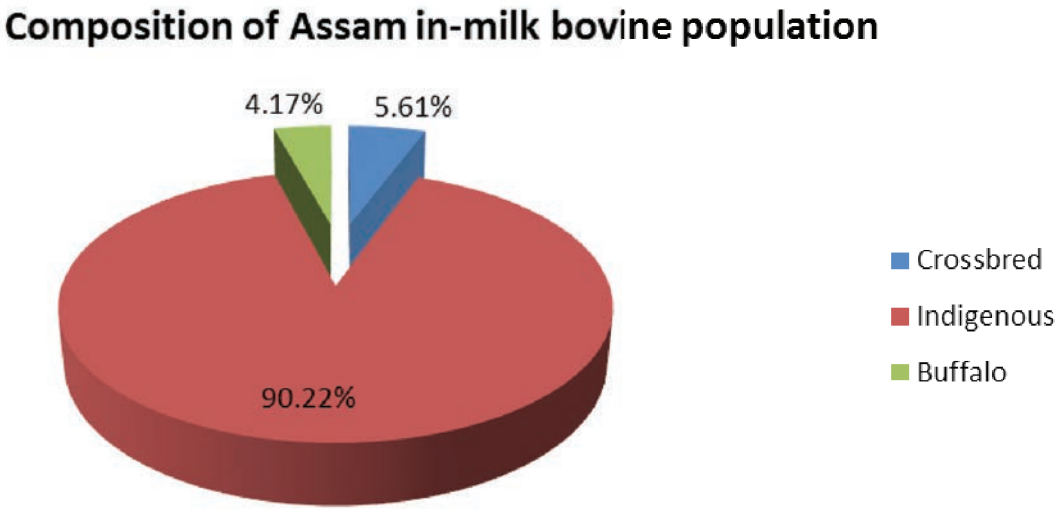
According to the 19th Livestock Census, 2012 of Assam, 90.22% of the in-milk population was of indigenous breeds followed by 5.61% crossbred and 4.17%buffalo in-milk populations (Figure 1).

Table 2: Bovine rearing HH and bovine population with respect to total HH

Districts	No. of HH	No.ofHHowning cattle (%)	No.of HH owning buffalo (%)	No. of bovines/1000 HH	
				Cattle	Buffalo
Golaghat	199,852	107,745 (53.91)	5,353 (2.68)	2,066	76
Sonitpur	361,934	213,258 (58.92)	3,744 (1.03)	2,603	100
Morigaon	179,681	91,832 (51.11)	1,281 (0.71)	1,769	23
Jorhat	223,344	119,594 (53.55)	4,466 (2.00)	2,201	118
Nalbari	151,716	78,323 (51.62)	1,058 (0.70)	1,715	30
Lakhimpur	189,955	136,062 (71.63)	1,518 (0.80)	3,199	73
Kokrajhar	159,831	74,366 (46.53)	3,721 (2.33)	2,038	83
Sivasagar	588,585	115,003 (19.54)	4,666 (0.79)	698	41
Goalpara	182,109	811,25 (44.55)	2,377 (1.31)	1,584	40
KarbiAnglong	189,781	88,352 (46.55)	2,763 (1.46)	1,915	79
Darrang	157,524	85,485 (54.27)	2,694 (1.71)	2,178	79
Barpeta	314,389	113,541 (36.11)	8,322 (2.65)	1,220	86
Nagaon	482,646	248,151 (51.41)	2,784 (0.58)	1,581	15
Dhubri	421,239	145,496 (34.54)	5,131 (1.22)	1,207	31
Kamrup	298,879	156,973 (52.52)	2,014 (0.67)	1,811	27
Cachar	387930	113,742 (29.32)	26,728 (6.89)	853	144
Total	**4,489,395**	**1,969,048 (43.86)**	**78,620 (1.75)**	**1,790**	**65**
Assam total	**6,470,066**	**2,709,854 (41.88)**	**121,336 (1.88)**	**1,593**	**67**

Source: Estimated based on the 19th Livestock Census, 2012

Figure 1.1: Composition ofAssam in-milk bovine population, 2012.



Source: 19th Livestock Census of Assam, 2012

2.1 Bovine population dynamics

A rise in dairy production is generally driven by population and yield effects. Yield effectsare based on changing the genetic structure of the cattle and buffalo populations through use of AI, while population effect indicates that the rise in milk production is due to increased milch animal population in the state. Perusal of Table 3 points out that the growth rate of the cattle population is not that impressive for the project districts of Assam. In fact, the steady annual growth rate of the cattle population is negative (-0.233%) for the state of Assam as a whole and also across project districts of the state (-0.15). The project districts that show a positive growth rate of cattle population during the inter-census periods under consideration (1994-2012) are Golaghat (0.12%), Nalbari (0.15%), Kokrajhar (0.06%), Sivasagar (0.13%), Karbi Anglong (0.001%), Darrang (0.14%) and Cachar (0.27%). Against the deceleration in the cattle population across the project districts and Assam as a whole, the growth rate of the buffalo population is positive. The compound annual growth rate is the highest in Dhubri district (2.76%) followed by Karbi Anglong district (2.43%).

Table 3 also presents the concentration of cattle and buffalo population for the three different censuses out of the total cattle and buffalo population in the state. Since the project considered mostly the potential districts of the state, it found that more than 70% of the total cattle population and more than 65% of the total buffalo population of Assam are concentrated in the selected project districts of the state (considering only the latest livestock census). Among the project districts, the highest concentration of cattle population of the state total is seen in Sonitpur district (9.14%) followed by Nagaon district (7.40%) and the lowest in Nalbari district. With regards to concentration of the buffalo population according to the project districts, almost 13% of the total buffalo population is concentrated in Cachar district followed by 8.29% in Sonitpur district with the lowest in Morigaon district (Table 3).

Table 3: Trend of bovine population in the selected project districts of APART

District	1994		2003		2012		CAGR (1994–12)	
	No. cattle (%)	No. buffalo (%)	No. cattle (%)	No. buffalo (%)	No.cattle (%)	No. buffalo (%)	Cattle	Buffalo
Golaghat	465,675 (5.98)	33,868 (5.20)	445,349 (5.29)	25,893 (3.82)	412,887 (4.01)	15,153 (3.48)	0.120	1.137
Sonitpur	382,611 (4.91)	29,360 (4.50)	513,678 (6.10)	34,249 (5.05)	942,292 (9.14)	36,106 (8.30)	-0.573	-0.177
Morigaon	311,787 (4.01)	12,646 (1.94)	287,200 (3.41)	10,183 (1.50)	317,841 (3.08)	4,179 (0.96)	-0.018	1.846
Jorhat	345,506 (4.44)	36,745 (5.64)	501,829 (5.96)	72,847 (10.75)	491,495 (4.77)	26,449 (6.08)	-0.283	0.364
Nalbari	302,370 (3.88)	6,078 (0.93)	339,589 (4.03)	7,992 (1.18)	260,150 (2.52)	4,552 (1.05)	0.153	0.314
Lakhimpur	359,863 (4.62)	32,839 (5.04)	426,392 (5.06)	21,019 (3.10)	607,682 (5.90)	13,819 (3.18)	-0.390	1.265
Kokrajhar	346,281 (4.45)	22,086 (3.39)	295,963 (3.52)	38,258 (5.65)	325,662 (3.16)	13,290 (3.05)	0.060	0.616
Sivasagar	469,155 (6.03)	44,486 (6.83)	464,456 (5.52)	27,178 (4.01)	411,099 (3.99)	24,406 (5.61)	0.133	0.763
Goalpara	198,611 (2.55)	11,876 (1.82)	187,984 (2.23)	6,929 (1.02)	288,494 (2.80)	7,283 (1.67)	-0.297	0.587
KarbiAnglong	363,601 (4.67)	55,125 (8.46)	207,671 (2.47)	40,569 (5.99)	363,343 (3.53)	14,935 (3.43)	0.001	2.433
Darrang	380,124 (4.88)	34,463 (5.29)	455,629 (5.41)	28,241 (4.17)	331,676 (3.22)	12,522 (2.88)	0.137	1.602
Barpeta	363,402 (4.67)	14,760 (2.26)	570,625 (6.78)	16,721 (2.47)	383,548 (3.72)	27,044 (6.21)	-0.050	-0.436
Nagaon	537,144 (6.90)	23,931 (3.67)	505,524 (6.00)	34,997 (5.16)	762,860 (7.40)	7,445 (1.71)	-0.282	2.012
Dhubri	377,116 (4.84)	53,037 (8.14)	517,708 (6.15)	17,434 (2.57)	508,361 (4.93)	13,043 (3.00)	-0.246	2.761
Kamrup	531,989 (6.83)	6,956 (1.07)	361,366 (4.29)	13,004 (1.92)	541,327 (5.25)	8,837 (2.03)	-0.016	-0.202
Cachar	427,424 (5.49)	46,267 (7.10)	382,912 (4.55)	77,129 (11.38)	330,765 (3.21)	56,036 (12.87)	0.274	-0.166
Total	**6,162,659 (79.153)**	**464,523 (71.27)**	**6,463,875 (76.77)**	**472,643 (69.75)**	**7,279,482 (70.62)**	**285,099 (65.50)**	**-0.146**	**0.586**
Assam total	**7,785,717**	**651819**	**8,419,647**	**677,669**	**10,307,604**	**435,265**	**-0.233**	**0.464**

Source: Livestock Census of India, various issues

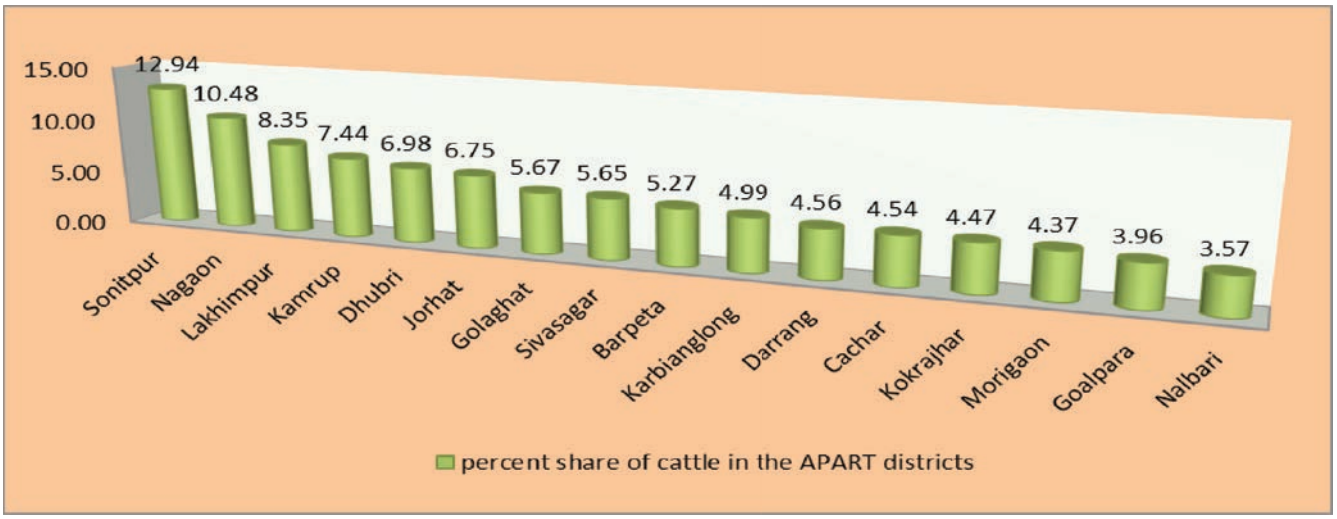
Note: Figures in parentheses indicate percentage to Assam total.

CAGR = compound annual growth rate

2.2 Distribution of Bovine Population

Almost 13% of the total cattle population across the project districts is concentrated in Sonitpur district followed by 10.48% in Nagaon district. The lowest percentage share of cattle population is in Nalbari district (3.57%) followed by almost 4% in Goalpara district (Figure 2).

Figure 2: Per cent share of cattle population during 2012 (Source: Quinquennial Livestock Census, 2012).



The distribution of buffalo population among the project districts of Assam are presented in Figure 3. The highest concentration of buffalo isin Cachar district (19.65%) followed by Sonitpur district (12.66%). The percent share of the buffalo population is lowest in Morigaon district followed by Nalbari (1.60%). The findings indicate that specific interventions relating to buffalo-based dairy value chains in the project would be welcome more in districts like Cachar, Sonitpur and Barpeta compared to districts such as Morigaon, Nalbari andGoalpara.

Figure 3: Per cent share of buffalo population during 2012 (Source: Livestock Census, 2012).

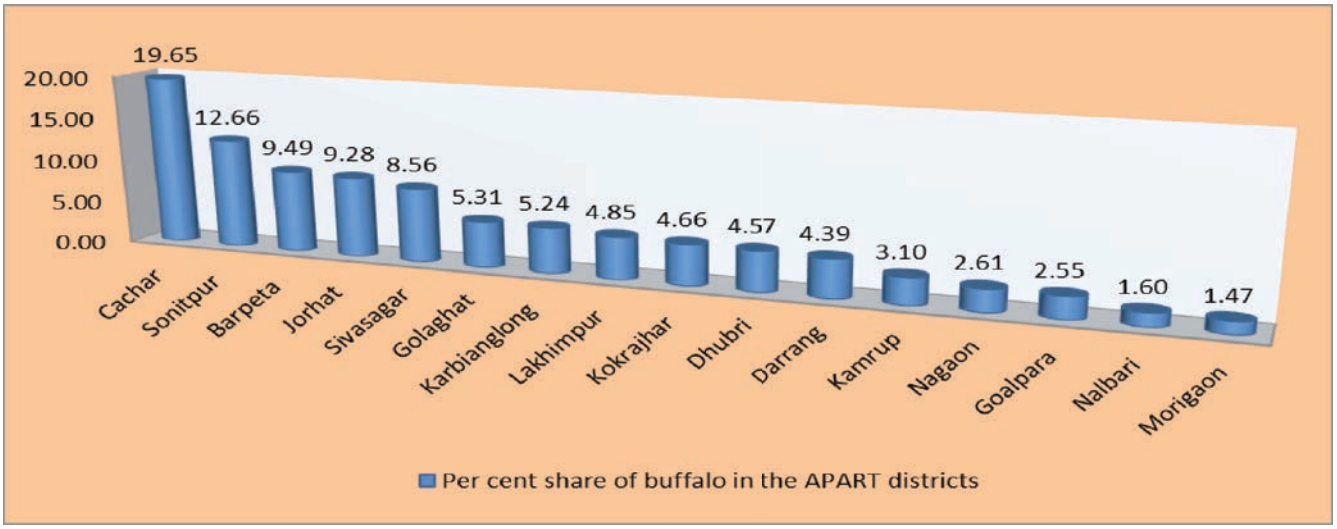


Table 4 presents the bovine population distribution among the project districts of Assam. The bovine population of the project districts is cattle dominant as the buffalo population constitutes only 3.76% (4.05% for the state as a whole). Although cattle cross breding are considered important for raising the milk production of the state, as of 2012, only 3.84% of the total cattle population is crossbred in the state as a whole. The low share of crossbred animals is in spite of state cattle breeding programmes emphasizing cross breding since the start of the Integrated Cooperative Development Project in 1973. The proportion of total crossbred cattle in the project districts of the

state is slightly higher (3.96%) over the state average. This low proportion may be attributed to low utilization of AI and insufficient introduction of purebred exotic bulls in geographically in accessible areas to administer AI. The project districts which have higher than the average proportion of crossbred cattle across project districts (i.e. 3.96%) are Barpeta (9.67%), Nalbari (9.48%), Morigaon (8.74%), Karbi Anglong (6.39%), Cachar (6.30%) and Nagaon (5.69%). The utilization of cross breding technology such as AI is the lowest in flood-affected districts like Lakhimpur (0.64%) and Bodoland Territorial Area Districts, Kokrajhar (0.74%) where milk is not a favoured consumption item. The ratio of cattle to buffalo population is highest in Cachar district followed by Barpeta district where buffaloes are reared mostly in a forest herd system in the northern part of the district and also in the river blocks in the south. In Nagaon district, the total buffalo population is only 7,445 compared to a cattle population of 7, 62,860 (Table 4).

Table 4: Distribution of bovine population by sex and breed in the APART districts of Assam

District	Total cattle	Total buffalo	Buffalo		Indigenous cattle			Crossbred cattle			Ratio of cattle to buffalo
			male (%)	female (%)	male (%)	female (%)	total (%)	male (%)	female (%)	Total (%)	
Golaghat	412,887	15,153	7,627 (50.33)	7,526 (49.67)	181,430 (43.94)	220,745 (53.46)	402,175 (97.41)	1,603 (0.39)	9,109 (2.21)	10,712 (2.59)	27.25
Sonitpur	942,292	36,106	11,923 (33.02)	24,183 (66.98)	373,458 (39.63)	533,871 (56.66)	907,329 (96.29)	6,719 (0.71)	28,244 (3.00)	34,963 (3.71)	26.10
Morigaon	317,841	4,179	2,141 (51.23)	2,038 (48.77)	121,839 (38.33)	168,225 (52.93)	290,064 (91.26)	3,025 (0.95)	24,752 (7.79)	27,777 (8.74)	76.06
Jorhat	491,495	26,449	8,342 (31.54)	18,107 (68.46)	189,058 (38.47)	290,544 (59.11)	479,602 (97.58)	2,245 (0.46)	9,648 (1.96)	11,893 (2.42)	18.58
Nalbari	260,150	4,552	1,702 (37.39)	2,850 (62.61)	64,595 (24.83)	170,907 (65.70)	235,502 (90.53)	4,124 (1.59)	20,524 (7.90)	24,648 (9.48)	57.15
Lakhimpur	607,682	13,819	4,532 (32.80)	9,287 (67.21)	321,963 (52.98)	281,819 (46.38)	603,782 (99.36)	935 (0.15)	2,965 (0.49)	3,900 (0.64)	43.97
Kokrajhar	325,662	13,290	7,179 (54.02)	6,111 (45.98)	146,378 (44.95)	176,861 (54.31)	323,239 (99.26)	410 (0.13)	2,013 (0.62)	2,423 (0.74)	24.50
Sivasagar	411,099	24,406	7,408 (30.35)	16,998 (69.65)	179,318 (43.62)	222,474 (54.12)	401,792 (97.74)	1,452 (0.35)	7,855 (1.91)	9,307 (2.26)	16.84
Goalpara	288,494	7,283	3,671 (50.41)	3,612 (49.60)	123,739 (42.90)	160,635 (55.68)	284,374 (98.57)	1,065 (0.37)	3,055 (1.06)	4,120 (1.43)	39.61
Karbi Anglong	363,343	14,935	5,692 (38.11)	9,243 (61.89)	177,065 (48.73)	163,057 (44.88)	340,122 (93.61)	11,328 (3.12)	11,893 (3.27)	23,221 (6.39)	24.33
Darrang	343,025	12,522	5,245 (41.89)	7,277 (58.11)	118,803 (34.63)	212,873 (62.06)	331,676 (96.69)	1,726 (0.50)	9,623 (2.81)	11,349 (3.31)	27.39
Barpeta	383,548	27,044	10,894 (40.28)	16,150 (59.72)	115,062 (30.00)	231,412 (60.34)	346,474 (90.33)	5,878 (1.53)	31,196 (8.13)	37,074 (9.67)	14.18
Nagaon	762,860	7,445	3,648 (49)	3,797 (51.00)	290,811 (38.12)	428,628 (56.19)	719,439 (94.31)	9,297 (1.22)	34,124 (4.47)	43,421 (5.69)	102.47
Dhubri	508,361	13,043	7,601 (58.28)	5,442 (41.72)	199,046 (39.15)	303,238 (59.65)	502,284 (98.81)	877 (0.17)	5,200 (1.02)	6,077 (1.20)	38.98
Kamrup	541,327	8,837	3,623 (41.00)	4,323 (48.92)	185,452 (34.26)	338,386 (62.51)	523,838 (96.77)	2,355 (0.44)	15,134 (2.80)	17,489 (3.23)	61.26
Cachar	330,765	56,036	19,593 (34.97)	36,443 (65.04)	107,518 (32.51)	202,419 (61.20)	309,937 (93.70)	3,278 (0.99)	17,550 (5.31)	20,828 (6.30)	5.90
Total	**7,290,831**	**285,099**	**110,821 (38.87)**	**173,387 (60.82)**	**2,895,535 (39.72)**	**4,106,094 (56.32)**	**7,001,629 (96.03)**	**56,317 (0.77)**	**232,885 (3.19)**	**289,202 (3.97)**	**25.57**
Assam Total	**10,307,604**	**435,265**	**171,420 (39.38)**	**263,845 (60.62)**	**4,216,411 (40.91)**	**5,695,291 (55.25)**	**9,911,702 (96.16)**	**76,332 (0.74)**	**319,570 (3.10)**	**395,902 (3.84)**	**23.68**

Source: Livestock Census Report, 2012

Note: Figures in parentheses are percentage to total cattle and total buffaloes

2.3 Compositional change

Since crossbreeding has occurred within the cattle population of the state, the changes in the composition of the cattle population (both crossbred and indigenous) with respect to males and females considering the purpose of rearing are presented in Tables 5 and 6. With increased farm mechanization, the preference for male cattle reduces and preference for milch cattle increases. During 1982 (separate enumeration for crossbred cattle started in 1982), the total crossbred cattle population in the state was 104,770 composed of 13% adult males, 55% adult females and 31% young stock. As of 2012, the percentage of adult males has lowered to 8.8% and adult females haves increased to almost 70%, indicating that crossbred cattle are preferred for milk production purpose (Table 4). A similar trend is seen within the indigenous cattle population. According to the Livestock Census, 1966, the proportion of adult males in the total indigenous cattle population was 38.7%, where as adult indigenous females constituted 30.3%, indicating the indigenous cattle population was mostly preferred for drought power. In 2012, the proportion of adult males reduced slightly to 35.6%, whereas the proportion of adult females increased to 35.2% implying the increasing importance of milking rather than work animals (Table 6).

Table 5: Compositional change of crossbred cattle in Assam

Livestock census	Crossbred cattle population (in thousands)			
	Adult males (%)	Adult females (%)	Young stock (%)	Total
1982*	14.3 (13.69)	57.7 (55.09)	32.7 (31.22)	104.7
1988	16.8 (10.34)	97.5 (60.01)	48.2 (29.65)	162.6
1994	21.4 (09.88)	131.2 (60.48)	64.3 (29.64)	216.9
1997	27.8 (11.02)	157.9 (62.45)	67.0 (26.52)	252.8
2003	27.7 (08.81)	192.6 (61.23)	94.2 (29.96)	314.6
2012	22.3 (08.87)	175.3 (69.60)	54.0 (21.46)	251.7

Source: Livestock Census Report of Assam (various issues)
Note: Figures with in parentheses indicate percentage of total

*Separate enumeration of the crossbred cattle population started with the 1982 census.

Table 6: Compositional change of indigenous cattle in Assam

Livestock census	Indigenous cattle population (in lakhs)			
	Adult males (%)	Adult females (%)	Young stock	Total
1966	23.6 (38.77)	18.5 (30.34)	18.8 (30.89)	61.0
1972	22.6 (39.00)	18.0 (31.11)	17.3 (29.89)	57.9
1979	25.1 (38.85)	19.4 (30.02)	20.1 (31.13)	64.7
1982	21.2 (32.17)	20.0 (30.39)	24.7 (37.43)	66.0
1988	25.4 (43.18)	20.7 (35.23)	12.7 (21.59)	58.9
1994	22.8 (36.88)	24.1 (39.10)	14.8 (24.01)	61.8
1997	22.6 (36.02)	24.1 (38.42)	16.0 (25.55)	62.8
2003	23.0 (35.87)	23.7 (36.99)	17.4 (27.14)	64.2
2012	31.5 (35.66)	33.5 (37.90)	23.4 (26.43)	88.5

Source: Livestock Census Report of Assam (various issues)

Notes: Figures within parentheses indicate percentage of total

2.4 Bovine population density

The density of bovine population in the project districts with respect to total geographical and grazing areas are presented in Table 7. In order to control for the heterogeneity in the size of the districts, density of cattle population per 100 hectares (ha) of geographical and grazing areas is considered. The density of bovine population is presented in Table 7. On average; a hundred ha of geographical area in Assam accommodates 134 cattle, comprising 5 crossbreds and 129 indigenous cattle. The corresponding figure for 100 ha of grazing area is 326 (12 crossbreds and 313 indigenous cattle). Among the project districts, Dhubri (305) has the highest cattle density per hundred ha of geographical area followed by Lakhimpur district (265) where as Karbi Anglong (34.8) has the lowest cattle density per 100 ha of geographical area (see Table 3). Regarding density per 100 ha of grazing area, Nagaon district has the highest cattle population (873) followed by Barpeta (605) with the lowest in Karbi Anglong (62). The density of crossbred cattle per 100 ha of geographical area is the highest in Nalbari district (24) and lowest in Kokrajhar district (0.8). The corresponding figure for 100 ha of grazing area is 75 in Nalbari and 3.7each in Kokrajhar and Lakhimpur. The low crossbred cattle density in Lakhimpur and Kokrajhar districts is due to low AI utilization with in the breedable cattle population because AI services in the districts are negatively influenced by the recurrent flood in Lakhimpur and the low preference for milk in Kokrajhar dominated by the Bodo community (where pig rearing is an important livestock activity). Districts like Barpeta (47 per 100 ha of grazing area) and Cachar (45 per 100 ha of grazing area) have much higher buffalo density than the rest of the districts. Overall, there is variation between cattle and buffalo density among the project districts. Many of the districts have lower crossbred cattle density implying the higher potential for breed improvement in those districts compared to the carrying capacity. Genetic improvement of the indigenous cattle stock will have win-win consequences as the reduction of the low-yielding indigenous breed will reduce pressure on grazing land and will immensely contribute towards increased milk production.

Table 7: Density of bovine Population in the APART districts of Assam (2012)

Districts	Geographical area (ha)	Grazing area (ha)	Density/100 ha of geographical area				Density/100 ha of grazing area			
			Crossbred	Indigenous	Total cattle	Total buffalo	Crossbred	Indigenous	Total cattle	Total buffalo
Golaghat	350,200	87,119	3.1	114.8	117.9	4.3	12.3	461.6	473.9	17.4
Sonitpur	528,058	219,314	6.6	171.8	178.4	6.8	15.9	413.7	429.7	16.5
Morigaon	155,100	53,547	17.9	187.0	204.9	2.7	51.9	541.7	593.6	7.8
Jorhat	285,100	142,956	4.2	168.2	172.4	9.3	8.3	335.5	343.8	18.5
Nalbari	100,957	32,753	24.4	233.3	257.7	4.5	75.3	719.0	794.3	13.9
Lakhimpur	227,700	105,476	1.7	265.2	266.9	6.1	3.7	572.4	576.1	13.1
Kokrajhar	316,544	65,149	0.8	102.1	102.9	4.2	3.7	496.2	499.9	20.4
Sivasagar	266,800	93,003	3.5	150.6	154.1	9.1	10.0	432.0	442.0	26.2
Goalpara	182,400	73,826	2.3	155.9	158.2	4.0	5.6	385.2	390.8	9.9
Karbi Anglong	1,043,400	587,707	2.2	32.6	34.8	1.4	4.0	57.9	61.8	2.5
Darrang	185,058	76,598	6.1	179.2	185.4	6.8	14.8	433.0	447.8	16.3
Barpeta	267,733	57,186	13.8	129.4	143.3	10.1	64.8	605.9	670.7	47.3
Nagaon	397,300	87,380	10.9	181.1	192.0	1.9	49.7	823.3	873.0	8.5
Dhubri	166,410	103,097	3.7	301.8	305.5	7.8	5.9	487.2	493.1	12.7
Kamrup	411,095	1,10105	4.3	127.4	131.7	2.1	15.9	475.8	491.6	8.0
Cachar	378,600	123,815	5.5	81.9	87.4	14.8	16.8	250.3	267.1	45.3
Total	**5,262,455**	**2,019,031**	**5.5**	**133.0**	**138.5**	**5.4**	**14.3**	**346.8**	**361.1**	**14.1**
Assam total	**7,646,328**	**3,163,967**	**5.2**	**129.6**	**134.8**	**5.7**	**12.5**	**313.3**	**325.8**	**13.8**

Source: Land Utilization Statistics, 2013, Directorate of Economics and Statistics, Government of Assam; Livestock Census of Assam, 2012.

3. Milk production status and dynamics

3.1 Composition of milk production according to bovine types and breed of cattle

Out of the total milk production, 30% is from the milk of crossbred cattle in the state. However, the crossbred cattle population constitutes only 3.84% of the total cattle stock indicating the importance of cattle crossbreeding to raise milk production of the state. In other words, since 3.84% crossbred cattle stock contributes 30.41% of the total milk production; efforts for further utilization of crossbreeding technology in the state may have a far-reaching impact on attaining self-sufficiency in milk production of the state. The diffusion of cattle crossbreeding and its impact on increased milk production is better across the project districts of the state. The contribution of buffalo in the total milk production of the state is 13.86% compared to 7.83% across project districts of the state. This implies that the role of buffalo stock in the project districts of the state is less important compared to the state of Assam as a whole towards the contribution of milk production.

At project district level, the contribution of crossbred cattle to the total milk production in Kamrup district is the highest (almost 71%) followed by Nagaon district (50.29%). The contribution of crossbred cattle milk is also remarkably high in Nalbari and Barpeta (almost 44% each). At district level, the contribution of buffalo milk to total milk production is highest in Cachar district (22.36%), followed by Lakhimpur (19.74%). Buffalo-based policy priority is sought in those districts to enhance production and productivity so as to increase the overall milk production. The role of buffaloes in raising milk production is insignificant in districts like Kamrup (1.56%) and Nagaon (2.63%) (Figure 4 and Table A1 in the Annexe)

Figure 4: Project district composition of milk production.

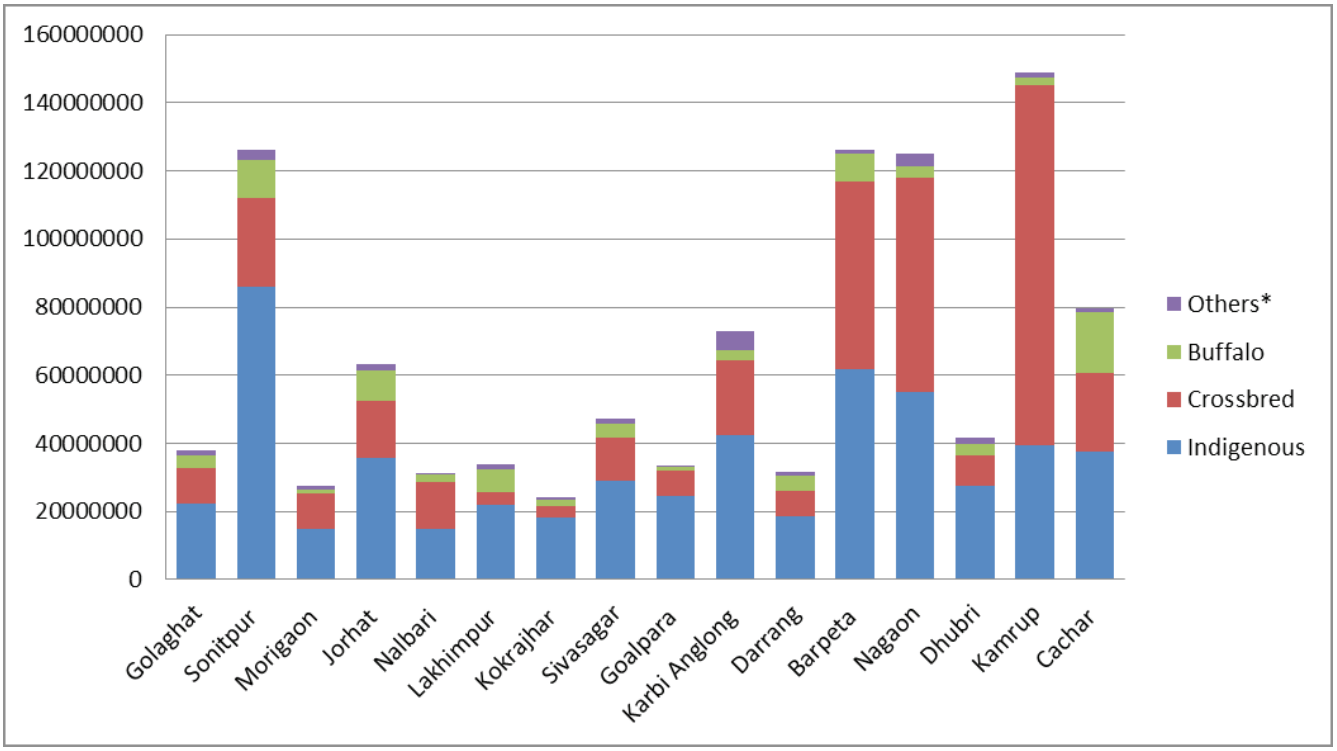
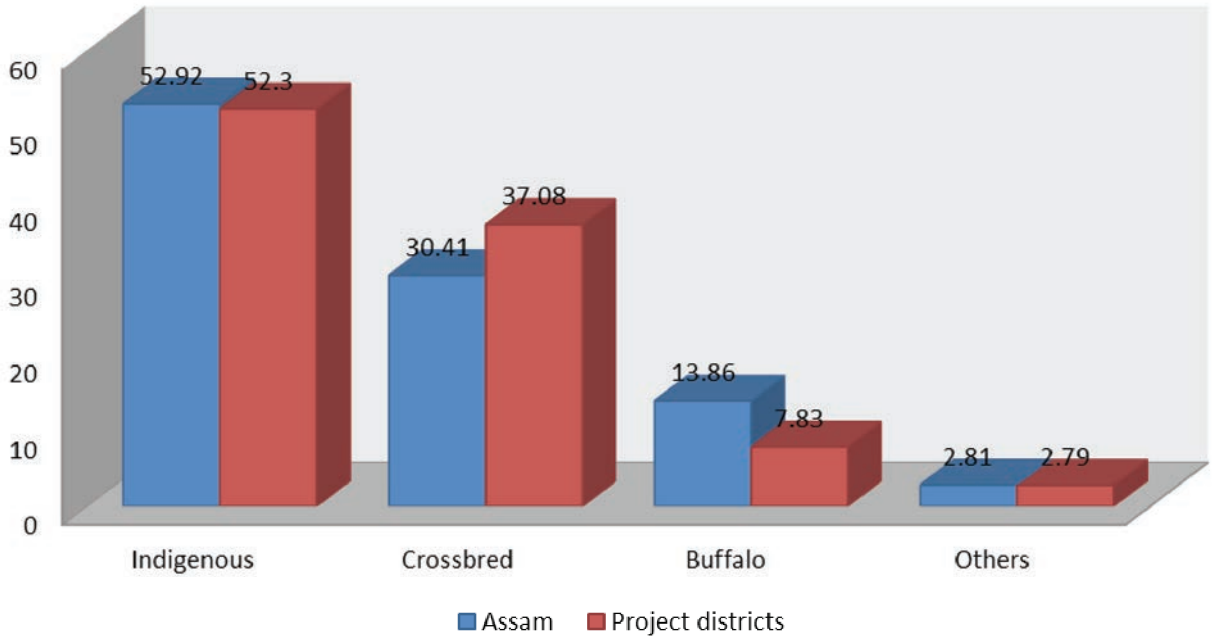


Figure 5: Percentage share of milk by animal species and breed.

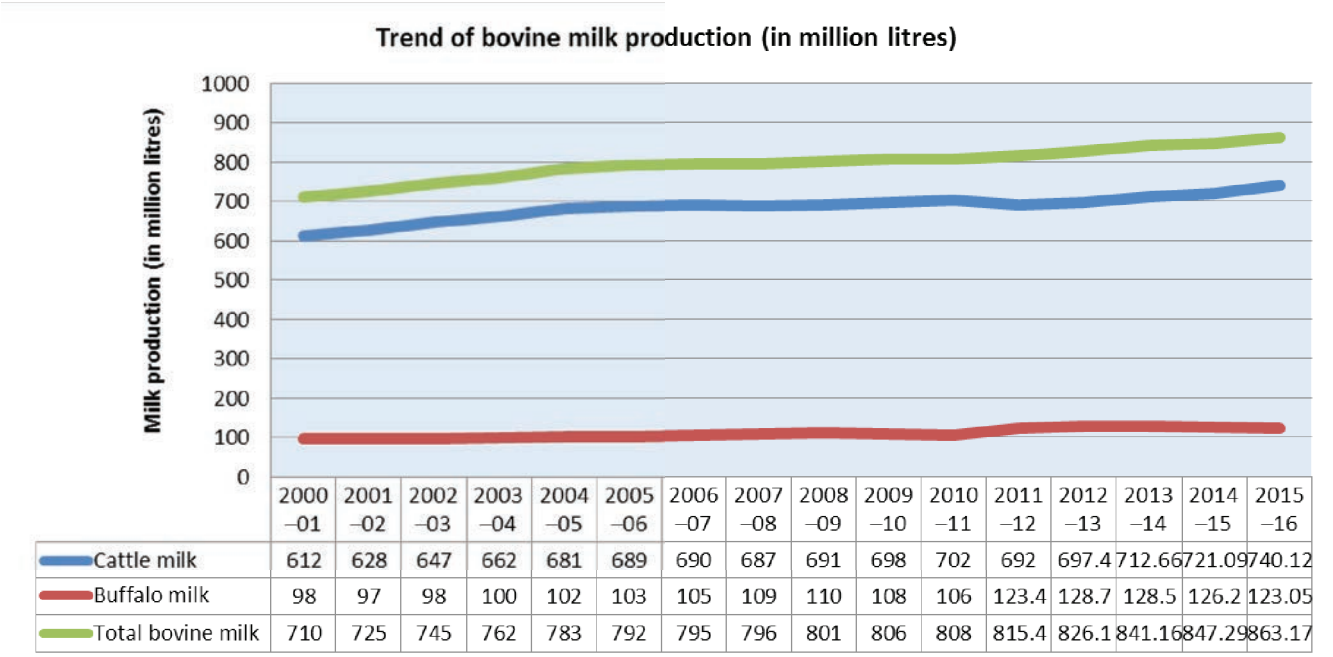


3.2 Trend in milk production

The trend in milk production for cattle and buffalo and the proportion of crossbred cattle milk production in Assam is shown separately in Figures 5 and 6. The total bovine milk production in Assam has steadily increased from 710 million litres in 2000–01 to 863.17 million litres during 2015–16. The constant increase in total bovine milk production in the state is largely due to the increase in crossbred cattle milk and buffalo milk production. During the period under consideration, the indigenous cattle milk production has increased by only 2 million litres (from 468 to 470.02 million litres), whereas the crossbred cattle milk and buffalo milk production has increased by 126 million litres and 98 million litres respectively. However, it is noted that the proportion of crossbred cattle in total cattle stock in the state has not increased significantly. The increase in crossbred milk production is primarily due to the increase in yield level of crossbred cattle stock due to the induction of bulls of high genetic merit from central cattle breeding farms Sunabeda, Orissa and Hesarghatta, Bangalore (Bayan 2018). The lactation milk yield of the buffalo population is also found to have increased which led to the increase in total buffalo milk production of the state.

Further more, the proportion of crossbred cattle milk production in total cattle milk production in the state has been increasing over the years and this increase in milk production is attributable to the continued increase in milk yield of crossbred cattle stock. During 2000–01, the proportion of milk production of crossbred cattle stock in total cattle milk production was 23.53% which rose to 36.49% during 2015–16 (Figure 6). This increasing proportion of crossbred cattle milk in total cattle milk production is thought to be a result of diffusion of cross breding technology. This has implications for raising total milk production of the state through replacement of low productive indigenous cattle stock with high yielding crossbred cattle in situations wheregrazing lands are in decline and concentrate feed costs are rising.

Figure 5: Trend in bovine milk production in Assam (in million litres).



	2000–01	2001–02	2002–03	2003–04	2004–05	2005–06	2006–07	2007–08	2008–09	2009–10	2010–11	2011–12	2012–13	2013–14	2014–15	2015–16
Cattle milk	612	628	647	662	681	689	690	687	691	698	702	692	697.4	712.66	721.09	740.12
Buffalo milk	98	97	98	100	102	103	105	109	110	108	106	123.4	128.7	128.5	126.2	123.05
Total bovine milk	710	725	745	762	783	792	795	796	801	806	808	815.4	826.1	841.16	847.29	863.17

Figure 6: Proportion of crossbred cattle milk production in total milk production of Assam (%).

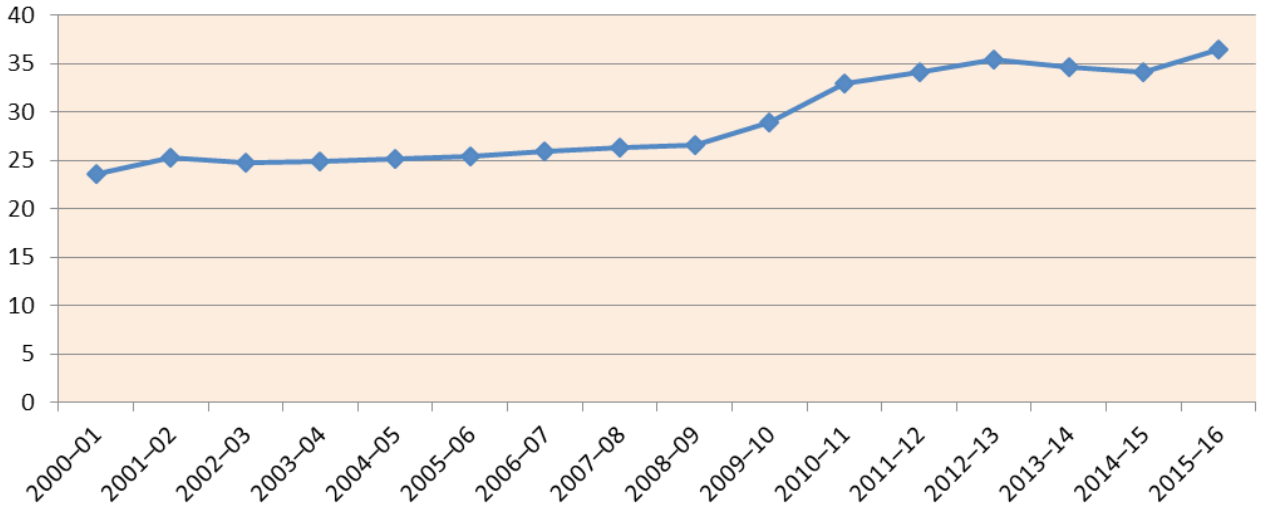


Table 8 presents the changing pattern of milk utilization in the state as a whole. The utilization of milk is categorized into three broad categories: milk sold as liquid, milk consumed as liquid and milk used as processed products. The trend shows that over the years there has been a shift from milk converted into milk products towards more selling of liquid milk. This change may be due to the fact that traditionally milk was widely used as processed products such as curd and cream in many social ceremonies in the state. The extent of this eventually reduced and mostly milk is sold in liquid form only. Table 8 also presents that at HH level over the years, milk consumption in liquid form has also come down significantly; during 1986–87, milk consumed as liquid constituted 44.17% but was reduced to 32% during 2015–16. This implies that previously HH members rank more milk in liquid form and that practice is less followed during the recent period. The assumption is that liquid milk is still fed to children while adults consume milk primarily mixed with tea.

Table 8: Milk utilization pattern in Assam (1986—13)

Year	% milk utilization		
	Milk sold as liquid	Milk consumed as liquid	Converted to milk products
1986–87	14.90	44.17	40.93
1999–00	15.80	48.30	35.90
2006–07	18.20	46.30	35.50
2009–10	30.00	48.00	22.00
2012–13	42.00	36.00	22.00
2015–16	46.00	32.00	22.00

Source: Integrated Sample Survey Reports (various issues), Government of Assam

3.3 Distribution of veterinary services institutes

The distribution of veterinary services institutes and its coverage of the bovine population are shown among the APART districts of Assam in Table 3. The assessment of the performance of bovine health delivery services is essential in order to alleviate constraints and tap opportunities for intervention along the dairy value chain. This necessitates an evaluation of the available infrastructure such as veterinary services institutions and its coverage of the bovine population. Across project districts, the distribution of veterinary hospitals, dispensaries, subcentres/first-aid centres/stock centres, block veterinary dispensaries, key village centres, regional AI centres, rinderpest checkposts and contagious bovine pleuropneumonia checkposts. In Assam, there are 22 hospitals, 337 dispensaries in which one dispensary covers 31,878 bovine animals while in the APART districts one dispensary covers 30,063 animals. Similarly, out of the total number of 684 subcentres in Assam which cover 15,706 bovines, 531 are found in the APART districts which cover 13,825 bovines. Combining all of the veterinary services institutions, 1236 are found for the state as a whole, andon average one institution covers 8,692 bovines in Assam and 7,786 in theproject districts.

Table 9: Distribution of veterinary services Institutes in the APART districts of Assam

Districts	Sub centres /FAC/ stock centre	Hospitals	Dispensari	Block veterinary dispensaries	KVC	RAIC	Rinderpest check posts	CBPP check posts	Total veterinary institutions
Golaghat	28(1:15,287)	1	11 (1:38,913)	4	1	2	1	1	49 (1:8,736)
Sonitpur	65 (1:15,052)	2	17 (1:57,553)	7	4	3	1	2	101 (1:9,687)
Morigaon	26 (1:12,385)	0	8 (1:40,253)	4	2	1	0	0	41 (1:7,854)
Jorhat	42 (1:12332)	1	21 (1:24,664)	8	0	1	0	2	75 (1:6,906)
Nalbari	43 (1:6,156)	1	12 (1:22,059)	2	0	1	0	0	59 (1:4,486)
Lakhimpur	51 (1:12,186)	1	11 (1:56,500)	5	0	1	1	2	72 (1:8,632)
Kokrajhar	25 (1:13,558)	1	10 (1:33,895)	2	3	2	4	0	47 (1:7,212)
Sivasagar	20 (1:21,775)	2	20 (1:21,775)	0	0	1	1	2	46 (1:9,468)
Goalpara	20 (1:14,789)	1	11 (1:26,889)	4	1	0	0	0	37 (1:7,994)
Karbi Anglong	17 (1:22,252)	0	8 (1:47,285)	9	0	0	1	0	36 (1:10,508)
Darrang	21 (1:16,931)	1	10 (1:35,555)	3	1	1	0	0	37 (1:9,609)
Barpeta	32 (1:12,831)	1	13 (1:31,584)	6	4	1	1	0	58 (1:7,079)
Nagaon	60 (1:12,838)	1	40 (1:19,258)	9	3	1	0	0	114 (1:6,757)
Dhubri	27 (1:19,311)	1	16 (1:32,588)	7	3	2	0	0	56 (1:9,311)
Kamrup	44 (1:12,504)	2	27 (1:20,376)	6	1	0	2	0	82 (1:6,252)
Cachar	27 (1:14,326)	4	17 (1:22,753)	0	4	2	3	0	57 (1:6,786)
Total	**531 (1:13,825)**	**20**	**244 (1:30,063)**	**67**	**27**	**19**	**15**	**9**	**938 (1:7,786)**
Assam total	**684 (1:15,706)**	**22**	**337 (1:31,878)**	**99**	**30**	**25**	**20**	**13**	**1236 (1:8,692)**

FAC = first aid centre; KVC = key village centre; RAIC = regional artificial insemination centre;

CBPP = contagious bovine pleuropneumonia

Note: Figures in parentheses are the number of bovine animals covered by one veterinary services institute.

Source: Number of veterinary services institutes are cited from the Statistical Handbook of Assam, 2016and bovine population numbers are cited from the 19th Livestock Census, 2012.

4. Cluster level profile on milk production (district specific)

This section provides informationand tabular analysis on the various aspects of the dairy value chain in the sample clusters of the project districts. Data were gathered through FGD and KII.

4.1 Golaghat district

4.1.1. Cluster villages identification based on field visit

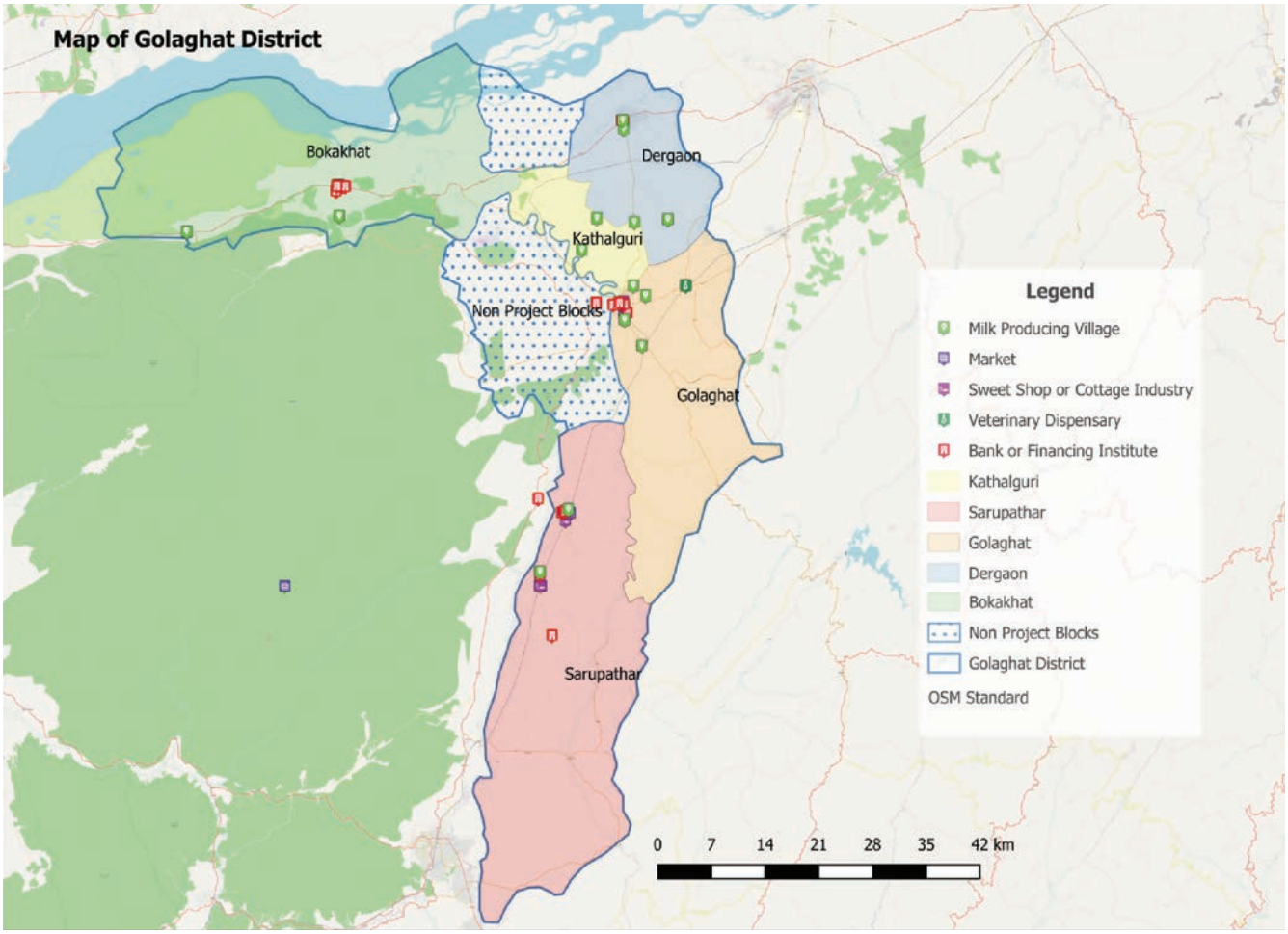
The project identified five clusters in Golaghat district for the implementation of APART. The selected clusters covering the potential villages for interventions with the informal dairy value chain actors are Kathalguri, Podumoni, Bokakhat, Dergaon and Sarupathar. Interviews began with a project overview and discussion with some of the informed sources such as DVOs, VOs and/or BVOs of the respective clusters. The ILRI enumerators then finalized selection of the villages listed by the DDD as potential project sites. The list of villages is shown in Table 4.1.1.

Table 4.1.1: Villageclusters of Golaghat district

Dairy cluster	Names of the DDD- listed villages	Names of the ILRI- listed villages	Potential villages incorporated	Non-potential villages dropped
Kathalguri	Buralikson, Sinatoli, Dhekial,	Buralikson, Sinatoli, Dhekial	0	0
Podumoni (Golaghat town)	Furkating, Kamarbondha, Bongaon, Jonakinagar, Bengenakhowa	Furkating, Kamarbondha, Bongaon, Jonakinagar, Bengenakhowa	0	0
Bokakhat	Gorhmur, Kamargaon, Kohora	Gorhmur, Kamargaon, Kohora, NikariChapori, NatunChapori, Parangaria	NikariChapori, NatunChapori, Parangaria	0
Dergaon	Dergaon, Htiekhowa	Dergaon, Htiekhowa	0	0
Sarupathar*	Sarupathar, Borpathar	Sarupathar, Borpathar*	0	0

*Sarupathar and Borpathar are vast areas for whichbovine populations as a whole are reported in each.

Figure 7: The map of the surveyed clusters of Golaghat district.



4.1.2 FGD participants' profile

Table 11 shows the number of participants segregated by gender and social status. The average number of participants across the project clusters is 8.4 in Golaghat district of which 5 were males (59.52%) and 3.4 were females (40.48%).Among the participants across the project clusters, representation from Other Backward Class (OBC)is the highest (48%) followed by 'general' (46%). No participants from Scheduled Caste (SC) were found,

while Scheduled Tribes (ST) represented 6% among the total participants. In the Dergon cluster, 100% of the farmers were from OBC, while in Sarupathar, all of the participants were from the general category.

Table 4.1.2: Distribution of participants by gender and social status

Dairy clusters	Average number of participants			%social status of participants			
	Male (%)	Female (%)	Total	General	SC	ST	OBC
Kathalguri	5 (41.67)	7 (58.33)	12	60	0	0	40
Podumoni (Golaghat town)	7 (77.78)	2 (22.22)	9	70	0	0	30
Bokakhat	5 (71.43)	2 (28.57)	7	0	0	30	70
Dergaon	4 (66.67)	2 (33.33)	6	0	0	0	100
Sarupathar	4 (50.00)	4 (50.00)	8	100	0	0	0

Source: Field Survey, 2018

4.1.3 Farming system by type of bovine stock

Analysis of the dairy farming system based on type of bovine stock in the selected project clusters shows that the district as a whole has 5,890 HH who have atleast one dairy cattle or buffalo during the time of the survey, representing 46.15% of HH among the total HH across project clusters. In the selected clusters as a whole, 78% of HH have local breeds, 13.40% have improved breeds, and 5.40% of HH have both local and improved breeds. Only 3.2% of the total HH have buffalo stock (Table 4.1.3).The number of farmers having improved breeds of cattle is highest in Podumoni cluster (23%) followed by Dergaon (18%). In Bokakhat cluster, only 5% of the total farming HH was found to have improved cattle. Discussion with some of the key informants indicated that there are some *Chapori* (river block) areas based on local cattle such as Nikarichapori, Notun Chapori and Parangaria where milk is collected at a junction point called Dukhutimukh and from there milk is supplied to Bokakhat town by a few milk traders. Thus, Dukhutimuch can be an important location to organize training to link the commercial producers and traders of the *Chapori* areas in Bokakhat.

Table 4.1.3: Distribution of farm HH by type of bovine stock

Dairy cluster	No. of total HH	Total farming HH (%)	%HH keeping local breed cattle	%HH keeping improved breed cattle	%HH keeping both local and improved breed cattle	%HH keeping buffalo
Kathalguri	720	260 (36.11)	82	6	12	0
Podumoni (Golaghat town)	2,600	1,180 (45.38)	64	23	9	4
Bokakhat	1,730	1,100 (63.58)	90	5	3	2
Dergaon	470	100 (21.28)	72	18	0	10
Sarupathar	6,000	3,250 (54.17)	82	15	3	0

Source: Field Survey, 2018

4.1.4 Farming system by rearing practices

Table 13 shows that almost 13.01% of farm HH rear cattle in a fully stall-fed condition, while the proportion of farmers rearing cattle in a partly stall-fed condition constitutes83.7%. There is not any *khuti* system of rearing except in Bokakhat. The farming system based on rearing practice is closely related to the type of bovine stock as shown in Table 4.1.4; crossbred animals are mostly fully stall-fed.

Table 4.1.4: Distribution of farm HH by rearing practices

Dairy cluster	% fully stall fed	% partly stall fed	%*khuti* (forage herd) system
Kathalguri	6.0	93.0	0.0
Podumoni (Golaghat town)	22.0	68.0	0.0
Bokakhat	4.5	90.5	5.0
Dergaon	18.0	82.0	0.0
Sarupathar	15.0	85.5	0.0

4.1.5 Women's participation in dairy production and income control

During FGD, men and women were asked separately about women's participation in dairy production and sales and control of income related to dairy sales. Overall, women's participation in rearing activities was greater than their control of income derived from dairy sales compared to men, however, this was dependent on the nature of the farm and type of farm activities.The fully commercial farms based on improved cattle stock require more physical labour usually performed by male HH members. Subsistence farming, however, is mostly performed by women. Moreover, activities such as selling milk in the market, grass collection and taking animals to grazing are carried out mostly by the male members of the family while cleaning cattle sheds and feeding the cattle at home are done mostly by the female members of the family. In regard to income control, farmers reported that their decision to spend income gained through the sale of milk and milk products is mostly discussed and carried out jointly by husband and wife. In the project clusters of Golaghat, women's participation in dairying activities is higher (54.5%) compared to their male counter parts. However, in Golaghat women's control of dairy income (46%) is less than men's (Table 4.1.5).

Table 4.1.5: Women's role in dairy production and income control

Dairy cluster	No. of total farming HH	Women have role in dairy production %	Women have control of income from dairy production %
Kathalguri	1,260	60.0	40.0
Podumoni (Golaghat town)	1,180	50.0	40.0
Bokakhat	1,100	47.5	50.0
Dergaon	100	55.5	50.0
Sarupathar	3,250	60.0	50.0

4.1.6 Average herd size (adult animals) of the farm HH according to type of bovine stock

The average herd size of adult animals to the type of bovine stock is reported in Table 4.1.6. The number of adult indigenous cattle kept per HH is 2.33 across the project clusters with the highest number in Podumoni (2.8) and the lowest in Dergaon (1.5). The average improved cattle holding among HH across the selected project clusters are 4.02. The farmers in Kathalguri and Sarupathar reported that none of the farmers in these clusters owned buffaloes during the time the survey was conducted. The numberof buffaloes held by the farmers of the remaining clusters are 1.42.

Table 4.1.6: Average herd size (adult animals) of bovine stock in the project clusters

Dairy cluster	Local cows	Improved cows	Buffaloes
Kathalguri	2.33	5.00	0.00
Podumoni (Golaghat town)	2.80	4.62	1.00
Bokakhat	2.00	2.50	0.75
Dergaon	1.50	3.50	2.50
Sarupathar	3.00	4.50	0.00

Source: Field Survey, 2018

4.1.7 Milk productivity and production of the bovine stock at cluster level

The daily milk yield of bovine stock is not uniform through out lactation. Immediately after calving, lactation gradually increases until reaching peak yield. Farmers were asked about their average daily milk yield during the lean and peak periods of lactation. In the selected project clusters of Golaghat, the daily average milk productivity of local cows during the lean period is 0.50 litres withthe highest yield reported in Bokakhat (0.75 litres) and the lowest intheDergaon cluster (0.37 litres). Peak lactation days of indigenous cattle yield 1.97 litres on average. The average lean and peak productivity of improved cattle stock is 2.66 and 10.88 litres and of buffaloes is 1.17 and 3.08 litres respectively. The average milk yield is the highest in Bokakhat across the stages of lactation (7.75 litres) and the lowest in Dergaon cluster (5 litres).

Table 4.1.7: Lowest and highest levels of average daily milk production per cow in the clusters (litre/day)

Dairy cluster	Milk production for local cows		Milk production of improved cows		Milk production of buffaloes	
	Low	High	Low	High	Low	High
Kathalguri	0.42	2.00	2.33	10.33	-	-
Podumoni (Golaghat town)	0.45	2.00	3.20	10.80	1.50	3.25
Bokakhat	0.75	1.87	2.25	13.25	1.00	3.00
Dergaon	0.37	1.50	2.00	8.0	1.00	3.00
Sarupathar	0.50	2.50	3.50	12.00	-	-

Tables 4.1.8 to 4.1.10 show the average milk production of local, improved and buffalo stock of the district. Based on local cattle stock, the total milk production across the clusters is 8,939 litres with highest milk production recorded as 5,996 litres in Sarupathar followed by Bokakhat (1,297) and Podumoni (1,295) clusters. The total milk production of the improved cattle in the selected project clusters is 13, 826 litres, with the highest milk production reported in Sarupathar (8,501) followed by Podumoni (4,309). Dergaon has the lowest milk production among the project clusters in the district (158). Buffalo stock in present in three clusters produce a total of 97 litres. The proportionate share of milk from local cows, improved cows and buffaloes constitute 40.43, 59.18 and 0.39% respectively across the project clusters.The productivity of improved cattle stock is better in the project district; only 13.40% of farming HH rear improved cattle stock, their stock contributes to 60.47% of total milk production, while 78% of the total farming HH rear indigenous breeds which contribute to 39% of total milk production across bovines. The prevalence and low milk productivity of indigenous cattle indicate that the project clusters will benefit from crossbreding to transform a significant number of the farms from subsistence to commercial. The *khuti* system in the *Chapori*areas of Bokakhat cluster which hold primarily local cattle should also be a focus of project interventions to increase the level and quality of animal health care and to improve management practices to increase dairy product yield.

Table 4.1.8: Estimated total milk production based on total local cattle stock

Dairy cluster	Estimated no. of HH with local cattle	Average herd size (adult lactating animals)	Average milk production per local cow	Total milk production with local cattle stock*
Kathalguri	213	1.16	1.21	301
Podumoni (Golaghat town)	755	1.40	1.23	1,295
Bokakhat	990	1.00	1.31	1,297
Dergaon	72	0.75	0.94	50
Sarupathar	2,665	1.50	1.50	5,996

*In estimating total milk production of local cows only the lactating animals were considered assuming 50% of the total adult local cattle as lactating.

Table 4.1.9: Estimated total milk production based on improved cattle stock

Dairy cluster	Estimated no. of HH with improved cattle	Average herd size (adult lactating animals)	Average milk production per improved cow	Total milk production with improved cattle stock*
Kathalguri	16	2.50	6.33	247
Podumoni (Golaghat town)	271	2.31	7.00	4,389
Bokakhat	55	1.25	7.75	533
Dergaon	18	1.75	5.00	158
Sarupathar	487	2.25	7.75	8,501

*In estimating total milk production of improved cattle only lactating animals are considered assuming 50% of the total adult improved cattle as lactating.

Table 4.1.10: Estimated total milk production based on buffalo stock

Dairy cluster	Estimated no. of HH with buffaloes	Average no. of HH with adult buffaloes	Average milk production per buffalo	Total milk production with buffaloes*	Total milk production across bovine stock#
Kathalguri	00.0	0.00	0.00	00.00	**547**
Podumoni (Golaghat town)	47.2	0.50	2.37	56.05	**5,740**
Bokakhat	22.0	0.37	2.00	16.50	**1,846**
Dergaon	10.0	1.25	2.00	25.00	**233**
Sarupathar	00.0	0.00	0.00	00.00	**14,497**

*In estimating total milk production of buffaloes only lactating animals were considered assuming 50% of the total adult buffaloes as lactating.

Total milk production is the summation of milk production across bovine stock in table 4.1.8 to 4.1.10.

4.1.8 Marketing behaviour of farmers at cluster level

All types of farms are found to sell their surplus milk. Farmers with local cattle stock keep a part of their milk produced for home consumption and offer to relatives and others; the remaining part is marketed to earn cash. Farmers with improved cattle stock produce primarily for market to earn profit, while some portion of the product is kept for HH consumption. Since total milk production is higher on commercial farms with crossbred / improved cattle, the proportion of milk marketed is also higher. On subsistence farms with local cattle, more than 50% of milk produced is consumed at home. Table 4.1.11 shows that farm HH with local cattle across project clusters sell 37.93% of the total milk production, while farm HH with improved cattle stock sell 85.70% of their total milk production. Project clusters with buffaloes sell 51.67% of their total milk production.

Table 4.1.11: Bovine stock percentage of milk sold per HH

Dairy cluster	% milk sold from local cows	% milk sold from improved cows	% milk sold from buffaloes
Kathalguri	36.67	90.00	-
Podumoni (Golaghat town)	38.00	81.00	75
Bokakhat	35.00	85.00	50
Dergaon	40.00	80.00	30
Sarupathar	40.00	92.50	-

Table 21 presents the sources of milk sale in the project clusters. Selling milk in the neighbourhood or in the local market is predominant in the majority of the clusters of Golaghat. These are smallholder dairy farmers rearing indigenous breeds to cater to the local raw milk consumers in their neighbourhood. Considering all of the selected clusters of the district, 52.67% of farmers sell milk locally, followed by selling to private processors (26.73%). DCS salesin the entire project clusters is only 7.13%, pointing out that almost 93% of the total farmers in the selected clusters use informal channels to sell milk. The informal market actors such as milk traders and private processors procure milk from almost 40% of the producers, establishing an informal value chain between producers and traders, producers and SMs/CPs, and producers to consumers fromSMs/CPs.

Prices offered to producers by various marketing sources is highest when farmers sell milk locally (INR 50/litre) followed by sourcing to private processors (INR45/litre). As shown by empirical studies in Assam and other states of India,cooperatives are weak in offering better prices to consumers (Kamuar et al. 2013; Kumar and Staal 2010; Bayan 2018).Similar findings are reported in the study sites of Golaghat where cooperatives offer only INR 36/ litres across clusters. Farmers' preference for marketing channels is in accordance with the prices they receive as shown in Table 4.1.12.

Table 4.1.12: Percentage of milk sales according to sources and their respective farm gate prices

Dairy cluster	Neighbours or local sale		To traders		To cooperatives		To private processors	
	%	Price (INR)/ litre	%	Price (INR)/ litre	%	Price (INR)/ litre	%	Price (INR_/ litre
Kathalguri	53.33	47	23.33	35.0	6.67	35	16.67	43
Podumoni (Golaghat town)	30.00	52	34.00	39.5	24.00	37	12.00	43
Bokakhat	75.00	50	0.00	-	0.00	-	25.00	50
Dergaon	80.00	50	0.00	-	5.00	33	15.00	45
Sarupathar	25.00	50	10.00	50.0	0.00	-	65.00	45

4.1.9 Access to veterinary services

For the consumers' safety and milk quality, adequate access to veterinary services is important. Table 4.1.13 presents the number of veterinary service providers which include local veterinarians, VFAs, CAHW and AI service providers. Across clusters, an average of two local veterinarians operates, while the average distance of the veterinarian from the farm villages is 4.14 km. At cluster level, the distance between veterinarians and farm villages is 9 km, while farm villages of Dergaon are located 1 km from a veterinarian. The distance between VFAs and villages is an average of 4.38 km across clusters, ranging from 1 km in Sarupathar to almost 12 km in Kathalguri. None of the farmers in Golaghat report access to a CAHW.

Table 4.1.13: Access to veterinary services at the selected project clusters of the district

Dairy cluster	No. local veterinarians*		Distance from the FGD location/village	No. VFAs		Distance from the FGD location/village	No. CAHWs		Distance from the FGD location/village
	Male	Female		Male	Female		male	female	
Kathalguri	1	0	9.0 km	3	0	12.3 km	0	0	-
Podumoni (Golaghat town)	3	0	2.7 km	11	0	03.1 km	1	0	1 km
Bokakhat	2	1	6.0 km	1	0	03.5 km	0	0	-
Dergaon	2	0	1.0 km	3	0	02.0 km	0	0	-
Sarupathar	1	0	2.0 km	1	0	01.0 km	0	0	-

*Local veterinarian includes both private and government employed.

4.1.10 Availability of producers/traders organizations and input supplying institutions at cluster level

Farmers report that there are not any registered milk traders organizations or self-help groups (SHGs) related to dairy farming practices in the selected clusters. Podumoni has five and Dergaon has one DCS; the other clusters do not have access to a DCS (Table 4.1.14)

Table 4.1.14: Availability of producers/traders organizations at cluster level (no.

Dairy cluster	Milk traders organizations	SHG	DCS
Kathalguri	0	0	0
Podumoni (Golaghat town)	0	0	5 (Forcatting, Tewa, Gaon,Kamarbondha,Bangaon)
Bokakhat	0	0	0
Dergaon	0	0	1 (Hatikhowa)
Sarupathar	0	0	0

Note: The major linked villages are listed in parentheses.

The availability of input supplying institutions in the selected project clusters such as dairy plant/chilling plant/ BMC, disease diagnostic laboratory (DDL), feed testing laboratory, feed mill and private veterinary clinic, is shown in Table 4.1.15. Farmers report that there is one chilling centre/BMC in Podumoni cluster and one chilling plant at Bokakhat cluster. Across project clusters, FGD participants identified one DDL and one feed mill in Golaghat town. There are five private veterinary clinics in Kathalguri, two in Podumoni and three in Saurpathar for animal health care/consultation and medicine dispensing.

Table 4.1.15: Availability of input supplying institutions at cluster level (no.)

Dairy cluster	Dairy plant, chilling plant, BMC	DDL	Feed testing laboratory	Feed mill	Private veterinary clinics
Kathalguri	0	0	0	0	5 (Ganga Medicos, Sarma Medicos, Arogy Medicos, Rijumoni Medicos, Golaghat
Podumoni (Golaghat town)	1 BMC/chilling centre at Furkating (under AACP)	1	0	0	2 (Roy and Mallick Medicos, Golaghat town)
Bokakhat	1	0	0	(1 under ALPCo)	0
Dergaon	0	0	0	0	0
Sarupathar	0	0	0	0	3 (Radha Pharmacy Das Pharmacy, Choudhury Pharmacy)

AACP = Assam Agricultural Competitiveness Project; ALPCo = Assam Livestock and Poultry Corporation

4.1.11 Major milk market actors and other infrastructure in the dairy value chain

In Table 4.1.16, the number of milk market actors involved in the dairy value chain of the selected project clusters is presented. These market actors are linked to the major town or market point of the cluster.Kathalguri and Podumoni have four milk traders each, Bokakhat and Saurpathar have 10 each, and Podumoni cluster which is linked to Golaghat town has 25 milk traders.No cottage industries exist in Kathalguri, Bokakhat and Dergaon as some of the cottage industry products such as ghee, curd or cream are available in the sweet shops. Sarupathar has five cottage industries while Podumoni has one. The number of sweet shops in Golaghat town (Podumoni cluster) is the highest at 20 while Dergaon has only three sweet shops.

Table 4.1.16: Number of milk market actors at cluster level (based on KII and FGD)

Dairy cluster	Milk traders	Cottage industries	Sweet shops
Kathalguri	4	0	9
Podumoni#	25	2	20
Bokakhat	10	0	10
Dergaon	4	0	3
Sarupathar	10	5	20

Note: Podumoni is linked to Golaghat town and thus the number of market actors is cited as from the town only.

The major linked markets where milk and milk products are traded are shown in Table 4.1.17. The major markets linked to these clusters are Golaghat town, Bokakhat town market, Dergaon, Kamargaon, KaharaTiniali, Garmur, Sarupthar and Borpathar. Farmers were asked if any of them accessed bank credit during the 12 months preceding the FGD and to name the banks. Except in Podumoni cluster, none of the farmers reported receiving credit from formal financial sources. A few farmers in Podumoni cluster reported that they received bank loans from the State Bank of India (SBI), United Bank of India (UBI) Golaghat, Assam Gramin Vikash Bank (AGVB) Golaghat and AGVB Hiladhari. Some of the unorganized commercial farms reported access to insurance services from the government-supported insurance scheme under the National Livestock Mission (NLM) Guwahati through Oriental Insurance and New India Assurance in the clusters of Kathalguri, Podumoni and Sarupathar. All of the selected clusters have favourable road infrastructure with blacktop approach roads to the villages.

Table 4.1.17: Markets and other infrastructure at cluster level

Dairy cluster	Major linked markets with trading of milk and milk products*	Bank and other financing institutions	Insurance for livestock#	Approach road quality of the cluster villages (% of total villages)		
				Blacktop road	Gravel road	Earthen road
Kathalguri	Golaghat	PNB-Kathalguri branch	Oriental Insurance/ New India Assurance	80	0	20
Podumoni (Golaghat town)	Golaghat town, Bokakhat	SBI, UBI Golaghat, AGVB Golaghat, AGVB Hiladhari	Oriental Insurance/ New India Assurance	100	0	0
Bokakhat	Bokakhat (weekly), Kamargaon, Kahara Tiniali, Garmur	Bandhan Bank, UBI, SBI, Indian Bank	0	70	10	20
Dergaon	Dergaon (daily), Golaghat (daily)	Allahabad Bank, UBI Dergaon, SBIDergaon	0	90	0	10
Sarupathar	Borapathar (daily), Sarupathar (daily)	SBI, AGVBSarupathar, UBIPodumoni	Oriental Insurance/ New India Assurance	60	20	20

Note: Market frequency is provided in parenthesis (daily, biweekly or weekly).
PNB = Punjab National Bank

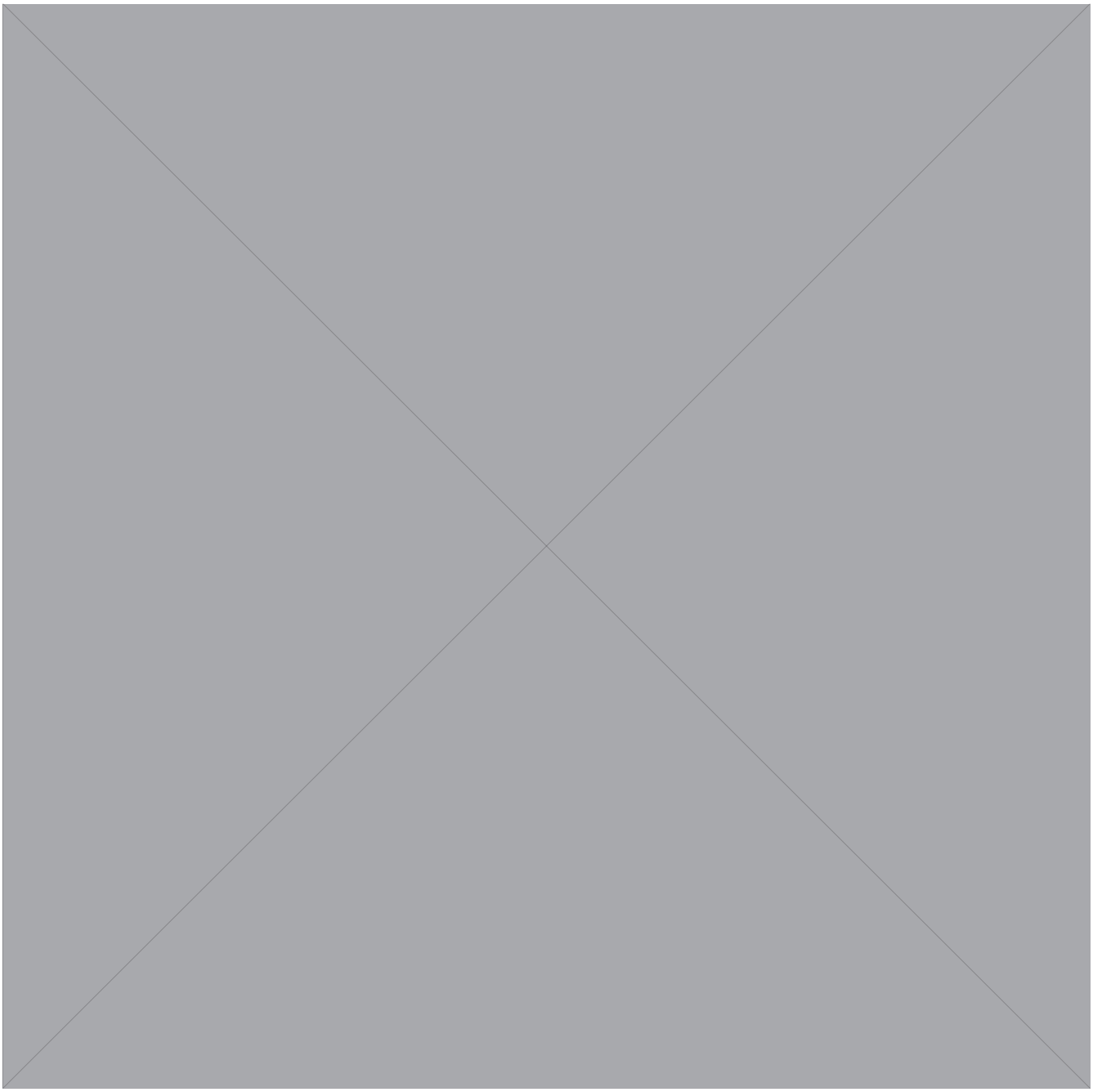
4.1.12 Progressive farmers at cluster level

Table 4.1.18 indicates the number of progressive dairy farmers/milk traders/cottage industry owners. The market actor that produce /sell / process a sizable amount of milk with planned business development agenda. There is three such entrepreneurs' one each in Podumoni, Bokakhatand Sarupathar clusters.

Table 4.1.18: Names and contacts of promising progressive entrepreneurs in dairy

Dairy cluster	Number of entrepreneurs
Kathalguri	0
Podumoni (Golaghat town)	1
Bokakhat	1
Dergaon	0
Sarupathar	1

Figure 4.1.1: Schematic representation of the value chain actors of the major recommended clusters.



4.1.14 Quick observations and recommendations

Padumoni is the dominant informal dairy cluster with linkage to Golaghat town and with presence of a sizable number of market actors. A sizable proportion of milk is supplied from *Chapari* areas (Rangagarachapari) which is mainly from buffaloes and some portion of buffalo milk is also supplied from Silanijan (Karbi Anglong).A milk van from Bokakhat supplies milk to Golaghat town. Milk is supplied from some farms with improved cattle like Bengenakhowa and Farkating; milk is also supplied from places where indigenous cattle are predominant like Bongaon, Junakinagar and Kamarbondha. Some portion of milk from Kothalguri, Bokakhat and Dergaon cluster also flows to Golaghat town. While there are 25 identified traders, there are 15 large farms that are also involved in the milk trade (producer cum trader). For convenience and wider coverage of the informal sector, Kathalguri cluster may be grouped with Golaghat town and 14–15 SMs of Dergaon town may be invited for training. For

convenience of training market actors,the following sequence may be followed and effort should made to track outside suppliers for quality check of the milk.

Table 4.1.19: Clusterlevel planning for conducting training in Golaghat district

Rank of importance	Name of the cluster	Possible no. of training sessions organized				Recommendations
		Producers (31)	SMs (6)	CPs (1)	Milk traders (3)	
Most potential	Padumoni (Golaghat town)	7	2.00	0.05	1.25	1. It is the main district town cluster considered as the most potential informal cluster. 2. Since the number of CPs is less, one CP's training can be organized in the district as a whole.
	Sarupathar	18	2.00	0.25	0.50	
Medium potential	Kathalguri	4	0.45	0	0.20	One SM and milk trader training could be organized by combining these two clusters.
	Bokakhat	1	0.50	0	0.50	
Less Potential	Dergaon	1	0.15	0	0	

Note: When considered for producer training, only commercial farms were considered with ownership of high-yielding improved animal stock plus the *khuti* system of rearing farms. Figures within parentheses indicate number of respective market actors.

4.2 Sonitpur district

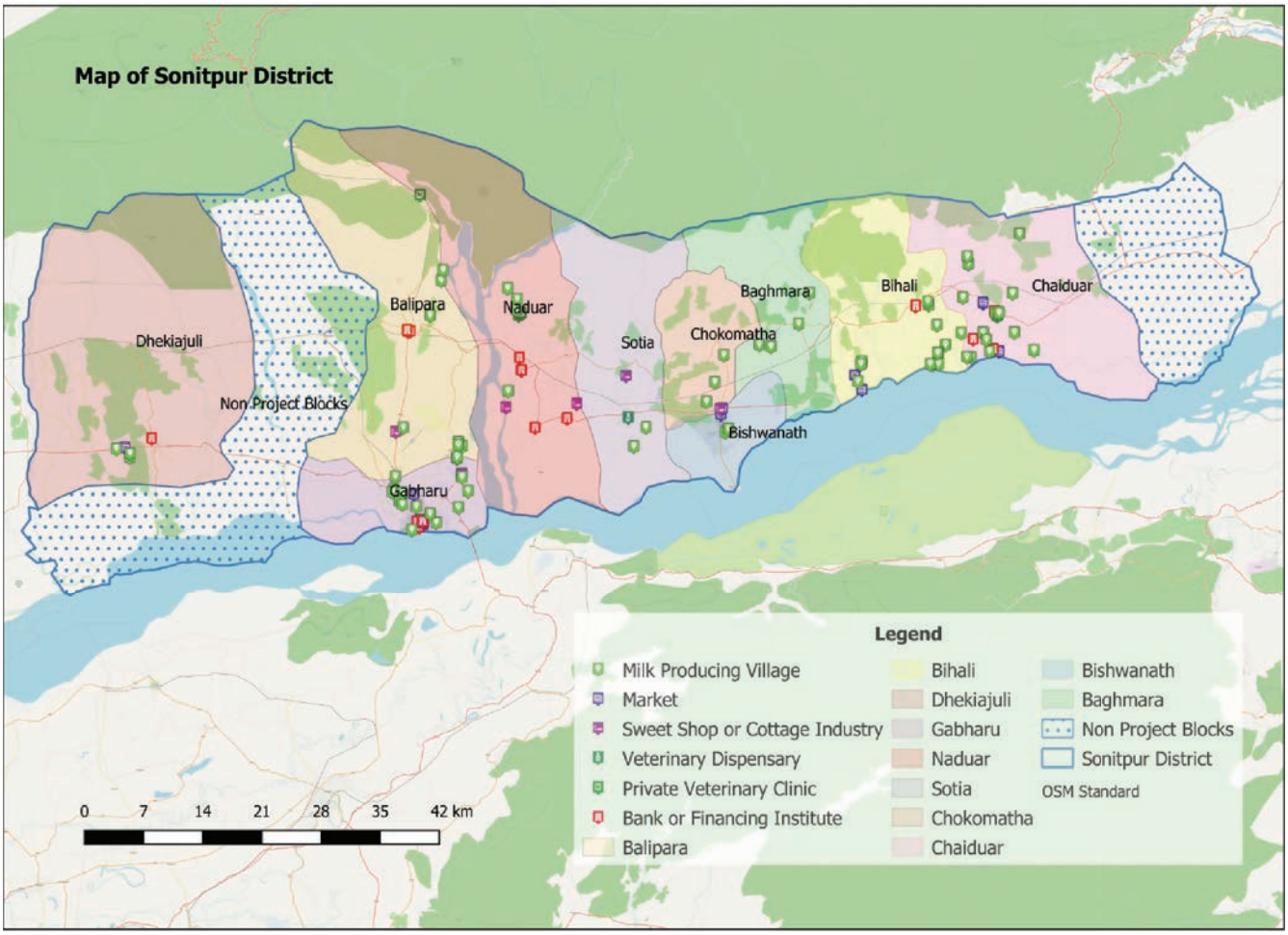
4.2.1 Cluster villages identification based on field visit

The project initially identified 11 clusters in Sonitpur district for the ongoing implementation of APART. The selected clusters covering the potential villages for the intervention of the informal dairy value chain are Balipara, Gavaru, Na Duar, Sootea, Dhekiajuli, Biswanath, Chokomatha, Baghmara, Bihali, Chaiduar and Tezpur town. An initial overview and discussion was held with some of the informed sources such as DVOs, VOs and/or BVOs of the respective clusters.The ILRI enumerators finalized selection of the villages listed by the DDD as potential sites for intervention. The lists of villages are shown in Table 4.2.1.

Table 4.2.1: Cluster villages in Sonitpur district

Dairy cluster	Names of the DDD-listed villages	Names of the ILRI-listed villages	Potential villages incorporated	Non-potential villages dropped
Balipara	Sonaipam, Sonaimiri, Lokra, Betonijhar, Solagaon, Goroimari	Sonaipam, Sonaimiri, Lokra, Betonijhar, Solagaon, Goroimari	0	0
Gavaru	Deurigaon, Ketekibari, Dhingi, Gotonga, Dekachuburi, Majgaon, Mission Chariali, Tolgereki, Bamungaon, Amolapan, Chamdhara, Urukoni, Dikraijan, Napam, Alisinga, Koroioni, Balichapori, Chataichapari, Puranaalimukh, Borburi, Borsingalihiagaon, Bamparbotia, Parbatia, Jahajghat	Deurigaon, Ketekibari, Dhingi, Gotonga, Dekachuburi, Majgaon, Mission Chariali, Tolgereki, Bamungaon, Amolapan, Chamdhara, Urukoni, Dikraijan, Napam, Alisinga, Koroioni, Balichapori, Chataichapari, Puranaalimukh, Borburi, Borsingalihiagaon, Bamparbotia, Parbatia, Jahajghat	0	0
Na Duar	Chamdhara, Moranakuri, Ragnachakua, Aarguri, Bordikorai, Morisuti	Chamdhara, Moranakuri, Ragnachakua, Aarguri, Bordikorai, Morisuti	0	0
Sootia	Ghiladharimukh, Koroioni, Nalbari	Ghiladharimukh, Koroioni, Nalbari	0	0
Dhekiajuli	Gejengaguri, Palashpathar, Palashbasti, Bhangamandir	Gejengaguri, Palashpathar, Palashbasti, Bhangamandir	0	0
Biswanath	GoliaErabari, Kadomoni, Panibharal, Dagon, Bhirgaon	GoliaErabari, Kadomoni, Panibharal, Dagon, Bhirgaon	0	0
Chokomatha	Japoubari, Falfali, Sadharupar, Lehugaon	Japoubari, Falfali, Sadharupar, Lehugaon	0	0
Baghmara	Laodolodni, Gelapukhuri, Gingia, Borjarni	Laodolodni, Gelapukhuri, Gingia, Borjarni	0	0
Bihali	Borajulunepali, Botiamari, No. 6 Botiamari, Nepalibari, Raaumari, Nasbor, Gangmouthan, Bahbaripathar, Bahbari, Nauniapathar, Shantipur, Sukansuti, Rampur, Morangaon, Borkathiabari	Borajulunepali, Botiamari, No. 6 Botiamari, Nepalibari, Raaumari, Nasbor, Gangmouthan, Bahbaripathar, Bahbari, Nauniapathar, Shantipur, Sukansuti, Rampur, Morangaon, Borkathiabari	0	0
Chaiduar	Karibilbengili, Karibil Nepali, Goroimari, Aflakhat, Amtola, Amlokhi Doloni, Gamiri, Kruwabasti, DigaliPathar, Shanti Pur, Borhatiguri, Gadhariapathar, Bakoridoloni, Dhokabor, Maranguri, Dathkhula, Madhya Satrang, Gorchepa, Khetrahati, Balitika, Kokila	Karibilbengili, Karibil Nepali, Goroimari, Aflakhat, Amtola, AmlokhiDoloni, Gamiri, Kruwabasti, Digali Pathar, Shanti Pur, Borhatiguri, Gadhariapathar, Bakoridoloni, Dhokabor, Maranguri, Dathkhula, Madhya Satrang, Gorchepa, Khetrahati, Balitika, Kokila	0	0
Tezpur town	0	Pachmail, Napam, Amolapan, Jahajghat, Bamparvatia, Da-parvatia, Chamdhara, Maranakuri, Tolgereki, Brahmaputra *Chapari* areas, Gorubandha, Belsiri, Jahamari and Kaoimari	Pachmail, Napam, Amolapan, Jahajghat, Bamparvatia, Da-parvatia, Chamdhara, Maranakuri, Tolgereki, Brahmaputra *Chapari* areas, Gorubandha, Belsiri, Jahamari and Kaoimari	0

Figure 4.2: The map of the surveyed clusters in Sonitpur district.



4.2.2 FGD participants' profile

Table 4.2.2 presents the number of FGD participants classified according to gender and social status. The average number of participants across the project clusters is 8.5 in Sonitpur district males 5.40 (63.23%) and females 3.14 (36.77%). In Sootea, Baghmara and Chaiduar clusters, female representation was more than 50% in the FGD. Across the project clusters, representation of participants from 'general' category is dominant (77.40%) followed by participants from OBC (14.70%). Representation from STsis the lowest (2.86%) attributed to the preference for pig rearing inthe tribal community. SC participation was almost 5% across project clusters. In Chokomatha cluster, 100% of the farmers were from the general category, while almost 60% of farmers in Tezpur town identified as 'general'.

Table 4.2.2: Distribution of participants by gender and social status

Dairy clusters	Average no.of participants (%)			Social status of participants (%)			
	Male	Female	Total	General	SC	ST	OBC
Balipara	5.3 (71.62)	2.1 (28.38)	7.4	80.00	00.00	07.00	13.00
Gavaru	7.9 (85.87)	1.3 (14.13)	9.2	65.00	00.00	10.28	24.72
Na Duar	4.8 (67.61)	2.3 (32.39)	7.1	89.00	05.62	00.00	05.38
Sootia	3.9 (48.15)	4.2 (51.85)	8.1	78.29	08.62	00.00	13.09
Dhekiajuli	6.7 (72.83)	2.5 (27.17)	9.2	69.85	00.00	00.00	30.15

Dairy clusters	Average no.of participants (%)			Social status of participants (%)			
	Male	Female	Total	General	SC	ST	OBC
Biswanath	5.2 (57.14)	3.9 (42.86)	9.1	77.55	08.79	05.22	08.44
Chokomatha	6.6 (55.00)	5.4 (45.00)	12.0	100.00	00.00	00.00	00.00
Baghmara	3.2 (43.24)	4.2 (56.76)	7.4	80.80	00.00	00.00	19.20
Bihali	5.5 (69.62)	2.4 (30.38)	7.9	90.22	09.78	00.00	00.00
Chaiduar	3.4 (46.58)	3.9 (53.42)	7.3	60.50	12.20	00.00	27.30
Tezpur town	7.3 (79.35)	1.9 (20.65)	9.2	60.23	10.34	08.98	20.45

Source: Field Survey, 2018

4.2.3 Farming system by type of bovine stock

The district as whole has 13,642 HH who have atleast one dairy cattle or buffalo, representing 52.42% of HH among the total HH across project clusters. The proportion of farming HH having local breeds is 78.60%, improved breeds 12.40% and both local and improved 8.21%.Only 0.79% of HH report keeping buffalo stock (Table 4.2.3). HH keeping improved breed of cattle is highest in Baghmarai cluster (33%) followed by Tezpur town (26.25%). In Chokomatha and Chaiduar clusters, 4% of the total farming HH was found to have improved cattle. HH keeping both improved and local cattle ranges from 1% in Chokomatha to 16% in Dhekiajuli. The proportion ofHH keeping buffaloes is highest in Biswanath cluster (4.21%).

Table 4.2.3: Distribution of farm HH by type of bovine stock

Dairy cluster	Total HH	Total farming HH (%)	%HH keeping cattle from local breeds	%HH keeping cattle from improved breeds	%HH keeping cattle from both local and improved breeds	%HH keeping buffaloes
Balipara	1,200	450 (37.50)	80.00	12.00	08.00	0.00
Gavaru	4,320	1,296 (30.00)	74.00	11.00	15.00	0.00
Na Duar	1,670	1,120 (67.07)	77.00	11.50	09.50	2.00
Sootia	800	555 (69.37)	85.00	09.00	06.00	0.00
Dhekiajuli	950	420 (44.21)	74.00	10.00	16.00	0.00
Biswanath	1,555	650 (41.80)	74.79	17.00	04.00	4.21
Chokomatha	621	318 (51.21)	95.00	04.00	01.00	0.00
Baghmara	722	295 (40.86)	83.00	33.00	08.75	0.00
Bihali	3,850	2,615 (67.72)	78.00	12.50	09.17	0.33
Chaiduar	3,888	1,513 (38.91)	89.67	04.00	05.67	1.33
Tezpur town	4,450	2,410 (54.16)	66.25	26.25	07.38	0.13

Note: Figures in parentheses indicate percentage of farming HH in total HH.
Source: Field Survey, 2018

4.2.4 Farming system by rearing practices

Almost 12.72% of farm HH rear cattle in a fully stall-fed condition across project clusters, while farmers rearing cattle in a partly stall-fed condition constitute almost 83.53% (Table 4.2.4). The proportion of farmers rearing dairy animals in a *khuti* system constitutes 3.92% in the district as a whole. The *khuti* system of rearing is the highest in Tezpur town (14%) followed by Biswanath cluster (13.22%). Rearing practices are closely related to the type of bovine stock (Table 4.2.3). The fully stall-fed rearing condition increases with the increase in the number of improved cattle stock (see comparative figures between Table 31 and Table 32).

Table 4.2.4: Distribution of farm HH by rearing practices

Dairy cluster	% fully stall fed	% partly stall fed	%*khuti* (forage herd) system
Balipara	15.57	84.43	00.00
Gavaru	12.97	82.03	05.00
Na Duar	14.00	80.00	06.00
Sootia	09.23	90.77	00.00
Dhekiajuli	14.39	85.61	00.00
Biswanath	20.00	66.78	13.22
Chokomatha	04.00	96.00	00.00
Baghmara	12.54	87.46	00.00
Bihali	14.59	83.41	02.00
Chaiduar	07.33	91.67	03.00
Tezpur town	15.25	70.75	14.00

4.2.5 Women's participation in dairy production and income control

Male and female FGD participants were asked separately to describe the status of women in the rearing activities of dairy animals and control of income accrued through milk and milk product sales. Women's participation in rearing activities was higher than their reported control of income. However, women's roles in dairying depend on the type of farm and farm activities. The fully commercial farms based on improved cattle stock require more physical labour usually performed by males within the HH while subsistence dairy farming is mostly conducted by women. Moreover, activities such as selling of milk in the market, grass collection and taking animals for grazing are carried out mostly by the male members of the family while cleaning of cattle shed and feeding the cattle at home are done mostly by the female members of the family. Across the project clusters in Sonitpur, women's role (34.44%) is lower compared to their male counterparts. The percentage of women's who control income related to dairying is an average of 23.36% throughout the selected project clusters of Sonitpur district (Table 4.2.5).

Table 4.2.5: Women's participation in dairy production and income control

Dairy cluster	No. of total HH	% women have role in milk production	% women have control of income from milk production
Balipara	450	38.00	19.22
Gavaru	1,296	28.22	16.77
Na Duar	1,120	41.19	27.21
Sootia	555	30.66	18.19
Dhekiajuli	420	48.22	40.22
Biswanath	650	35.50	28.00
Chokomatha	318	38.22	32.29
Baghmara	295	27.18	17.55
Bihali	2,615	28.00	18.55
Chaiduar	1,513	21.67	15.00
Tezpur town	2,410	42.00	24.00

4.2.6 Average herd size (adult animals) of the farm HH according to type of bovine stock

Herd size of the cattle stock (adult animals) according to the type of bovine stock is reported in Table 4.2.6. The number of adult indigenous cattle per HH is 1.65 across the project clusters with the highest in the farm locations where milk comes to Tezpur town (3.00) and the lowest in Chokomatha (1.22). Higher cattle head numbers in the directly linked locations of Tezpur town is partly because of the *khuti*-based farming system which haslarger

herd sizes. Similarly, the average improved cattle holding in each HH across selected project clusters is 2.32. The farmers in NaDuar, Biswanath, Bihali, Chaiduar and Tezpur town reported the presence of buffaloes with an average herd size of 3.09 across these clusters (see Table 4.2.6).

Table 4.2.6: Average herd size (adult animals) by the bovine stock in the project clusters

Dairy cluster	Local cows	Improved cows	Buffaloes
Balipara	1.92	2.15	-
Gavaru	1.72	2.11	-
Na Duar	1.33	1.95	1.75
Sootia	1.52	1.67	-
Dhekiajuli	1.33	2.34	-
Biswanath	1.82	2.39	5.22
Chokomatha	1.22	3.00	-
Baghmara	1.34	2.85	-
Bihali	1.42	1.83	2.02
Chaiduar	1.50	2.00	4.33
Tezpur town	3.00	3.20	2.14

4.2.7 Milk productivity and production of the bovine stock at cluster level

The daily milk yield of the bovine stock is not uniform during the entire lactation length. Immediately after the calf is born, milk production gradually increases until it reaches peak yield. Table 4.2.7 presents the daily milk productivity of local cows across APART clusters. During lean production, milk yield is 0.48 litres on average for the clusters as a whole with the highest yield in Biswanath (0.81 litres) and lowest in Dhekiajuli (0.25 litres) clusters. During the peak lactation days of indigenous cattle, average productivity is 2.33 litres across project clusters. The average lean and peak productivity yields of improved cattle stock are 2.36 and 8.25 litres respectively while buffaloes are 1.15 and 4.21 litres respectively. The average milk yield of improved cattle is the highest in Na Duar cluster across the stages of lactation (6.50litres) while the lowest yield is in Tezpur town cluster (4.08litres).

Table 4.2.7: Lowest and highest levels of average daily milk production per cow in the clusters

Dairy cluster	Milk production for local cows		Milk production of improved cows		Milk production of buffaloes	
	Low	High	Low	High	Low	High
Balipara	0.50	2.00	2.65	8.15	-	-
Gavaru	0.54	2.12	2.25	8.29	-	-
Na Duar	0.48	1.98	3.00	9.99	1.50	5.22
Sootia	0.39	1.93	2.88	7.23	-	-
Dhekiajuli	0.25	2.25	2.12	9.57	-	-
Biswanath	0.81	3.42	1.97	7.21	1.35	4.22
Chokomatha	0.47	2.89	2.00	8.63	-	-
Baghmara	0.38	1.96	2.20	8.95	-	-
Bihali	0.46	1.70	2.50	8.30	1.25	4.21
Chaiduar	0.50	2.00	2.00	6.17	0.50	3.18
Tezpur town	0.48	2.33	2.36	8.25	1.15	4.21

Tables 4.2.8 to 4.2.10 present the average milk production of local, improved and buffalo stock of the district. Based on local cattle stock, the total milk production across the clusters is 12,663 litres with the highest milk production recorded as 5,478 litres in Tezpur town (*khuti*-based farming) followed by Bihali and Chaiduar

clusters. The total milk production of the improved cattle in the selected APART clusters is 20,117 litres, with the highest milk production reported again in Tezpur town followed by Bihali. Based on improved cattle stock, Chokomatha has the lowest milk production among the APART clusters in the district. Total milk production across the few clusters reporting the presence of buffalo stock is only 380.98 litres. The proportionate share of total milk production of all three categories of bovine stock of the selected APART districts is local cows 38.19%, improved cows 60.67% and buffaloes 1.15%. Since the productivity of improved cattle stock is relatively higher in the APART district, a meager proportion of farming HH rearing improved cattle stock, 12.40%, contributes almost 60.67% of the total milk production, while as high as 78.60% of the total farming HH rearing indigenous breeds contribute38.19% of total milk production across bovines. This indicates the potential role of cattle crossbreding to raise milk production in the state.

Table 4.2.8: Estimated total milk production based on total local cattle stock

Dairy cluster	Estimated no. of HH with local cattle	Average herd size (adult lactating animals)	Average milk production per local cow	Total milk production with local cattle stock*
Balipara	360	0.96	1.25	432
Gavaru	959	0.86	1.33	1,097
Na Duar	862	0.67	1.23	705
Sootia	472	0.76	1.16	416
Dhekiajuli	311	0.67	1.25	258
Biswanath	486	0.91	2.12	936
Chokomatha	305	0.61	1.68	313
Baghmara	245	0.67	1.17	192
Bihali	2,040	0.71	1.08	1,564
Chaiduar	1,357	0.75	1.25	1,272
Tezpur town	1,597	1.25	1.41	2,814

*In estimating total milk production of local cows only the lactating animals were considered assuming 50% of the total adult local cattle as lactating.

Table 4.2.9: Estimated total milk production based on improved cattle stock

Dairy cluster	Estimated no. of HH with improved cattle	Average herd size (adult lactating animals)	Average milk production per improved cow	Total milk production with improved cattle stock*
Balipara	54	1.08	5.40	313
Gavaru	143	1.06	5.27	793
Na Duar	129	0.98	6.50	816
Sootia	50	0.84	5.06	211
Dhekiajuli	42	1.17	5.85	287
Biswanath	111	1.19	4.59	606
Chokomatha	13	1.50	5.32	101
Baghmara	97	1.43	5.58	773
Bihali	327	0.92	5.40	1,615
Chaiduar	61	1.00	4.09	247
Tezpur town	633	1.60	5.31	5,375

*In estimating total milk production of improved cattle only lactating animals are considered assuming 50% of the total adult improved cattle as lactating.

Table 4.2.10: Estimated total milk production based on buffalo stock

Dairy cluster	Estimated no. of HH with buffaloes	Average herd size (adult lactating animals)	Average milk production per improved cow	Total milk production with buffaloes*	Total milk production across bovine stock#
Balipara	00.00	0.00	0.00	0.00	**745**
Gavaru	00.00	0.00	0.00	0.00	**1,890**
Na Duar	22.00	0.87	3.36	66.00	**1,587**
Sootia	00.00	0.00	0.00	0.00	**627**
Dhekiajuli	00.00	0.00	0.00	0.00	**546**
Biswanath	27.00	2.61	2.79	199.00	**1,741**
Chokomatha	00.00	0.00	0.00	0.00	**414**
Baghmara	00.00	0.00	0.00	0.00	**965**
Bihali	09.00	1.01	2.73	24.00	**3,203**
Chaiduar	20.00	2.16	1.84	80.00	**1,599**
Tezpur town	03.00	1.07	2.68	9.00	**8,198**

*In estimating total milk production of buffaloes only lactating animals were considered assuming 50% of the total adult buffaloes as lactating

#Total milk production is the summation of milk production across bovine stock in Tables 4.2.8 to 4.2.10.

4.2.8 Marketing behaviour of farmers at cluster level

All types of farms sell their surplus milk. Farmers with local cattle stock keep a part of their milk produced for home consumption and offer to relatives while the remaining part is marketed to earn cash. Farmers with improved cattle stock produce primarily for the market to earn profit, while some portion of the mild produced is kept for HH consumption. Since total milk production is high in commercial farms with crossbred/improved cattle, the proportion of milk marketed is also high. Onlocal-cattle subsistence farms with one or two litres of milk production; more than 50% of milk produced is consumed at home. Table 4.2.11 shows that farm HH with local cattle across project clusters sell 47.01% of the total milk production, while farm HH with improved cattle stock sell 79.92% of their total HH milk production. Project clusters with buffaloes sell 84.51% of their total milk production.

Table 4.2.11: Distribution of milk production across bovine stock

Dairy cluster	% with local cows	% with improved cows	%with buffaloes
Balipara	52.00	78.00	-
Gavaru	39.28	79.42	-
Na Duar	51.33	85.63	82.00
Sootia	40.38	74.33	-
Dhekiajuli	60.00	80.00	-
Biswanath	55.00	82.00	90.50
Chokomatha	39.00	85.00	-
Baghmara	49.41	82.64	-
Bihali	43.56	75.19	80.32
Chaiduar	40.13	76.98	85.22
Tezpur town	52.50	80.00	70.25

Table 40 presents the sources of milk sales in the APART clusters. Selling milk in the neighbourhood or in the local

market is predominant in the majority of the clusters of Golaghat. These are smallholder dairy farmers rearing dairy animals of indigenous breed to cater to the local raw milk consumers in their neighbourhood. Considering the district as a whole based on the selected clusters, 47.53% of farmers sell milk locally, followed by selling to milk vendors (34.23%). Selling milk to the DCS in all of the project clusters is only 0.40% pointing out that almost 99.60% of the total farmers in the selected cluster use informal channels to market milk. The informal market actors such as milk traders and private processors account for 52.07% of the producers establishing an informal value chain between producers to traders and producers to SMs/CPs or producers to consumers to SMs/CPs.

Prices offered to producers by various marketing sources is the highest when farmers sell milk locally (INR 44/ litre) followed by INR 42/litre when sourced to private processors. Farmers' preference for marketing channels is in accordance with the prices they receive as shown in Table 4.2.12.

Table 4.2.12: Percentage of milk sale by sources and their respective farm gate prices

Dairy cluster	Neighbours or local sale		To traders		To DCS		To private processors	
	%	Price/litre	%	Price/litre	%	Price/litre	%	Price/litre
Balipara	60.00	50.00	10.00	40.00	0.00	-	30.00	50.00
Gavaru	75.00	50.00	25.00	42.50	0.00	-	00.00	-
Na Duar	32.00	40.00	64.00	30.00	4.00	37.00	00.00	-
Sootia	15.00	40.00	85.00	30.00	0.00	-	00.00	-
Dhekiajuli	30.00	44.00	70.00	38.00	0.00	-	00.00	-
Biswanath	20.00	50.00	00.00	-	0.00	-	80.00	40.00
Chokomatha	65.00	40.00	10.00	35.00	0.00	-	25.00	40.00
Baghmara	60.00	40.00	20.00	35.00	0.00	-	20.00	40.00
Bihali	45.00	40.00	55.00	35.00	0.00	-	00.00	-
Chaiduar	73.33	45.00	03.33	40.00	0.00	-	23.34	40.00
Tezpur town	15.00	50.00	57.00	35.00	8.00	35.00	20.00	40.00

Source: Field Survey, 2018

4.2.9 Access to veterinary services

Table 4.2.13 presents the number of veterinary service providers which include local veterinarians, VFAs, CAWHs and AI practitioners providing services to the farmers. Across clusters,an average of 1.27 local veterinarians operate, while the average distance from the farm villages is 3 km. Farm villages of Bihali cluster are on average 6.5 km from a veterinarian, while farm villages of Biswanath cluster are 0.5 km from a veterinarian's residence/ duty station. VFAs are located on average2.58 km from villages across clusters ranging from 0.5 km in Sootea and Chokomatha clusters to almost 8km in Bihali. CAHW provide services in Bihali and Chaiduar clusters; none of the farmers in the remaining clusters of Sonitpur reporthaving access to CAHW. There are one to three AI practitioners across NaDuar, Sootea, Dhekiajuli, Biswanath, Chokomatha, Bihali and Chaiduar clusters.

Table 4.2.13: Access to veterinary services at the selected APART clusters of the district

Dairy cluster	Local veterinarianno.*		Distance from the FGD location/village	VFA (no.)		Distance from the FGD location/ village (km)	CAHWno.		Distance from the FGD location/village (km)
	Male	Female		Male	Female		Male	Female	
Balipara	1	0	3.0 km	2	0	3.0 km	0	0	0.0
Gavaru	1	0	3.0 km	1	0	3.0 km	0	0	0.0
Na Duar	1	0	3.2 km	1	0	3.2 km	0	0	0.0
Sootia	1	0	3.5 km	6	0	0.5 km	0	0	0.0
Dhekiajuli	1	0	1.5 km	3	0	1.5 km	0	0	0.0
Biswanath	1	0	0.5 km	0	0	0.0 km	0	0	0.0
Chokomatha	1	0	1.5 km	2	0	0.5 km	0	0	0.0
Baghmara	1	0	2.0 km	2	0	2.0 km	0	0	0.0
Bihali	1	0	6.5 km	6	0	8.0 km	1	0	0.5
Chaiduar	1	0	2.5 km	1	0	2.5 km	1	0	0.5
Tezpur town	7	0	5.8 km	9	0	4.2 km	0	0	-

*Local veterinarian includes both private and government employed.

4.2.10 Access to other services (input and breeding)

Except in Podumoni cluster, farmers reported the availability of one or two shops where they can buy milk cans or other such equipment specifically designed for milk storage and transportation. Farmers in Bihali indicated that there is no shop in their local or village market where they can buy feed for dairy animals. However, the average distance to supplier shops of the selected villages of the remaining clusters is almost 4.68 km. pure feed shops are almost nil in most of the clusters as feeds are primarily sold in the grocery shops only. Quality segregation of a particular type of feed is mostly not found in these shops and thus farmers buy the available stock only. Few farmers have knowledge on the quality of feeds. A grocery shop where concentrate feeds are available are present in almost all of the clusters, either within the clusters or in major linked villages with distance between shop and from the APART village ranging from 2 to 5 km. In clusters such as Gavaru, Sootia, Biswanath and Bihali, farmers report having access to bulls for natural mating services. Farmers in all of the clusters report the presence of nonde script indigenous community bulls (scrub) for religious prayers. Some farmers offer male calves to a temple which later become community bulls used for breeding purposes. The breed of such bulls is not clearly defined and most of the cows coming to heat get mated with such bulls in the field without farmers' knowledge.

4.2.11 Availability of producers/traders organizations and input supplying institutions at cluster level

Farmers report that there are not any registered milk traders organizationsin the selected clusters. Similarly, SHG related to dairy farming practices and active milk producer's institutions do not existacross project clusters. Na Duar, Bihali and linked villages of Tezpur townreport the presence of DCS (see Table 4.2.14)

Table 4.2.14: Availability of producers/traders organizations at cluster level

Dairy cluster	Milk traders organizations	DCS
Balipara	0	0
Gavaru	0	0
Na Duar	0	1(DUSS at Bordikorai,Arguri)
Sootia	0	0

Dairy cluster	Milk traders organizations	DCS
Dhekiajuli	0	0
Biswanath	0	0
Chokomatha	0	0
Baghmara	0	0
Bihali	0	1(DUSS at Botiamari)
Chaiduar	0	0
Tezpur town	0	5

DUSS = Dugdha Utpadak Samabai Samiti

Farmers report that there is no functional dairy plant in any of the clusters. There was a dairy plant in Sonitpur, Directorate of Dairy Developmentbut currently it is not functional. There is one chilling plant/BMC at Bhutpara in Dhekiajuli cluster and one in Tezpur town.There is one DDL and one feed mill (Sri Ram Feed) in Tezpur town. There is no feed testing laboratory in any of the listed clusters. There are four private veterinary clinics in Tezpur town; three in Biswanath cluster two in Dhekiajuli where medicines for animal and health care/consultation are available. The farmers in the remaining clusters report that there are not any specialized veterinary clinics, but that animal medicines are available where human medicines are sold (Table 4.2.15).

Table 4.2.15: Availability of input supplying institutions at cluster level

Dairy cluster	Dairy plant, chilling plant, BMC	DDL	Feed testing laboratory	Feed mill	Private veterinary clinic
Balipara	0	0	0	0	0
Gavaru	0	0	0	0	0
Na Duar	0	0	0	0	0
Sootia	0	0	0	0	0
Dhekiajuli	1 chilling centre (at Bhutpara)	0	0	0	2
Biswanath	1 (Non-functional)	0	0	0	3 (Karayani, Borbheti)
Chokomatha	0	0	0	0	0
Baghmara	0	0	0	0	0
Bihali	0	0	0	0	0
Chaiduar	0	0	0	0	0
Tezpur town	1 (non-functional), 1 BMC	1	0	1 (Shri Ram Cattle Feed, Tezpur)	4 (pet care, Patanjali KisanSeva Kendra)

4.2.12 Major milk market actors and other infrastructure in the dairy value chain

Table 4.2.16 displays the number of milk market actors involved in the dairy value chain of the selected APART clusters. These market actors are linked to the major town or market point of the cluster.Balipara and Dhekiajuli have 15 milk traders each while Gavaru and Biswanath have 10 each. The linked villages of Tezpur town have the highest number of milk traders of 80 while Sootia cluster has only eight. There is no cottage industry owner in Balipara, Chokomatha and Baghmara as some of the cottage industry products such as ghee, curd or cream are available in the sweet shops. In the remaining clusters, cottage industry owners range from one to five. The number of sweet shops in Tezpur town is the highest while lowest in Sootea and Chokomatha (five each).

Table 4.2.16: Number of milk market actors at cluster level (based on KII and FGD)

Dairy cluster	Milk traders	Cottage industry owners	Sweet shop owners
Balipara	15	0	10
Gavaru	10	5	7
Na Duar	20	2	20
Sootia	8	1	5
Dhekiajuli	15	2	15
Biswanath	10	2	15
Chokomatha	10	0	5
Baghmara	15	0	12
Bihali	10	1	15
Chaiduar	10	1	12
Tezpur town	80	3	50

The major linked markets where milk and milk products are traded are shown in Table 4.2.17 along with other components of the dairy value chain such as access to credit from financial sources, insurance services and road infrastructure. The major markets linked to these clusters are Goroimari, Balipara, Mission Chariali, Jamuguri, Balipara, Tezpur town, Sootia, Dhekiajuli, Borsola, Biswanath Chariali, Chokomatha, Rotua, Jinjia, Baghmari, Bihali, Borgang, Gomeri, Helem and Misamari. Farmers were asked if they accessed bank credit during the 12 months preceding the FGD and to name the banks. In Gavaru, Dhekiajuli, Chaiduar and Tezpur town clusters, a few farmers obtained credit from formal financial sources such as SBI, AGVB, UCO and Punjab National Bank (PNB).Some of the unorganized commercial farms from Balipara, Gavaru, Na Duar, Sootia ,Chaiduar and Tezpur town clusters reported access to insurance services from the government supported insurance scheme under the NLM Guwahati through Oriental Insurance or New India Assurance. Almost 58% roads are blacktop in the project clusters followed by 28% gravel and 14% earthen.

Table 4.2.17: Markets and other infrastructure at cluster level

Dairy cluster	Markets with trading of milk and milk products*	Bank and other financing institutions	Insurance for livestock	Approach road quality (% of total cluster villages)		
				Blacktop	Gravel	Earthen
Balipara	Goroimari, Balipara	SBI, UCO Bank, United Bank	Oriental Insurance/ New India Assurance	80	0	20
Gavaru	Mission Chariali,	SBI	Oriental Insurance/ New India Assurance	70	30	0
Na Duar	Jamuguri, Balipara, Tezpur	0	Oriental Insurance/ New India Assurance	40	60	0
Sootia	Sootea	SBI	Oriental Insurance/ New India Assurance	30	70	0
Dhekiajuli	Dhekiajuli, Borsola	SBI-Dhekiajuli	0	75	0	25
Biswanath	Biswanath Chariali	UBI, Indian Bank, Canara Bank, SBI	0	70	10	20
Chokomatha	Chokomatha	0	0	60	20	20
Baghmara	Rotua, Jinjia, Baghmari	0	0	50	30	20
Bihali	Bihali, Borgang	0	0	80	20	0
Chaiduar	Gomeri, Helem, Misamari	AGVB,SBI,UCO	Oriental Insurance/ New India Assurance	20	55	25
Tezpur town	Tezpur town	PNB Tezpur Branch, SBI, UBI, Bandhan Bank, AGVB	Oriental Insurance/ New India Assurance	60	15	25

Source: Field Survey, 2018

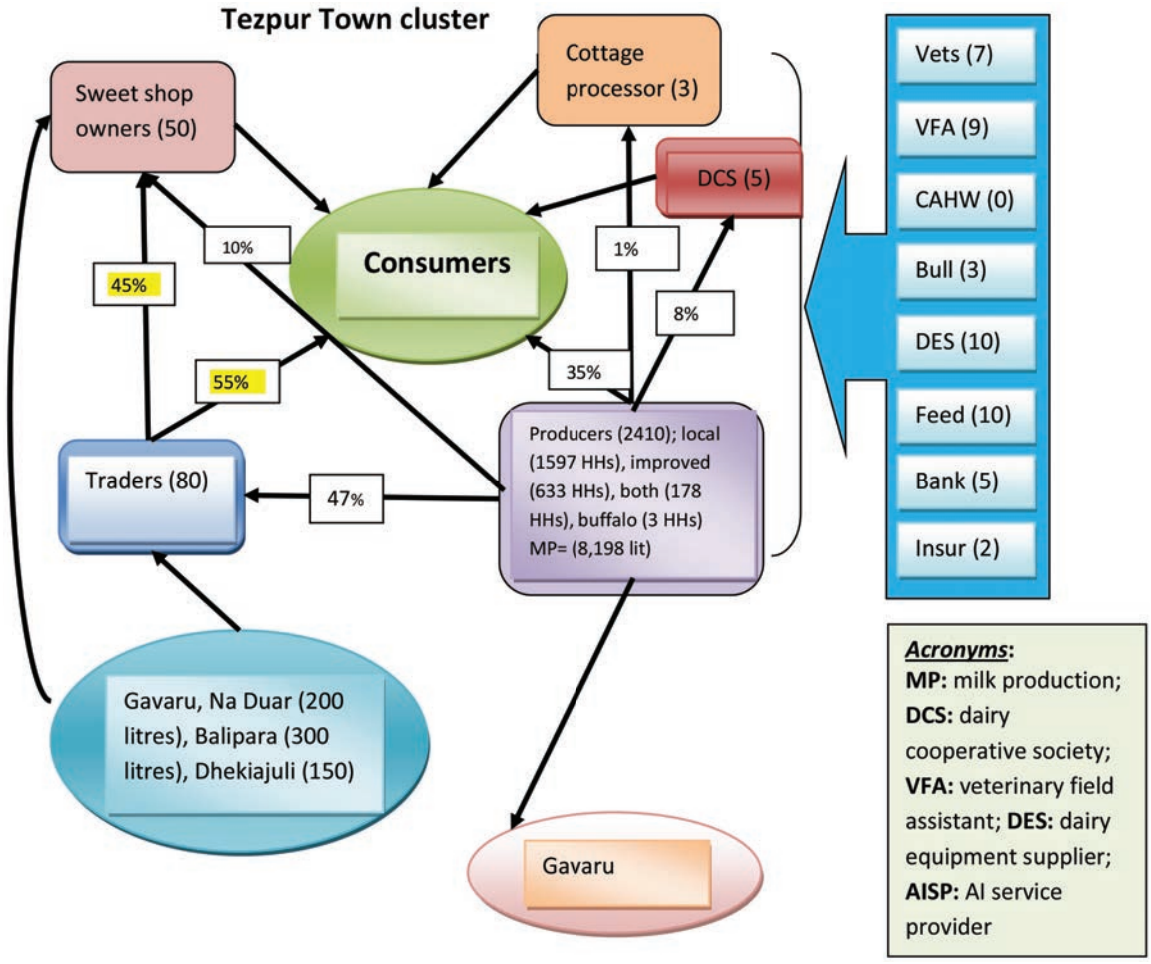
4.2.13 Progressive farmers at cluster level

Table 4.2.18 presents the number of progressive dairy farmers/milk traders/cottage industry owners. There are three such entrepreneurs in Balipara cluster, one each in Na Duar, Baghamara and Bihali, two each in Dhekiajuli and Chaiduar and four in Tezpur town clusters.

Table 4.2.18: Names and contacts of promising progressive entrepreneurs in dairy

Dairy cluster	No. of progressive farmers
Balipara	3
Gavaru	0
Na Duar	1
Sootia	0
Dhekiajuli	2
Biswanath	0
Chokomatha	0
Baghmara	1
Bihali	1
Chaiduar	2
Tezpur town	4

Figure 4.2.1: Schematic representation of the value chain actors of the major recommended clusters.



4.2.14 Quick observations and recommendations (Sonitpur)

Gavaru and Dhekiajuli clusters may be grouped with the Tezpur town cluster for convenience and wider coverage of market actors and due to strong inter-cluster flow ofmilk. Jahajghat, Tolgereki, Napam, Amolapan, Bam-Parvatia, Da-Parvatia and Panchmail are the main milk producing villages but there are some indigenous cattle and buffalo *khutis* at *Chapari* areas from where a large amount of milk is supplied to the town. Main *Chapari* areas are Bam Beseria, Phakuachuburi, Bogaiborachuk, Bali Chapari, Chatai Chapari, Puranaalimukh and Pukhuria. Pukhuria is a junction point to collect milk from *Chapari* areas. Some portion of milk is also being supplied from some villages of Balipara, Dhekiajuli and Na Duar.

In Bihali cluster, Batiamari is the highest milk producing village. Besides, there are also some cattle and buffalo *khutis* in *Chapari* areas (e.g. Rangsali is one of the milk producing *Chapari*). Maximum milk from the cluster villages of Dhekiajuli is supplied to Dhekiajuli and Barsola market. Gejengaguri is the highest milk producing village. Goruduba, Belsiri, Teliagon, Jahamari and Kaoimari are some potential milk producing villages in Dhekiajuli from where some portion of milk is being supplied to Tezpur and Balipara. In Na Duar, milk producing villages are located on either side of the national highway. One side has Chamdhara and Maranakuri villages where almost 20-25% of producers have improved breed cattle. On the other side there are some local cattle and buffalo *khutis* near Bordikorai village, and Bali and Bongaon *Chaparis*. At Moransut and Rongachokua, there are some producers who have improved breed cattle but most producers have primarily indigenous breed cattle. In the Chaiduar cluster, around 5–6 milk traders and 12 sweet shops are operating in three different markets within the cluster—Helem, Gomeri and Misamari. Milk from this cluster is not supplied outside because current production does not meet local demand. Because of poor market demand especially for the evening milk, production has slowed down in Baghmara cluster. There are some *khutis* of local cattle and buffaloes in Borjaroni village linked with the main markets such as Ginjia, Rotua and Baghmari. In Biswanath and Chokomatha clusters, 15 traders are currently supplying milk to 10–12 sweet shops at Biswanath Chariali market, the only major market in the clusters. Formerly, some portion of milk was being supplied to Arunachal Pradesh and the Veterinary Department of Arunachal Pradesh also provided treatment services to the producers but now the supply of milk to Arunachal Pradesh has been stopped due to low production. The main production villages in Balipara cluster are Sitabasti, Bhalukjharani, Borghat, 5th mile, Betonijhar, Solagaon and Goroimari. Almost 700 litres of milk is supplied daily to the Air Force Station and *Sashastra Seema Bal* (SSB) training centre located within the cluster. Large producers trade milk t and mainly sell their own milk and processed products such as dahi, paneer and cream to the consumers of Air Force station and SSB training centre. Because of production shortages in Balipara, some milk is supplied from Gabharu, Dhekiajuli and Na Duar clusters to Balipara. In Gavaru cluster, Jahajghat, Tolgereki, Napam, Amolapan, Bam-Parvatia and Da-Parvatia are the main milk producing villages. Apart from these villages, there are also some indigenous cattle and buffalo *khutis* at *Chapari* areas from where a large amount of milk is supplied to Tezpur town. Main *Chapari* areas are Bam Beseria, Phakuachuburi, Bogaiborachuk, Bali Chapari, Chatai Chapari, Puranaalimukh and Pukhuria. (Pukhuria is a junction point to collect milk from the *Chapari* areas). Mainly milk is supplied to Tezpur town and Mission Chariali market and along with some portion of milk to Balipara market.

Based on the number of market actors and spatial convenience of the clusters to organize training, the following sequence may be followed to plan for training in the clusters.

Table 4.2.19: Cluster level planning for conducting training in Sonitpur district

Rank of importance	Name of the cluster	Possible no. of training sessions				Recommendations
		Producers (63)	SM (8)	CP (1)	MT (9)	
Most potential	Tezpur town	25	2.50	0.15	4	1. Tezpur town is the linked market of Gavaru cluster so both can be grouped as one cluster. 2. Biswanath, Chokomatha and Baghmara are adjacent clusters and thus the market actors may be adjusted as per suitable for batch size.
	Gavaru	60	0.50	0.00	0.75	
	Na Duar	50	1.00	0.10	1.00	
	Biswanath	40	0.75	0.10	0.50	
	Chokomatha	00.50	0.25	0.00	0.50	
	Baghmara	40	0.60	0.00	0.75	
Medium potential	Bihali	13.00	0.75	0.05	0.50	While organizing training for MT and SM, one full batch training for both the groups can be organized.
	Chaiduar	02.00	0.60	0.05	0.50	
	Dhekiajuli	02.00	0.75	0.10	0.75	
Less potential	Sootia	02.00	0.25	0.05	0.40	

Notes: Only commercial farms with ownership of high yielding improved animal stock plus the *khuti* system of rearing farms were considered for producers training.

Figures within parentheses indicate number of respective market actors.

SM = sweet makers; CP = cottage processors; MT = milk traders

4.3 Jorhat district

4.3.1 Cluster villages identification based on field visit

There are five clusters in Jorhat district selected for implementation of the ongoing project. The selected clusters covering the potential villages for intervention of the informal dairy value chain are Dekorgorha, Titabor, Sipahokhola, Kaliapani, Selenghat, UjaniMajuli, Majuli and Jorhat. After an initial overview and discussion with some of the informed sources such as DVOs and VOs/BVOs of the respective clusters, the ILRI enumerators finalized the villages listed by the DDD as potential APART clusters. The list of villages is shown in Table 4.3.1.

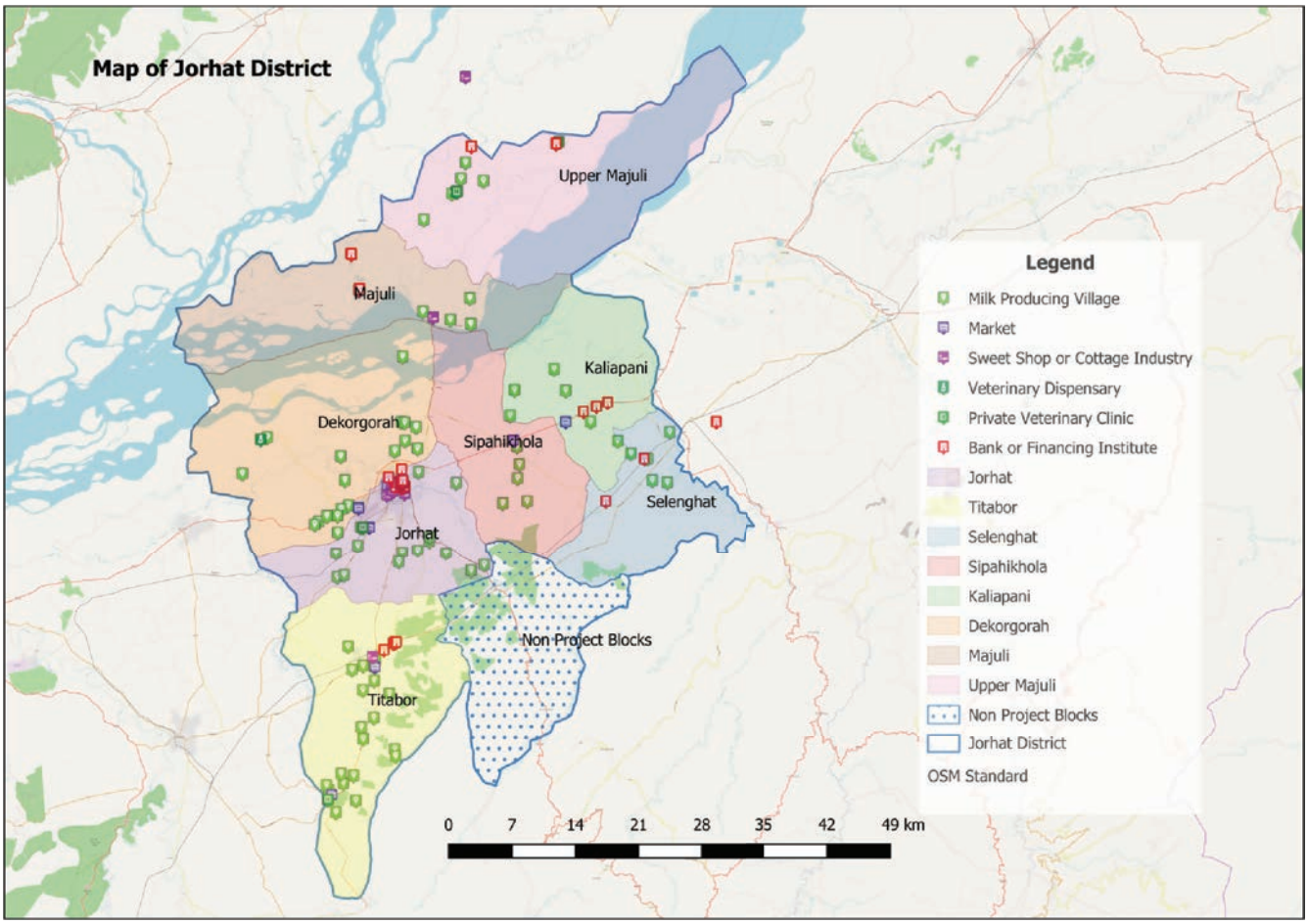
Table 4.3.1: Cluster villages in Jorhat district

Dairy cluster	Names of the DDD-listed villages	Names of the ILRI-listed villages	Potential villages incorporated	Non-potential villages dropped
Dekorgarha	Porbotia, Sahpuria, Pokimuri Habigaon, Pulibor Bamungaon, Dhapkota, Azangaon, Chowrasoa, Tilikium Bezgaon, Bapuji Path, Pokamura, Dhekelia, Panichakowa, Pakhimari, Dahotia, Tilikium Bamungaon, Potiagaon, Naoboisa, Kamarmati, Bebejia, Lehetia, Bhogonia, Bhugarchuk, Dhenususa, Sengeligaon, Kenduguri Bamungaon, Kachogoral, Chenijan, Bahona, Upper Deurigaon, Nam Deurigaon, Kareng Chapori, Charighariagaon, Kolbari Gaonngdoi Dohgaon, Borigaon, Khajurigaon, Potiapokhola Sorbaibondha, Krishna Nagar, Napamua, Baligaon, Nizbaligaon, Kokilamukh, Korokatoli, Gorokhiadole, Kuhumjugunia, Dohgaon, Chintamonigarh, Ale Dhonkhuloi Chapori, Upper Dhonkhuloi, NamoniDhonkhuloi, Majuligaon, Nam Gorumora, Upper Gorumora, Madhya Gorumora, Ganakabari, Goriachapori, Gendhalingmora, Nahotia, Sengeliati, Solmara, Randhanijan, Borbheti, Malowpathar, Ghorpholia, Monaimazi, Malowali, no. 1 Sonarigaon, no. 2 Sonarigaon, Gayangaon, Kansaikia Ali, Naosolia, Bohotia, Dekagaon, Hazarigaon, Pulibor, Gondhia, Bhatemora, Sarucharai, Khoragorua, Chirotiagaon	Sahpuria, Pokimuri Habigaon, Pulibor Bamungaon, Dhapkota, Chowrasoa, Tilikium Bezgaon, Pokamura Dhekelia, Panichakowa, Pakhimari,Dahotia, Tilikium Bamungaon, Potiagaon, Naoboisa, Kamarmati, Bebejia, Lehetia, Bhogonia, Bhugarchuk, Dhenususa, Sengeligaon, Kenduguri Bamungaon, Kachogoral, Chenijan, Bahona, Gaonngdoi Dohgaon, Borigaon, Khajurigaon, Potiapokhola Sorbaibondha, Krishna Nagar, Napamua, Baligaon, Nizbaligaon, Kokilamukh, Korokatoli, Gorokhiadole, Kuhumjugunia, Dohgaon, Chintamonigarh, Ale Dhonkhuloi Chapori, Upper Dhonkhuloi, Namoni Dhonkhuloi, Majuligaon, Nam Gorumora, Upper Gorumora, Madhya Gorumora Nahotia, Sengeliati, Solmara, Randhanijan, Borbheti, Malowpathar, Ghorpholia, Monaimazi, Malowali, no. 1 Sonarigaon, no. 2 Sonarigaon, Gayangaon, Kansaikia Ali, Naosolia, Bohotia, Dekagaon, Hazarigaon, Pulibor, Gondhia, Bhatemora, Sarucharai, Khoragorua, Chirotiagaon	0	Porbotia, Azangaon, Bapuji Path, Upper Deurigaon, Nam Deurigaon, Kareng Chapori, Charighariagaon, Kolbari, Ganakabari, Goriachapori, Gendhalingmora
Titabor	Borholla T.E.., Garajan Grant, Tyrakuri, Kalapani T.E., Cherelipathar, Gohaingaon, Chereligohain, Rajabari, Morangaon, Borholla Grant, Kheremagaon Phalengichuk, Dihingia, Salauria, Amgurikhat, Kavhojan, Titabor, Lalunggaon, Bebejia	Garajan Grant, Kecha Bebejia, Tyrakuri, Kalapani T.E., Cherelipathar, Gohaingaon,Chereligohain, Rajabari, Morangaon, Borholla Grant, Kheremagaon, Dihingia, Bengenakhowa, Salauria, Amgurikhat, Kavhojan, Titabor, Tipamia Bampathar, LahanKachari, Tengajan	Tipamia Bampathar, LahanKachari, Tengajan	Borholla T.E., KechaBebejia, Phalengichuk, Bengenakhowa, Lalung Gaon, Bebejia
Sipahikhola	Fesual, Holongapar Gohaingaon, Gayangaon, Meteli, Meleng, Meleng T.E., Holalbari, Borfoidiya, Gajpuria	Fesual, Holongapar Gohaingaon, Gayangaon, Meteli, Meleng, Meleng T.E., Holalbari, Borfoidiya, Gajpuria	0	0-

Dairy cluster	Names of the DDD-listed villages	Names of the ILRI-listed villages	Potential villages incorporated	Non-potential villages dropped
Kaliapani	Bhakatgaon, Namchuk, Phukonorbari, Changmaigarh, Kaibartagarh, Kawoimari, Bejorchiga, Kumargaon	Bhakatgaon, Namchuk, Phukonorbari, Kaibartagarh, Kawoimari, Kumargaon	0	Changmaigarh, Bejorchiga
Selenghat	Bongaligaon, Namsisu, Haluagaon, Chaodanggaon, Ronkham, Selenggaon, Deoghoria, Boisahabi T.E, Hatimuria	Bongaligaon, Namsisu, Haluagaon, Chaodanggaon, Selenggaon, Deoghoria, Boisahabi T.E, Hatimuria	Tengabari	Ronkham
UjaniMajuli	Jengrai, Kumarbari, Serpai, BorpomuaMoghua Chuk, Rangachahi, Barguri, Nawgaon, Pahumora, Karkichuk, Gatiwali, Nepali, Phuloni, Jamuoni, Raidangon	Jengrai, Kumarbari, Serpai, Borpomua Moghua Chuk, Rangachahi, Barguri, Nawgaon, Pahumora, Karkichuk, Gatiwali, Nepali, Phuloni, Jamuoni, Raidangon	0	0
Majuli	Dakhinpat Kumargaon, Chumoimari	Dakhinpat Kumargaon, Upar Chumurimari (Sp)	0	0
Jorhat	Murmuria, Koronga, Kathonigaon, Chinamara, no. 1 Chaudanggaon, Mazgaon, Nagadhuli, Nagajhanka, Dhopatbari, Mariani MES, Sonowal, Khatkotia, Duklongia, Pukhuria, Napam, Itabhata, Gormur, Na AliDhekiajuli, Jalukoni,Rowriah, Sensowa Gaon, Jamuguri, Ramdhari Colony, MES gate (Rowriah), Gokul Basti, Kuhiarboria, Charaibahi, Dholajan, Dholi, Chungi, Mohorgaon, Khongia	Murmuria, Koronga, Kathonigaon, Chinamara, no. 1 Chaudanggaon, Mazgaon, Nagadhuli, Nagajhanka, Dhopatbari, Mariani MES, Sonowal, Khatkotia, Duklongia, Pukhuria, Napam, Itabhata, Gormur, Na AliDhekiajuli, Jalukoni,Rowriah, Sensowa Gaon, Jamuguri, Ramdhari Colony, MES gate (Rowriah), Gokul Basti, Kuhiarboria, Charaibahi, Dholajan, Dholi, Chungi, Mohorgaon, Khongia	0	0

Source: Field Survey, 2018;

Figure 4.3: The map of the surveyed clusters in Jorhat district.



4.3.2 FGD participants' profile

Table 4.3.2 shows the number of participants segregated by gender and social status. The average number of participants across the project clusters in Jorhat district is 5.36 (male 3.57 66.61% and female 1.79 33.39%). Across the project clusters, representation of participants from the 'general' category is the highest (44.58%) followed by the OBC community (42.08%). Only 1.65% of the total participants belonged to the SC community while 11.68% belonged to the ST community.

Table 4.3.2: Distribution of participants by gender and social status

Dairy cluster	Average no. of participants			% social status of participants			
	Male (%)	Female (%)	Total	General	SC	ST	OBC
Dekorgarha	2.84 (63.53)	1.63 (36.47)	4.47	75.87	0	0	24.13
Titabor	2.77 (61.02)	1.61 (38.98)	4.38	48.12	0	21.23	30.65
Sipahikhola	3.20 (71.33)	1.20 (28.67)	4.4	23.33	13.21	0	63.46
Kaliapani	4.80 (84.28)	0.60 (15.72)	5.4	30.12	0	12.23	57.65
Selenghat	4.20 (74.43)	1.40 (25.57)	5.6	31.77	0	0	68.23
UjaniMajuli	3.86 (81.31)	1.28 (18.69)	5.14	29.46	0	21.22	49.32
Majuli	5.20 (71.23)	2.10 (28.77)	7.30	61.24	0	38.76	0
Jorhat	4.36 (72.35)	1.82 (27.65)	6.18	56.76	0	0	43.24

4.3.3 Farming system by type of bovine stock

The district as a whole has16, 288 HH who have atleast one dairy cattle or buffalo, representing 76.09% HH among the total HH across project clusters. According to breed of cattle for the selected clusters as a whole, proportion of farming HH having local breed, improved breed and both local and improved are 82.04%, 10.92% and 4.38% respectively. Proportions of farming HH with buffalo stock constitute only 2.66% of the total HH (Table 4.3.3). Proportion of farmers having improved breed of cattle is the highest in Sipahikhola cluster (23.60%) followed by Dekorgorha (17.91%). In UjaniMajuli cluster, only 3.57% of the total farming HH was found to have improved cattle. Discussion with some of the key informants indicated that there are some *Chapori*areas based on local cattle mainly in Ujanimajuli and Majuli clusters (Table 50).

Table 4.3.3: Distribution of farm HH by type of bovine stock

Dairy cluster	Total HH	Total farming HH (%)	% HH keeping cattle from local breed	% HH keeping cattle from improved breed	% HH keeping cattle from both local and improved breed	% HH keeping buffaloes
Dekorgarha	6,668	4,505 (67.56)	74.84	17.91	06.31	0.94
Titabor	4,121	3,690 (89.54)	93.44	05.00	01.23	0.33
Sipahikhola	2,422	1,890 (78.01)	75.40	23.60	01.00	0.00
Kaliapani	779	715 (91.75)	71.00	15.00	10.40	3.60
Selenghat	1,155	825 (71.42)	90.02	8.60	01.38	0.00
UjaniMajuli	2,281	1,592 (69.78)	86.43	3.57	01.43	8.57
Majuli	524	380 (72.52)	72.50	7.50	12.50	7.50
Jorhat	3,456	2,691 (77.86)	90.68	6.21	02.79	0.32

Source: Field Survey, 2018

Note: Figures in parentheses indicate percentage of farming HH to total HH.

4.3.4 Farming system by rearing practices

Table 4.3.4 shows that almost 13% of farm HH rear cattle in a fully stall-fed condition across project clusters, while 79% of farmers rear cattle in a partly stall-fed condition. There is not any *khuti* system of rearing except in Ujani Majuli, Majuli and partly in Titabor where 14.28%, 87.50% and 0.12% respectively keep cattle in a stall-fed condition. The farming system based on rearing system is closely related to the type of bovine stock as shown in Table 4.3.3. The fully stall-fed rearing condition increases with the increase of the number of improved cattle stock. (See Tables 4.3.3 and 4.3.4).

Table 4.3.4: Distribution of farm HH by rearing practices

Dairy cluster	% fully stall fed	% partly stall fed	*% khuti* (forage herd) system
Dekorgarha	14.16	85.84	0
Titabor	05.78	94.11	00.11
Sipahikhola	05.60	94.40	0
Kaliapani	17.60	82.40	0
Selenghat	06.80	93.20	0
UjaniMajuli	04.28	81.43	14.28
Majuli	06.00	06.50	87.50
Jorhat	05.21	94.79	0

Source: Field Survey, 2018

4.3.5 Women's participation in dairy production and income control

In the project clusters of Jorhat, women's role in milk production is relatively heterogeneous ranging from 20% in Majuli cluster to 62% in Sipahikhola. Across clusters, the average role of women in performing farm activities is 38.33% which is however lower than their role in making spending decisions regarding dairy income (44.05%) (Table 4.3.5).

Table 4.3.5: Women's role in dairy production and income control

Dairy cluster	No. of farming HH	% women have role in milk production	% women have control of income from milk production
Dekorgarha	4,505	38.95	41.58
Titabor	3,690	45.56	46.67
Sipahikhola	1,890	62.00	50.00
Kaliapani	715	32.00	40.00
Selenghat	825	32.00	42.00
UjaniMajuli	1,592	44.28	47.14
Majuli	380	20.00	45.00
Jorhat	2,691	31.82	40.00

Source: Field Survey, 2018

4.3.6 Average herd size (adult animals) of the farm HH according to type of bovine stock

The average herd size (adult animals) according to the type of bovine stock is reported in Table 4.3.6. The number of adult indigenous cattle per HH is 2.7 across the project clusters with the highest in Sipahikhola, Ujani Majuli, and Majuli (3.1 each) and the lowest in Dekorgarha (2.2). The average improved cattle holding in each HH across selected project clusters is 3.09. Farmers in Sipahikhola and Selenghat did not own buffaloes during the time of the FGD. The average size of buffaloes held by the farmers of the remaining clusters is 2.63

Table 4.3.6: Average herd size (adult animals) by the bovine stock in the project clusters

Dairy cluster	Local cows (%)	Improved cows (%)	Buffaloes (%)
Dekorgarha	2.2 (74.84)	4.5 (17.91)	0.4 (0.94)
Titabor	2.6 (93.44)	2.6 (05.00)	1.2 (0.33)
Sipahikhola	3.1 (75.40)	2.4 (23.60)	0.0 (0.00)
Kaliapani	2.8 (71.00)	2.5 (15.00)	9.0 (3.60)
Selenghat	2.2 (90.02)	2.4 (08.60)	0.0 (0.00)
UjaniMajuli	3.1 (86.43)	1.6 (03.57)	4.1 (8.57)
Majuli	3.1 (72.50)	4.2 (07.50)	0.5 (7.50)
Jorhat	2.5 (92.68)	4.5 (06.21)	0.6 (0.32)

Source: Field Survey, 2018

4.3.7 Milk productivity and production of the bovine stock at cluster level

The daily milk yield of the bovine stock is not uniform during the entire lactation length. Immediately after a calf is born, milk production gradually increases until it reaches the peak yield. Milk production lowers at pregnancy and the cycle continues. Across the selected project clusters of Jorhat, the average daily milk productivity of local cows during the lean period is 0.52 litres with Titabor having the highest yield at 0.61 litres while the lowest is in Sipahikhola cluster (0.35 litres). During the peak lactation days of the indigenous cattle, average productivity across clusters is 1.89 litres. Table 4.3.7 shows that the average lean and peak productivity of improved cattle stock is 2.98 and 8.83 litres respectively while buffaloes are 1.42 and 3.49 litres respectively. The average milk

yield of improved cattle is the highest in Sipahikhola across the stages of lactation (10.80litres) and the lowest in Jorhat cluster (7.18litres).

Table 4.3.7: Lowest and highest levels of average daily milk production per cow in the clusters

Dairy cluster	Milk production of local cows		Milk production of improved cows		Milk production of buffaloes	
	Low	High	Low	High	Low	High
Dekorgarha	0.59	2.26	3.25	10.32	1.50	3.75
Titabor	0.61	2.08	3.14	08.83	1.40	3.67
Sipahikhola	0.35	1.90	3.00	10.80	-	-
Kaliapani	0.55	1.80	2.60	08.60	1.60	4.00
Selenghat	0.50	2.00	3.00	09.40	-	-
UjaniMajuli	0.53	1.78	2.50	07.50	1.00	2.50
Majuli	0.50	1.50	2.80	08.00	1.50	3.50
Jorhat	0.52	1.77	3.59	07.18	1.50	3.50

Source: Field Survey, 2018

Table 4.3.8 to 4.3.10 shows the average milk production of local, improved and buffalo stock of the district. The total milk production of local cattle stock across the clusters is 22,115 litres with the highest milk production in Titabor (6,028 litres) followed by Dekargarha and Jorhat clusters. Table 4.3.9 shows that the total milk production of the improved cattle in the selected project clusters is 21,300 litres, with the highest milk production reported in Dekorgarha followed by Sipahikhola. UjaniMajuli has the lowest milk production of the improved cattle stock among the project clusters in the district. The clusters reporting the presence of buffalo stock have a total milk production of 879litres. The proportion of milk production across types of stock and clusters is local cows 57.15%, improved cows 38.45 % and buffaloes 4.40.

Table 4.3.8: Estimated total milk production based on total local cattle stock

Dairy cluster	Estimated no. of HH with local cattle	Average herd size (adult lactating animals)	Average milk production per local cow	Total milk production with local cattle stock*
Dekorgarha	3,371.54	1.10	1.43	5,285
Titabor	3,447.94	1.30	1.35	6,029
Sipahikhola	1,425.06	1.55	1.13	2,485
Kaliapani	507.65	1.40	1.18	835
Selenghat	742.67	1.10	1.25	1,021
UjaniMajuli	1,375.97	1.55	1.16	2,463
Majuli	275.50	1.55	1.00	427
Jorhat	2,494.02	1.25	1.15	3,570

Source: Field Survey, 2018

*In estimating total milk production of local cows only the lactating animals were considered assuming 50% of the total adult local cattle as lactating.

Table 4.3.9: Estimated total milk production based on improved cattle stock

Dairy cluster	Estimated no. of HH with improved cattle	Average herd size (adult lactating animals)	Average milk production per improved cow	Total milk production with improved cattle stock*
Dekorgarha	806.85	2.30	6.79	12,318
Titabor	184.50	1.30	5.99	1,436
Sipahikhola	446.04	1.20	6.90	3,693
Kaliapani	107.25	1.25	5.60	751
Selenghat	070.95	1.20	6.20	528
Ujani Majuli	056.83	0.80	5.00	227
Majuli	028.50	2.10	5.40	323
Jorhat	167.11	2.30	5.39	2,025

Source: Field Survey, 2018

*In estimating total milk production of improved cattle only lactating animals are considered assuming 50% of the total adult improved cattle as lactating.

Table 4.3.10: Estimated total milk production based of buffalo stock

Dairy cluster	Estimated no. of HH with buffaloes	Average herd size (adult lactating animals)	Average milk production per improved cow	Total milk production with buffaloes*	Total milk production across bovine stock#
Dekorgarha	042.35	0.2	2.63	22.23	**17,625**
Titabor	012.18	0.6	2.54	18.52	**7,483**
Sipahikhola	000.00	0.0	0.00	0.00	**6,178**
Kaliapani	025.74	4.5	2.80	324.32	**1,910**
Selenghat	000.00	0.0	0.00	0.00	**1,549**
Ujani Majuli	136.43	2.1	1.75	489.46	**3,180**
Majuli	028.50	0.3	2.50	17.81	**768**
Jorhat	008.61	0.3	2.50	6.46	**5,601**

Source: Field Survey, 2018

*In estimating total milk production of buffaloes only lactating animals were considered assuming 50% of the total adult buffaloes as lactating.

#Total milk production is the summation of milk production across bovine stock in Tables 4.3.8 to 4.3.10.

4.3.8 Marketing behaviour of farmers at cluster level

All types of farms sell their surplus milk. Farmers with local cattle stock keep a part of their milk produced for home consumption and offer to relatives while the remaining part is marketed to earn cash. Farmers with improved cattle stock produce primarily for the market to earn profit, while some portion of the milk produced is kept for HH consumption. Since total milk production is high on commercial farms with crossbred / improved cattle, the proportion of milk marketed is also high. On subsistence farms with local cattle that produce one or two litres of milk, a sizable amount of milk produced is consumed at home. Table 4.3.11 shows that farm HH with local cattle across project clusters sell 62% of their total milk production; while farm HH with improved cattle sell 85.70% of their total HH milk production. Project clusters with buffaloes sell 79.17% of their total milk production (Table 4.3.11).

Table 4.3.11: Type of bovine stock percentage of milk sold per HH

Dairy cluster	% with local cows	% with improved cows	% with buffaloes
Dekorgarha	58.95	91.05	95
Titabor	60.00	82.22	50
Sipahikhola	63.00	76.00	0
Kaliapani	65.00	90.00	90
Selenghat	70.00	84.00	0
UjaniMajuli	47.14	83.33	70
Majuli	62.00	90.00	90
Jorhat	70.00	89.00	80

Source: Field Survey, 2018

With strong cooperative-based milk and milk products marketing in the district, the informal sector of milk marketing is at a low stage. Based on the data provided by the district dairy officer, the milk and milk products marketing in the district at the level of the district processing plant is at a constant rise from 32,496 litres of milk during 2001–02 to 636,162.5 litres during 2016–17. Similarly, the processed products marketing such as curd increased from 721 kilograms (kg) in 2001–02 to 18,779.65 kg during 2016–17. The marketing of paneer (914.65 kg), cream (347.10 kg) and ghee (31.75 kg) also increased significantly.

Table 4.3.12 presents the sources of milk sale in the project clusters. Selling milk in the neighbourhood or in the local market is predominant in the majority of the clusters of Jorhat. These are smallholder dairy farmers rearing dairy animals of indigenous breed to cater to the local raw milk consumers in their neighbourhood. Considering the district as a whole based on the selected clusters, 43.03% of farmers sell milk locally, followed by selling to milk vendors / traders (31.08%). Selling milk to the DCS in all ofthe project clusters is 12.89%; almost 87% of the total farmers in the selected clusters use informal channels to dispose of milk. The informal market actors such as milk traders and private processors together procure milk from almost 42% of the producers establishing an informal value chain between producers to traders and producers to SMs / CPs or producers to consumers to SMs.

Prices offered to producers by various marketing sources is the highest when farmers sell milk locally (INR 44/ litre) followed by INR 42/ litre when sourced to a private processor. As shown by empirical studies in Assam and the rest of India that cooperatives are weak in offering better prices to consumers (Kumar et al. 2013; Kumar and Staal 2010; Bayan 2018), similar findings are also reported in the APART sites of Jorhat where cooperatives offer only INR 34.5/litres across clusters. Farmers' preference for marketing channels is in accordance with the prices they receive as shown in Table 4.3.12.

Table 4.3.12: Percentage of milk sale by sources and their respective farm gate prices

Dairy cluster	Neighbours or local sale		To traders		To cooperatives		To private processors	
	%	Price/litre	%	Price/litre	%	Price/litre	%	Price/litre
Dekorgarha	36.32	48.57	33.68	39.62	06.84	35.00	18.95	42.43
Titabor	65.56	47.67	18.06	40.00	10.28	38.00	03.89	45.00
Sipahikhola	36.00	44.00	06.00	40.00	29.00	38.00	29.00	40.00
Kaliapani	16.00	40.00	68.00	33.50	16.00	35.00	00.00	-
Selenghat	58.00	47.50	0.00	-	16.00	33.00	26.00	50.00
Ujani Majuli	81.00	40.00	08.33	40.00	0.00	-	10.00	40.00
Majuli	05.00	40.00	70.00	35.00	25.00	30.00	0.00	-
Jorhat	46.36	44.00	35.28	43.17	07.80	33.00	10.56	40.00

Source: Field Survey, 2018;

4.3.9 Access to veterinary services

Table 4.3.13 presents the number of veterinary service providers which include local veterinarians, VFAs, CAHWs, and AI practitioners providing services to the farmers. Across clusters, an average of three local veterinarians operates, while the average distance from the farm villages is 4.71km. At cluster level, farm villages of Sipahikhola cluster are 8 km from a visiting local veterinarian, while farm villages of Dekorgarha are relatively closely located to a doctor's residence/duty station (2.25 km). VFAs are on average across clusters 4.38 km from villages ranging from 1.85 km in Titabor to almost 5 km in Jorhat clusters. None of the farmers in Jorhat reports access to a CAHW. There is one AI practitioner in Selenghat, two in Ujani Majuli and eight in Sipahikhola clusters, while the remaining clusters report the absence of AI practitioners (Table 4.3.13).

Table 4.3.13: Access to veterinary services at the selected project clusters of the district

Dairy cluster	No. of local veterinarians*		Distance from the FGD location/village km	No. of VFAs		Distance from the FGD location /village km	No. of CAHWs		Distance from the FGD location/ village km
	Male	Female		Male	Female		Male	Female	
Dekorgarha	6	0	2.25	7	0	2.46	0	0	0
Titabor	3	0	2.62	5	0	1.85	0	0	0
Sipahikhola	2	0	8	2	0	4.40	0	0	0
Kaliapani	1	1	6.60	1	0	6.60	0	0	0
Selenghat	1	0	3.50	0	0	-	0	0	0
Ujani Majuli	2	0	3	2	0	3.71	0	0	0
Majuli	2	0	3.50	2	0	6	0	0	0
Jorhat	5	0	5.27	6	0	4.77	0	0	0

*Local veterinarian includes both private and government Employed.

4.3.10 Access to other services (input and breeding)

The major inputs that a farmer accesses for their milk storage and transportation, feeding of cattle and natural mating of their animals are presented for Jorhat district in Appendix Table A2.Farmers reported an average of 2.42 utensils shopsin each cluster from where they can buy milk storage equipment. The average distance from the FGD locations/sample villages is almost 3 km. Farmers in the selected clusters indicated that there is an average of 2.75 grocery shops across the project clusters readily available for buying concentrate feeds with an average distance of 1.96 km from the sample villages. Pure feed shops are almost nil in most of the clusters as feeds are primarily sold in the grocery shops. Quality segregation of a particular type of feed is mostly not found in these shops and thus farmers buy the available stock. Most farmers lack knowledge on the quality of feeds. In all of the selected clusters except Selenghat, a few breeding bulls are available for providing natural mating services (an average of 1.63 across clusters).

4.3.11 Availability of producers/traders organizations and input supplying institutions at cluster level

Farmers report that there is one registered milk traders organization in Titabor, Sipahikhola and Ujani Majuli. There arenot any SHGs related to dairy farming or active milk producers institutions. All of the clusters except Selenghat and Ujani Majuli have active DCS (Table 4.3.14).

Table 4.3.14: Availability of producers / traders organization at cluster level (no.)

Dairy cluster	Milk traders organizations	DCS
Dekorgarha	0	4 (Dahotia,PokamuraDhekelia etc.)
Titabor	1	7 (DUSS at Tipomia, Chereligohain, Kheremagaon, Marangaon, Sereli Pathar, Borhala Grant, Tyrakuri, Salauria, Dihingia, Bogargaon, Kachojan, Titabor)
Sipahikhola	1	4 (DUSS at Fasual, Bonfoidiya, Gohain Gaon)
Kaliapani	0	1(DUSS at Bhakatgaon)
Selenghat	0	0
UjaniMajuli	0	0
Majuli	0	1(DUSS at Kumargaon)
Jorhat	0	5

Notes: In parentheses are the major linked villages.

DUSS = Dugdha Utpadak Samabai Samiti

Farmers report that there is one dairy plant and one chilling plant in Jorhat cluster under DDD, while there is one BMC under DDD at Felengichok. There is one DDL at Jorhat town; none of the other clusters have a DDL and none of the clusters have a feed testing laboratory or feed mill. Table 4.3.15 indicates that there are six private veterinary clinics in Titabor cluster, one in Sipahikhola, three in Ujani Majuli and one in Jorhat clusters where medicines for animal health care and consultation with the veterinary doctors are available.

Table 4.3.15: Availability of input supplying institutions at cluster level

Dairy cluster	No. of dairy plant, chilling plant, BMC	No. Of DDL	No. of feed testing laboratory	No. of feed mill
Dekorgarha	0	0	0	0
Titabor	1 BMC (Felengichok)	0	0	0
Sipahikhola	0	0	0	0
Kaliapani	0	0	0	0
Selenghat	0	0	0	0
UjaniMajuli	0	0	0	0
Majuli	0	0	0	0
Jorhat	2 [DDD Chilling Plant (Rowroia), Jorhat Dairy]	1	0	0

4.3.12 Major milk market actors and other infrastructure in the dairy value chain

In Table 4.3.16, the number of milk market actors involved in the dairy value chain of the selected APART clusters is presented. The number of milk traders in the selected clusters is in the range of 7 in Sipahikhola to 30 in Jorhat town. The reason for less milk market actors in Jorhat is because of the widely covered formal sector under the DDD and the number of DDD selling booths in different locations from where raw milk and processed milk products are purchased by consumers. There is one cottage industry owner each in Dekorgarha and Jorhat as some of the cottage industry products such as ghee, curd and cream are also available in the sweet shops. The number of sweet shops in Jorhat town is highest (35) while lowest in Ujani Majuli and Majuli (one each).

Table 4.3.16: Number of milk market actors at cluster level (based on KII and FGD)

Dairy Cluster	Milk traders	Cottage industry owners	Sweet shop owners
Dekorgarah	13	1	7
Titabor	12	0	10
Sipahikhola	7	0	12
Kaliapani	8	0	10
Selenghat	20	0	15
Ujani Majuli	12	0	5
Majuli	16	0	5
Jorhat town	30	2	35

The major linked markets from where milk and milk products are traded are shown in Table 4.3.17. The major markets linked to these clusters are Sipahikhola, Morigong, Jorhat town, Torajan, Pulibor, Borhala, Titabor, Bampathar Tiniali, Titabor chariali, Teok, Amguri, Jengraimukh, Borguri, Phuloni, Kamalabri, Deberapara Chariali, Moriani and Chinamara. Farmers were asked if they had accessed bank credit during the 12 months preceding the FGD and to name the banks. Dairy farmers in Dekorgarha, Titabor, Sipahikhola and Jorhat clusters reported accessing credit from institutions such as the Industrial Bank of India (IDBI), AGVB, UBI and SBI. Some of the unorganized commercial farms reported access to insurance services from the government supported insurance scheme under the NLM Guwahati in all of the clusters except Sipahikhola, Ujani Majuli and Majuli. Most of the selected clusters have favourable road infrastructure with blacktop approach roads to the villages (80%). The proportion of villages having gravel roads is 11.87% and earthen roadsis 8.13%.

Table 4.3.17: Markets and other infrastructure at cluster level

Dairy cluster	Markets with trading of milk and milk products*	Bank and other financing institutions	Insurance for livestock	Approach road quality of (% of villages in the cluster)		
				Blacktop	Gravel	Earthen
Dekorgarha	Sipahikhola (weekly), Morigong (daily), Jorhattown, Torajan Market, Pulibar	IDBI (Jorhat) AGVB	Oriental Insurance /New India Assurance	70	10	20
Titabor	Borhala, Titabor, Jorhat town,Bampathar Tiniali, TitaborChariali	LakhimiBank (Melamati), UBI-Titabor,I DBI-Jorhat, AGVB	Oriental Insurance /New India Assurance	100	0	0
Sipahikhola	Sipahikhola, Jorhat	UBI	0	80	10	10
Kaliapani	Teok, Amguri, Jorhat	0	Oriental Insurance /New India Assurance	100	0	0
Selenghat	Amguri, local area	0	Oriental Insurance /New India Assurance	80	10	10
Ujani Majuli	Jorhat, Jengrai Mukh, Borguri, Phuloni	0	0	60	25	15
Majuli	Kamalabari, Jorhat	0	0	50	10	40
Jorhat	Jorhat town, Deberapara Chariali, Moriani, Chinamara	SBI-Jorhat	Oriental Insurance /New India Assurance	100	0	0

Note: *The frequency of markets when known is in parentheses (daily, biweekly or weekly).

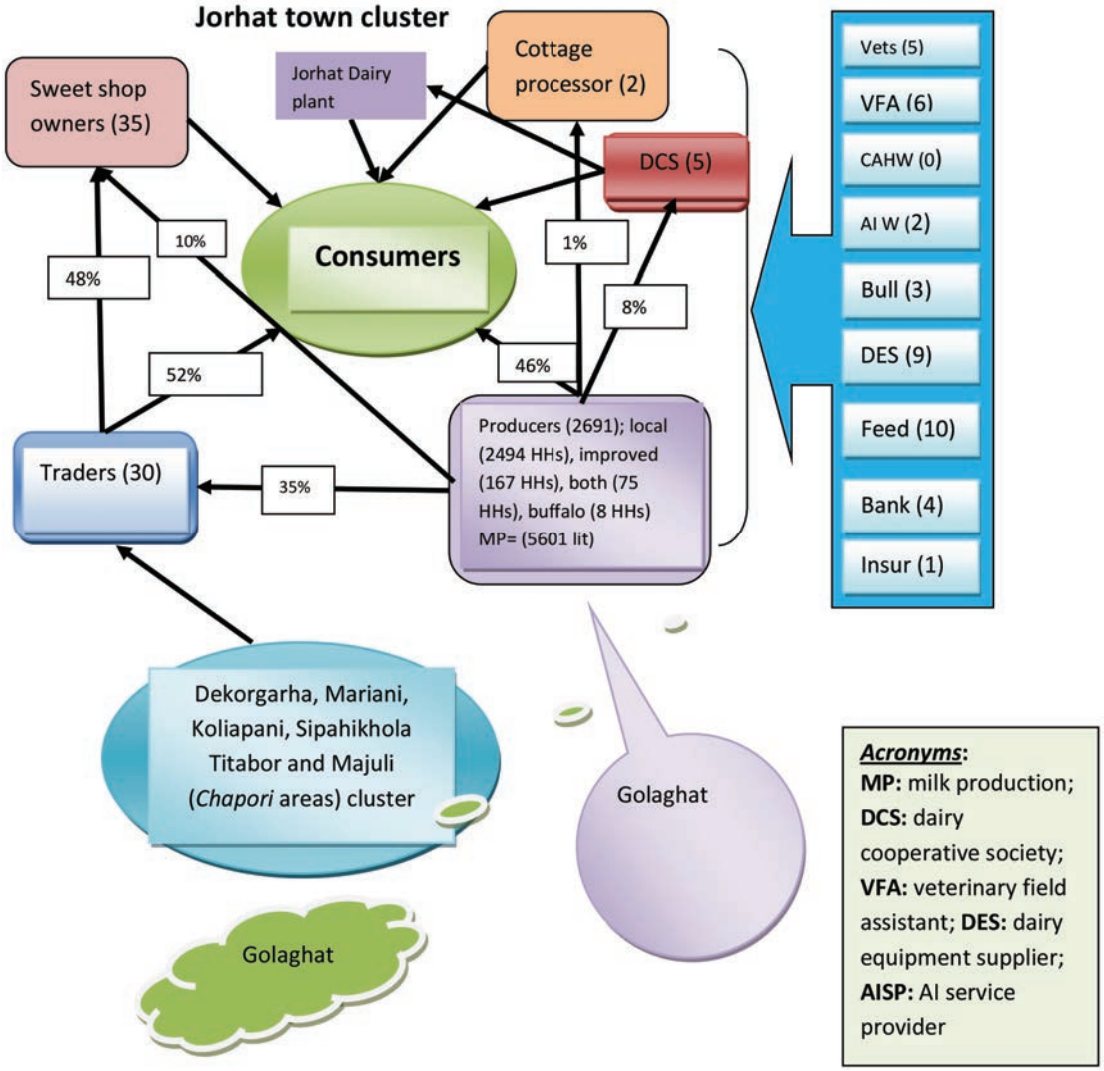
4.3.13 Entrepreneurs at cluster level

Table 4.3.18 indicates the number of progressive dairy farmers/milk traders/cottage industry owners. There are three such entrepreneurs: two in Ujani Majuli and one in Majuli cluster.

Table 4.3.18: Names and contacts of promising progressive entrepreneur in dairy

Dairy cluster	Number of entrepreneurs
Dekorgarha	0
Titabor	0
Sipahikhola	0
Kaliapani	0
Selenghat	0
UjaniMajuli	2
Majuli	1
Jorhat	0

Figure 4.3.1: Schematic representation of the value chain actors of the major recommended clusters in Jorhat town.



4.3.14 Quick observations and recommendations

The district has milk processing plants equivalent to the capacity of 5,000 litres /day along with a 2,000 litres capacity chilling plant. The DCS network in Jorhat district is very active. As of now, the district dairy department has organized 42 DCS in Jorhat along with 56 DCS in Golaghat district. The average daily milk procurement through DCS is 1,600 litres in the district out of 6,500 litres of milk production from the member producers. The dairy development department has already covered the potential areas by forming DCS and procuring milk and DDD also puts effort into forming DCS in the virgin areas to procure more milk and to optimally utilize the processing plant's capacity in the district. An interview with the district dairy officer revealed that most villages with surplus milk have already been covered through formalized the DCS system under the DDD. The surveyors further filtered the villages in terms of the penetration level of DCS to arrive at a list of villages in the selected dairy clusters with sufficient informal milk handling.

The highest milk supplies to Jorhat town from the production areas in the cluster are RRL and Parvatia.Milk is also being supplied from Morioni and some amount of milk from the *Chapori* areas of Majuli (which have indigenous cattle and buffalo *khutis*). There are some other milk producing villages near town including Chinamara, Chalihagaon (Nantolibasti), Kathanigaon, Mahargaon, Sonarigaon and Mazgaon from where milk is mainly being supplied to Jorhat town. In Titabor cluster, milk mainly comes from Madhapur, Tipomia, Borhola grant, Dihingia and Bengenakhowa, while in Kaliapani cluster milk generally comes from Bhakatgaon, Namchuk, Phukonorbari, Chanmaigarh, Kaibartagaon, Kamargaon, Kawoimari and Bejorchiga.In Kaliapani cluster, villages under Jajimukh GP and Teok East and West are major milk producing areas. Milk from this cluster also comes to Jorhat town especially from the *Chapori* areas like Nimatichapari, Bormothauri, Dorbarchapari and Ramoichapari. Teok and Mudoijan town are the main markets in the cluster while there is another market outside of the cluster called Kakojan where milk is also supplied. Gohaingaon, Fesual and Borfoidiya are some major milk producing villages in Sipahikhola cluster, while in some of the remaining listed village's production has declined in the recent period. In the Selenghat cluster, Amguri (Sivasagar) is the main market, and some portion of milk produced in the cluster is supplied to Teok market as well. In Majuli cluster, Singimari and Baghmara are milk producing *Chapori* areas situated in North Lakhimpur district from where milk is supplied to Majuli and to Dhakuakhana (North Lakhimpur). Other *Chapori* areas are located near Dakhinpat from where around 300 litres of milk daily are supplied to Jorhat town. The major market points in the Majuli islands are Kamalabari, Gormur, Jengrai and Phuloni Chariali. They have 2–3 CPs who make dahi paneer and cream and sell them locally. Table 4.3.19 indicates the recommendations for cluster level training of the value chain actors in Jorhat district.

Table 4.3.19: Cluster level planning for conducting training in Jorhat district

Rank of importance	Name of the cluster	Possible no. of training sessions				Recommendations
		Producers (44)	SM (5)	CP (0)	MT (6)	
Most potential	Dekorgarah	23	0.35	0.05	0.65	Dekorgarah and Jorhat clusters can be merged for the convenience of imparting training.
	Jorhat	3	1.75	0.05	1.50	
Medium potential	Sipahikhola	7	0.60	0	0.35	1. One training that can be organized for SMs in Sipahikhola and Kaliapani. 2. Ujoni MajuliandMajuli can be merged as one cluster because of geographic proximity.
	Selenghat	1	0.75	0	1	
	Kaliapani	5	0.50	0	0.40	
	UjoniMajuli	1	0.25	0	0.60	
	Majuli	2	0.25	0	0.80	
Less Potential	Titabor	2	0.50	0	0.60	Titabor has less potential in terms of the presence of informal market actors.

Note: When considered for producer's training, only commercial farms were considered with ownership of high yielding improved animal stock plus the *khuti* system of rearing farms.

Prod: Dairy producers, **MT:** Milk traders; Figures within brackets indicate number of respective market actors.

4.4 Nalbari district

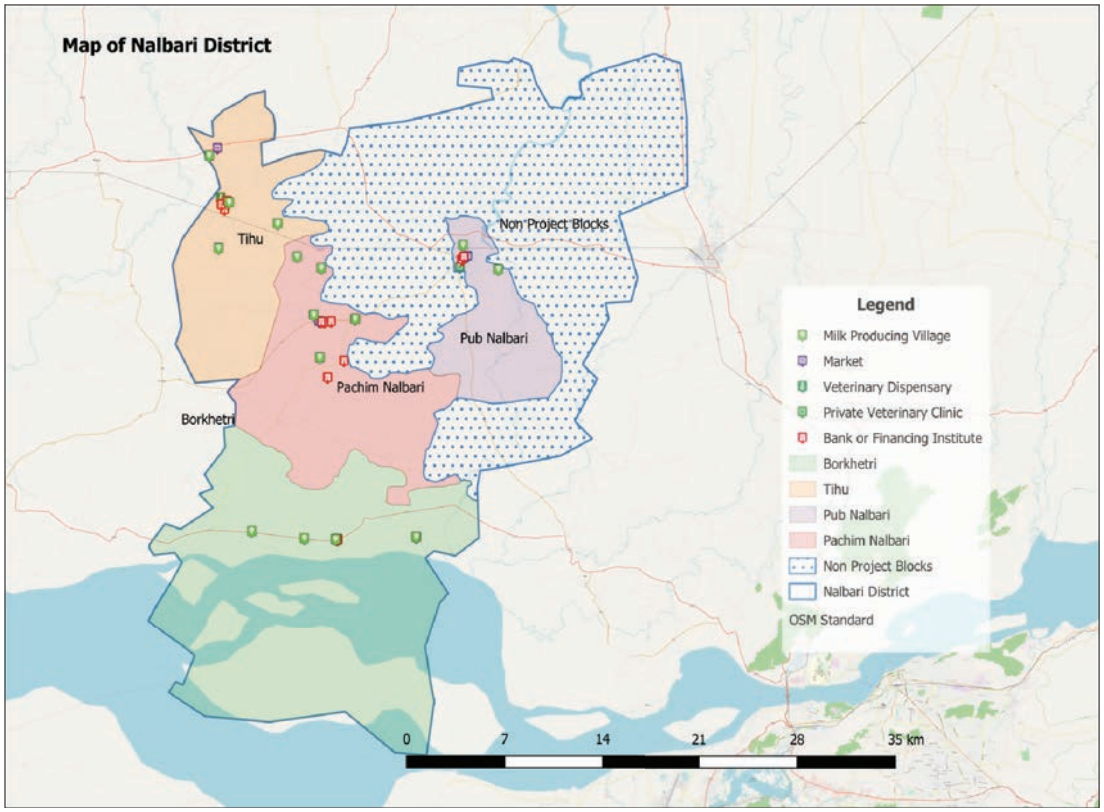
4.4.1 Cluster villages identification based on field visit

A total of four potential clusters were identified in Nalbari district for the implementation of the ongoing APART. The selected clusters covering the potential villages for intervention in the informal dairy value chain are Pub Nalbari and Borigog, Pachim Nalbari, Barkhetri and Tihu. An initial overview and discussion was held with some of the informed sources such as DVOs, VOs / BVOs of the respective clusters.The ILRI enumerators then finalized the villages as listed by the DDD as potential clusters from where the village specific information was obtained. The list of villages is shown in Table 4.4.1.

Table 4.4.1: Cluster villages in Nalbari district

Dairy cluster	Names of the DDD-listed villages	Names of the ILRI-listed villages	Potential villages incorporated	Non-potential villages dropped
Pub Nalbari and Borigog	Balitara Digheli, Terechia, Poila, Sondha, Balikaria	Balitara Digheli, Terechia, Poila, Sondha, Balikaria,	0	0
Pachim Nalbari	Chamata, Belsor, Gamarimuri, Kaithalkuchi, Niz-Tapa.	Chamata, Belsor, Gamarimuri, Kaithalkuchi, Niz-Tapa.	0	0
Barkhetri	Mukalmua, Bortola, Kaplabori, Rampur, Satemari, Loharkatha, Adabari, Bhangnamari, Kalarchar, Lowpara Char	Mukalmua, Bortola, Kaplabori, Rampur, Satemari, Loharkatha, Adabari, Bhangnamari, Kalarchar, Lowpara Char	0	0
Tihu	Tihu, Nathkuchi, Gobradal, Niz-Namati, Makhibaha, Sialmari.	Tihu, Nathkuchi, Gobradal, Niz-Namati, Makhibaha, Sialmari.	0	0

Figure 4.4: The map of the surveyed clusters in Nalbari district.



4.4.2 FGD participants' profile

The number of participants segregated by gender and social status is presented in Table 4.4.2. The average number of participants across the project clusters is 10.90 (male 8.31 76.24% and female 2.55 23.76%). Across clusters, the participants are predominantly from the 'general' category (84.25%) followed by participants from the OBC community (12%) and the SC community (3.75%). There are no participants from the ST community. In Tihu cluster, 100% of the farmers were from the 'general' category.

Table 4.4.2: Distribution of participants by gender and social status

Dairy cluster	Average number of participants			% Social status of participants			
	Male (%)	Female (%)	Total	General	SC	ST	OBC
Pub Nalbari and Borigog	07.22 (82.99)	01.48 (17.01)	8.70	80	5	0	15
PachimNalbari	10.20 (75.56)	03.30 (24.44)	13.50	65	10	0	25
Barkhetri	08.30 (85.57)	01.20 (14.43)	09.70	92	0	0	8
Tihu	07.50 (64.10)	04.20 (35.90)	11.70	100	0	0	0

4.4.3 Farming system by type of bovine stock

The district as a whole has 6,150 HH who have atleast one dairy cattle or buffalo, representing 59.81% of HH among the total HH across project clusters. The proportion of farming HH having local breed, improved breed and both local and improved are 67.50%, 21.50% and 10.45% respectively. Farming HH with buffalo stock constitute a meager 0.55% of the total HH (Table 69), as buffaloes are held only in Barkhetri cluster. The proportion of farmers having improved breed of cattle is higher in Paschim Nalbari and Tihu clusters (25% each) followed by Pub Nalbari and Borigog (20%).

Table 4.4.3: Distribution of farm HH by type of bovine stock

Dairy cluster	Total HH	Total farming HH (%)	HH keeping cattle from local breeds	HH keeping cattle from improved breeds	HH keeping cattle from both local and improved breeds	HH keeping buffaloes
Pub Nalbari and Borigog	1,473	1,020 (69.25)	67.50	20.00	12.50	0.00
Pachim Nalbari	3,260	1,700 (52.15)	66.00	25.00	9.00	0.00
Barkhetri	3,450	2,270 (65.80)	74.00	16.00	7.80	2.20
Tihu	2,100	1,160 (55.24)	62.50	25.00	12.50	0.00

Note: Figures in parentheses are the proportion of farming HHout of totalHH of the cluster villages.

4.4.4 Farming system by rearing practices

Table 4.4.4 presents that 20.44% of farm HH rear cattle in a fully stall-fed condition across project clusters, while the proportion of farmers rearing cattle in a partly stall-fed condition constitutes 78.31%. There is not any *khuti* system of rearing except in Barkhetri cluster. The farming system based on rearing practice is proportionately related to the type of bovine stock owned by the farming HH of the project clusters as shown in Table 4.4.3. The fully stall-fed rearing condition increases with the increase of the number of improved cattle stock. (see Tables 4.4.3 and 4.4.4).

Table 4.4.4: Distribution of farm HH by rearing practices

Dairy cluster	% fully stall fed	% partly stall fed	% *khuti* (forage herd) system
Pub Nalbari and Borigog	18.00	82.00	0.00
Pachim Nalbari	22.00	78.00	0.00
Barkhetri	20.00	75.00	5.00
Tihu	21.75	78.25	0.00

4.4.5 Women's participation in dairy production and income control

Men and women farmers were asked separately to describe women's participation and control of income in dairy farming.It was reported that women's roles in performing the rearing activities were higher compared to control of income from dairy production. Women's roles in farm activities depend on the type of farm and farm activities. Across the project clusters of Nalbari district, women's role in farming activities (60.67%) is higher than men's while women's control of income is lower (39.42%) (Table 4.4.5).

Table 4.4.5: Women's role in dairy production and income control

Dairy cluster	No. of farming HH	% women have role in milk production	% women have control of income from milk production
Pub Nalbari and Borigog	1,020	60.54	35.47
Pachim Nalbari	1,700	65.55	40.25
Barkhetri	2,270	55.32	38.22
Tihu	1,160	61.25	43.75

4.4.6 Average herd size (adult animals) of the farm HH according to type of bovine stock

The average herd size of adult animalsaccording to the type of bovine stock is shown in Table 4.4.6. The number of adult indigenous cattle per HH is 1.47 across the project clusters with the highest in Pub Nalbari and Borigog cluster and the lowest in Tihu. The average improved cattle holding in each HH across selected project clusters is 2.01. The farmers in the clusters ofPub Nalbari and Borigog, Paschim Nalbari and Tihu did not own buffalo at the time of the survey. However, buffaloes are reared in a *khuti* system in Barkhetri in the Brahmaputra *Chapori* areas with a herd size of 9.80 animal heads.

Table 4.4.6: Average herd size (adult animals) by the bovine stock in the project clusters

Dairy cluster	Local cows	Improved cows	Buffaloes
Pub Nalbari and Borigog	1.75	2.50	0
PachimNalbari	1.40	1.90	0
Barkhetri	1.61	2.00	9.80
Tihu	1.13	1.63	0

Source: Field Survey, 2018

4.4.7 Milk productivity and production of the bovine stock at cluster level

The daily milk yield varies during the entire lactation length showing an inverted U-shaped trend. Immediately after the calf is born, milk production gradually increases until it reaches peak yield. At pregnancy, milk production decreases and the cycle repeats. Across the selected project clusters of Nalbari the daily milk productivity of local cows during the lean period is 0.48 litres (Table 4.4.7). During the peak lactation days of the indigenous cattle average productivity is 2.16 litres. The average lean and peak productivity of improved cattle stock is 2.63 and 8.83 litres respectively and of buffaloes in the Barkhetri cluster lean productivity is 1 litre per day and peak

productivity is 7 litres/day. The average milk yield of improved cattle is the highest in Tihu across the stages of lactation (6.25litres) and the lowest in Pub Nalbari and Borigog cluster (5.25litres).

Table 4.4.7: Lowest and highest levels of average daily milk production per cow in the clusters

Dairy cluster	Milk production for local cows litres		Milk production of improved cows litres		Milk production of buffaloes litres	
	Low	High	Low	High	Low	High
Pub Nalbari and Borigog	0.50	2.25	3.00	07.50	-	-
PachimNalbari	0.40	2.40	2.40	08.60	-	-
Barkhetri	0.52	2.00	2.60	09.20	1	7
Tihu	0.50	2.00	2.50	10.00	-	-

Tables 4.4.8 to 4.4.10 show the average milk production of local, improved and buffalo stock of the district. Based on local cattle stock, the total milk production across the clusters is approximately 4,144 litres with highest milk production recorded as 1,704 litres in Barkhetri followed by Paschim Nalbari with almost 1,100. Table 4.4.9 shows out that the total milk production of the improved cattle in the selected project clusters is almost 7,179 litres, with the highest milk production reported to be in Paschim Nalbari followed by Barkhetri. The only cluster reporting the presence of a buffalo population reared in for aged herd system *(khuti)* has total milk production based of 978.82litres. The proportionate share of total milk production by all three categories of bovine stock of the selected project districts is local cows 33.68%, improved cows 58.6% and buffaloes7.96%. Compared to the other districts, the share of milk production of buffalo stock is higher although only one cluster is reportedly producing buffalo milk. This suggests a specific impetus for the buffalo-based farmers to raise their milk production. Similarly, the indigenous cattle stock also contributes significantly too all milk production of the select project clusters.

Table 4.4.8: Estimated total milk production based on total local cattle stock

Dairy cluster	Estimated no. of HH with local cattle	Average herd size (adult lactating animals)	Average milk production per local cow litres	Total milk production with local cattle stock* litres
Pub Nalbari and Borigog	688.50	0.88	1.38	828
Pachim Nalbari	1,122.00	0.70	1.40	1,100
Barkhetri	1,679.80	0.81	1.26	1,704
Tihu	725.00	0.57	1.25	512

*In estimating total milk production of local cows only the lactating animals were considered assuming 50% of the total adult local cattle as lactating.

Table 4.4.9: Estimated total milk production based on improved cattle stock

Dairy cluster	Estimated no. of HH with improved cattle	Average herd size (adult lactating animals)	Average milk production per improved cow litre	Total milk production with improved cattle stock* litre
Pub Nalbari and Borigog	204.00	1.25	5.25	1,339
Pachim Nalbari	425.00	0.95	5.50	2,221
Barkhetri	363.20	1.00	5.90	2,143
Tihu	290.00	0.82	6.25	1,477

*In estimating total milk production of improved cattle, only lactating animals are considered assuming 50% of the total adult improved cattle as lactating.

Table 4.4.10: Estimated total milk production based on buffalo stock

Dairy cluster	Estimated no. of HH with buffaloes	Average herd size (adult lactating animals)	Average milk production per improved cow litre	Total milk production with buffaloes* litre	Total milk production across bovine stock#litre
Pub Nalbari and Borigog	0.00	0.00	0.00	000.00	**2,167**
Pachim Nalbari	0.00	0.00	0.00	000.00	**3,320**
Barkhetri	49.94	4.90	4.00	978.82	**4,826**
Tihu	0.00	0.00	0.00	000.00	**1,989**

*In estimating total milk production of buffaloes only lactating animals were considered assuming 50% of the total adult buffaloes as lactating

#Total milk production is the summation of milk production across bovine stock in Tables 4.4.8 to 4.4.10.

4.4.8 Marketing behaviour of farmers at cluster level

The marketed surplus of milk according to bovine stock is presented in Table 4.4.11. Marketed surplus is left over milk after keeping for HH consumption and offering to relatives. Farmers with improved cattle stock produce primarily for market to earn profit, while some portion of the produce is kept for household consumption. On other hand, farmers with local cattle keep most of their produce for home consumption and if production is higher they dispose of the surplus through local sale. Since total milk production is higher on commercial farms with crossbred / improved cattle, the proportion of milk marketed is also high. On subsistence farms with one or two litres of milk production based on local cattle, close to 50% of milk produced is generally consumed at home. Farm HH with local cattle across project clusters sell 51.87% of the total milk production, while farm HH with improved cattle stock sell 82% of their total HH milk production. The only project cluster with the presence of buffaloes sells 90% of their total milk production.

Table 4.4.11: Bovine stock percentage of milk sold per HH

Dairy cluster	% with local cows	% with improved cows	% with buffaloes
Pub Nalbari and Borigog	50.00	80.00	00.00
PachimNalbari	48.00	82.00	00.00
Barkhetri	62.00	86.00	90.00
Tihu	47.50	80.00	00.00

Table 4.4.12 presents the major marketing channels in the project clusters. Compared to other districts discussed above, the percentage of milk sold in the neighbourhood or in the local market is less (18.87%) as milk is predominantly supplied to traders and private processors in Nalbari district. Across the project clusters, selling milk to traders and private processors together constitute 78.75% of the total milk producers. Most of the smallholder farmers brought milk to the market close to Nalbari town. Selling milk to the DCS across the project clusters is only 2.5%. The average prices offered to producers by various marketing sources is the highest when farmers sell milk locally (INR47.75/litre) followed by INR 41.37/ litre when sourced to milk traders. As obvious from empirical findings across India that cooperatives are weak in offering better prices to consumers, the price in the study sites of Nalbari from DCS is lower at INR 35/litre. The price offered by private processors is INR 38.75/ litre across the project clusters; the lowest price offered by private processor is in Barkhetri cluster.

Table 4.4.12: Percentage of milk sale by sources and their respective farm gate prices

Dairy cluster	Neighbours or local sale		To traders		To cooperatives		To private processors	
	%	Price/litre	%	Price/litre	%	Price/litre	%	Price/litre
Pub Nalbari and Borigog	10.00	50.00	50.00	40.00	10.00	35.00	30.00	40.00
PachimNalbari	22.00	46.00	38.00	40.00	0.00	-	40.00	40.00
Barkhetri	8.00	45.00	60.00	37.50	0.00	-	32.00	35.00
Tihu	35.50	50.00	10.00	48.00	0.00	-	55.00	40.00

4.4.9 Access to veterinary services

Table 4.4.13 presents the number of veterinary service providers which include local veterinarians, VFAs, CAHWs and AI practitioners providing services to farmers. Across clusters, an average of two local veterinarians operates, while the average distance from the farm villages is 2.93 km. At cluster level, farm villages of Pub Nalbari and Borigog cluster are located 5 kmfrom a local veterinarian while farm villages of Barkhetri are closer to a doctor's residence/duty station. VFAs are an average of 1.73 km from villages across clusters ranging from 1 km in Tihu cluster to almost 2.7 km in Paschim Nalbari. None of the farmers in Nalbari report access to CAHWs. There is one AI practitioner (*Gopal Mitra*) in Paschim Nalbari with an average distance of 3.5 kmandtwo in Barkhetri with a distance of 4 km to serviced villages.

Table 4.4.13: Access to veterinary services at the selected project clusters of the district

Dairy cluster	No. of local veterinarians*		Distance from the FGD location/ village km	No. of VFAs		Distance from the FGD location/ village km	No. of CAHWs		Distance from the FGD location/ village km
	Male	Female		Male	Female		Male	Female	
Pub Nalbari and Borigog	3	1	5.0	2	0	2.0	0	0	-
PachimNalbari	2	0	3.3	7	0	2.7	0	0	-
Barkhetri	3	0	1.4	9	0	1.5	0	0	-
Tihu	2	0	2.0	7	0	1.0	0	0	-

* Local veterinarian includes both private and governmentemployed.

4.4.10 Access to other services (input and breeding)

In this section, major inputs that a farmer accesses for milk storage and transportation, feeding of cattle and natural mating of their animal are discussed. Except in Pub Nalbari and Borigog clusters, farmers reported the availability of atleast one shop where they can buy milk cans or other equipment specifically designed for milk storage and transportation. Paschim Nalbari which is linked closely to Nalbari town has 12 equipment shops. However, the average distance to supplier shops of the selected villages of the remaining clusters is almost 6 km. The presence of pure feed shops is low in most of the clusters as feeds are primarily sold in the grocery shops. Grocery shops within the clusters are an average distance of 11.25 km from cluster villages (see Annexe Table A2). In all of the selected clusters, there are no natural mating services of purebred exotic bulls available on a commercial basis. However, there are a few farmers who have bulls (mostly indigenous/community bulls) used for breeding purposes with an average distance from the farmers of 2.67 km.

4.4.11 Availability of producers/traders organizations and input supplying institutions at cluster level

Farmers report that there are not any registered milk traders organizations, active milk producer's institutions or SHGs related to dairy farming practices in the clusters. However, there are active DCS in the selected clusters ranging from one in Rampur to four each in Paschim Nalbari and Tihu (Table 4.4.14)

Table 4.4.14: Availability of producers/traders organizations at cluster level

Dairy cluster	No. of milk traders organizations	No. of DCS
Pub Nalbari and Borigog	0	3 (Sondha, Digheli, Poila, Terechia DUSS)
Pachim Nalbari	0	4 (Gamarimuri, Chamata, NizTapa, Belsor DUSS)
Barkhetri	0	1 (Rampur DUSS)
Tihu	0	4 (Tihu No. 3 ward, Nathkuchi, Sialmari)

Note: The major linked villages are in parentheses.

DUSS = Dugdha Utpadak Samabai Samiti

Farmers report that there is one BMC plant of Amul in Tihu cluster and one BMC in Sarihatoli, Nalabri.There is one DDL located within the Pub Nalbari and Borigog cluster. There are no feed testing laboratories or feed mills in any of the APART clusters. Table 4.4.15 indicates that there are five private veterinary clinics in Pub Nalbari and Borigog, and two each in Paschim Nalbari and Tihu clusters where medicines for animal health care and consultation with the veterinary doctors are available.

Table 4.4.15: Availability of input supplying institutions at cluster level

Dairy cluster	No. of dairy plant, chilling plant, BMC	No. of DDL	No. of feed testing laboratory	No of feed mill	No. of private veterinary clinics
Pub Nalbari and Borigog	1 chilling centre (at Sarihatoli)	1	0	0	5 (AmulyaMedhi,Rajdeep Medic store,ManjuVet,Igir Pharmacy Vet,Manju Vet clinic)
Pachim Nalbari	0	0	0	0	2 (Chanda Vet Clinic,Mishra Vet Clinic)
Barkhetri	0	0	0	0	0
Tihu	1 (Amul)	0	0	0	2 (Bina Medicos,Sarma Medicos)

4.4.12 Major milk market actors and other infrastructure in the dairy value chain

In Table 4.4.16, the number of milk market actors involved in the dairy value chain of the selected APART clusters of Nalbari district is presented. These market actors are linked to the major town or market point of the cluster. The number of milk traders is in the range of 10 in Paschim Nalbari to 40 in Pub Nalbari and Borigog. For the convenience of training of milk traders and SMs, Pub Nalbari and Borigog and Paschim Nalbari can be grouped together for cost-effective and convenient training arrangements. There is no cottage industry owner in any of the selected clusters as some of the cottage industry products such as ghee, curd or cream are available in the sweet shops. The number of sweet shops in Pub Nalbari and Borigog (30) is highest while lowest in Paschim Nalbari (6).

Table 4.4.16: Number of milk market actors at cluster level (based on KII and FGD)

Dairy cluster	No. of milk traders	No. of cottage industry owners	No. of sweet shop owners
Pub Nalbari and Borigog	40	0	30
Paschim Nalbari	10	0	6
Barkhetri	15	0	7
Tihu	20	0	10

The major linked markets where milk and milk products are traded are shown in Table 4.4.17. The major markets linked to these clusters are Nalbari town, Chamata, Kaithalkuchi, Belsor, Barnibari, Mukalmuwa, Rampur,

Makhibaha and Tihu Chowk. Farmers were asked if any of them had accessed bank credit during the 12 months preceding the survey and to name the banks.Dairy farmers of all of the clusters except Pub Nalbari and Borigog reported that some of the farmers obtained credit from formal financial sources such as AGVB Kaithakuchi, AGVB Chamata, SBI Mukalmua, Central Bank of India (CBI) and AGVB Nathkuchi. Some of the unorganized commercial farms of all of the clusters reported access to insurance services from the government supported insurance scheme under the NLM Guwahati. The percentage of villages having black top approach roads, gravel roads and earthen roads are respectively 66.25%, 12.50% and 21.25% in the APART district.

Table 4.4.17: Markets and other infrastructure at cluster level

Dairy cluster	Markets with trading of milk and milk products*	Bank and other financing institutions	Insurance (for livestock)	Approach road quality of the cluster villages		
				Black top road	Gravel road	Earthen road
Pub Nalbari and Borigog	Nalbari	0	New India Assurance/ Oriental Insurance	45	10	45
Pachim Nalbari	Chamata, Nalbari (daily), Kaithalkuchi, Belsor, Barnibari	AGVB-Kaithalkuchi, AGVB-Chamata	New India Assurance/ Oriental Insurance	60	20	20
Barkhetri	Guwahati (daily), Mukalmua (bi-weekly), Rampur	SBI-Mukalmua	New India Assurance/ Oriental Insurance	100	0	0
Tihu	Makhibaha, Tihu chowk	Central Bank of India, AGVB (Nathkuchi)	New India Assurance/ Oriental Insurance	60	20	20

Note: *In parentheses the nature of markets (daily, biweekly or weekly)

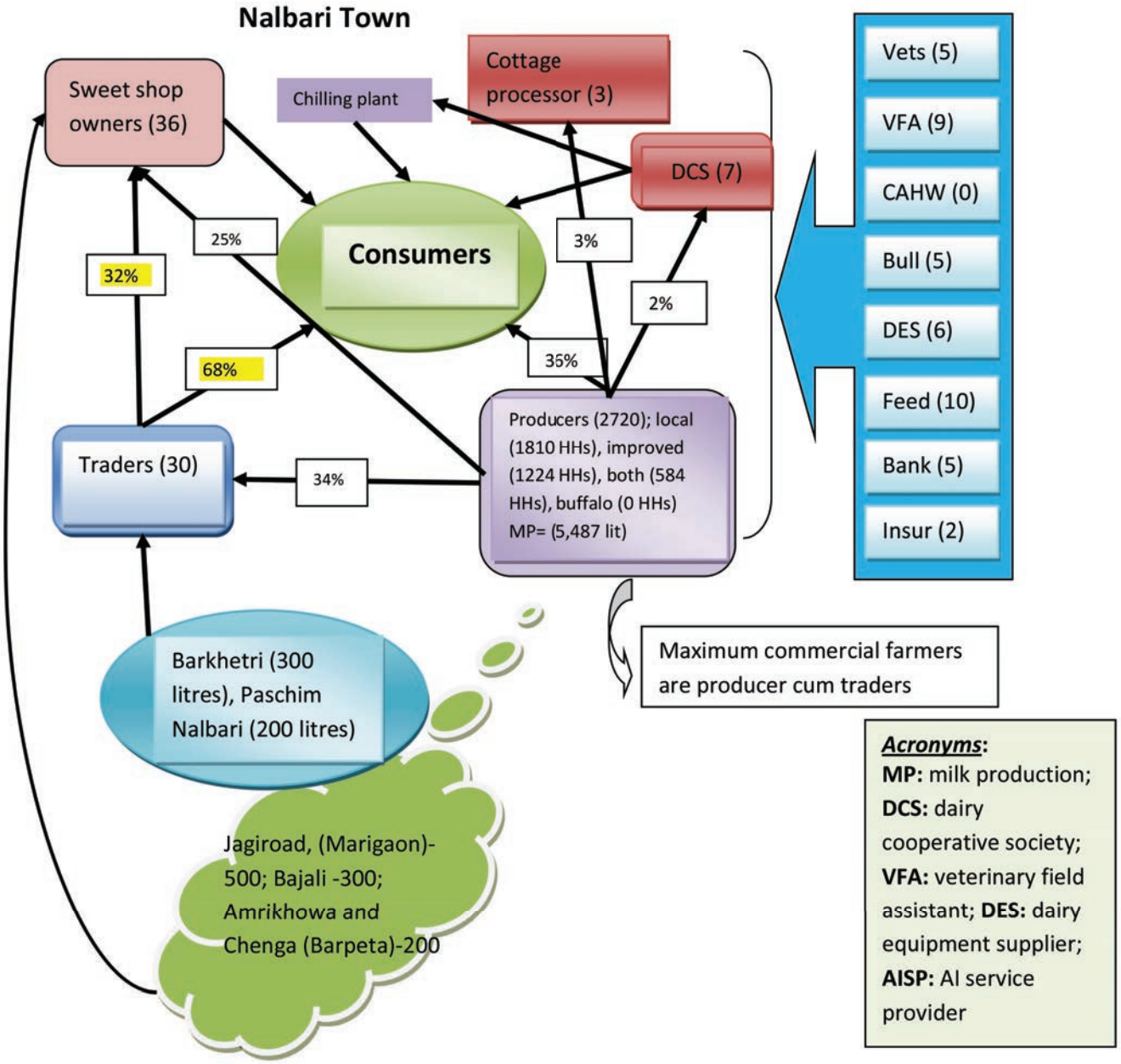
4.4.13 Progressive farmers at cluster level

Table 4.4.18 indicates the number of progressive dairy farmers/milk traders/cottage industry owners. It shows that during the survey, in all the clusters of Nalbari district few such entrepreneurs were identified as shown in the table with their contact information.

Table 4.4.18: Names and contacts of promising progressive entrepreneur in dairy

Dairy cluster	Number of progressive farmers
Pub Nalbari and Borigog	2
Pachim Nalbari	4
Barkhetri	1
Tihu	2

Figure 4.4.1: Schematic representation of the value chain actors of the major recommended clusters.



4.1.15 Summary and recommendations

At Nalbari town, milk is mainly supplied from the villages of Pub Nalbari, Pachim Nalbari and Barkhetri. Milk is also supplied from some of the outside districts such as Pathsala and Amrikhuwa (Sarukhetri cluster in Barpeta). Some portion of milk is supplied from the private processors like Sitajakhala Dugdha Utpadak Samabai Samiti (DUSS) (Amlighat, Morigaon). There are almost 50 sweet shops and almost 40 milk traders in the town. Many of the milk traders are producers themselves. Some milk products like sweets are supplied from a cottage industry in Chenga (Barpeta).

Gobradal, Makhibaha, Tihu, Nathkuch and Sialmari are some important milk producing villages in the cluster. Other milk producing villages with buffalo are Bhojkuchi, Bathanutari and Bhuta. There is a milk parlor at the Tihu market that purchases more than 300 litres of milk daily and there is a sweet making factory (cottage

industry) which purchases 80–90 litres of milk daily from the producers and vendors. Recently, Purabi has started to purchase milk from the producers but the demand for milk is not met in the cluster so a milk van from the DSCs of Nityananda and Patacharkuchi also supplies milk to the market.In the Paschim Nalbari cluster, producers of Kaithalkuchi, Gamarimuri and Juardi mainly sell milk to a DCS at Juardi and the DCS mainly supplies milk to Pathsala, some portion of milk to Gobradal (Purabi) and the rest of the milk to the local market at Kaithalkuchi. Besides, from Chamata and Belsor milk is being mainly supplied to Chamata market and some portion of milk to Nalbari town. Some producers from these areas supply milk to Purabi dairy (WAMUL). It can be assumed that the formal sector is playing a vital role in the milk business of the district. The Cahpori area of Borkhetri cluster is an important source of milk for the informal sector of the district. For convenience of training market actors, the following sequence may be followed.

Table 4.4.19: Cluster level planning for conducting training in Nalbari district

Rank of importance	Name of the cluster	Possible no. of training sessions				Recommendations
		Producers (51)	SM (3)	CP (0)	MT (3)	
Most potential	Pub Nalbari and Borigog	11	1.5	0	1	Pub Nalbari and Paschim Nalbari can be grouped as one cluster and two training programs for milk traders and SMs may be organized. Milk traders from Pub Nalbari are mostly producers cum traders.
	Paschim Nalbari	18	0.5	0	1	
Medium potential	Tihu	11	0.5	0	1	Part of the Tihu forms an informal cluster as the formal sector's presence with AMUL and WAMUL coexist in the cluster.
	Borkhetri	11	0.5	0	0.5	Barketri is an isolated cluster with presence of informal milk flow from *Chapori* areas. Neither a full batch SM's training nor a CP's can be organized.
Less Potential	Nil					

Note: When considered for producer's training, only commercial farms were considered with ownership of high yielding improved animal stock plus the *khuti* system of rearing farms

MT: Milk traders;

4.5 Lakhimpur district

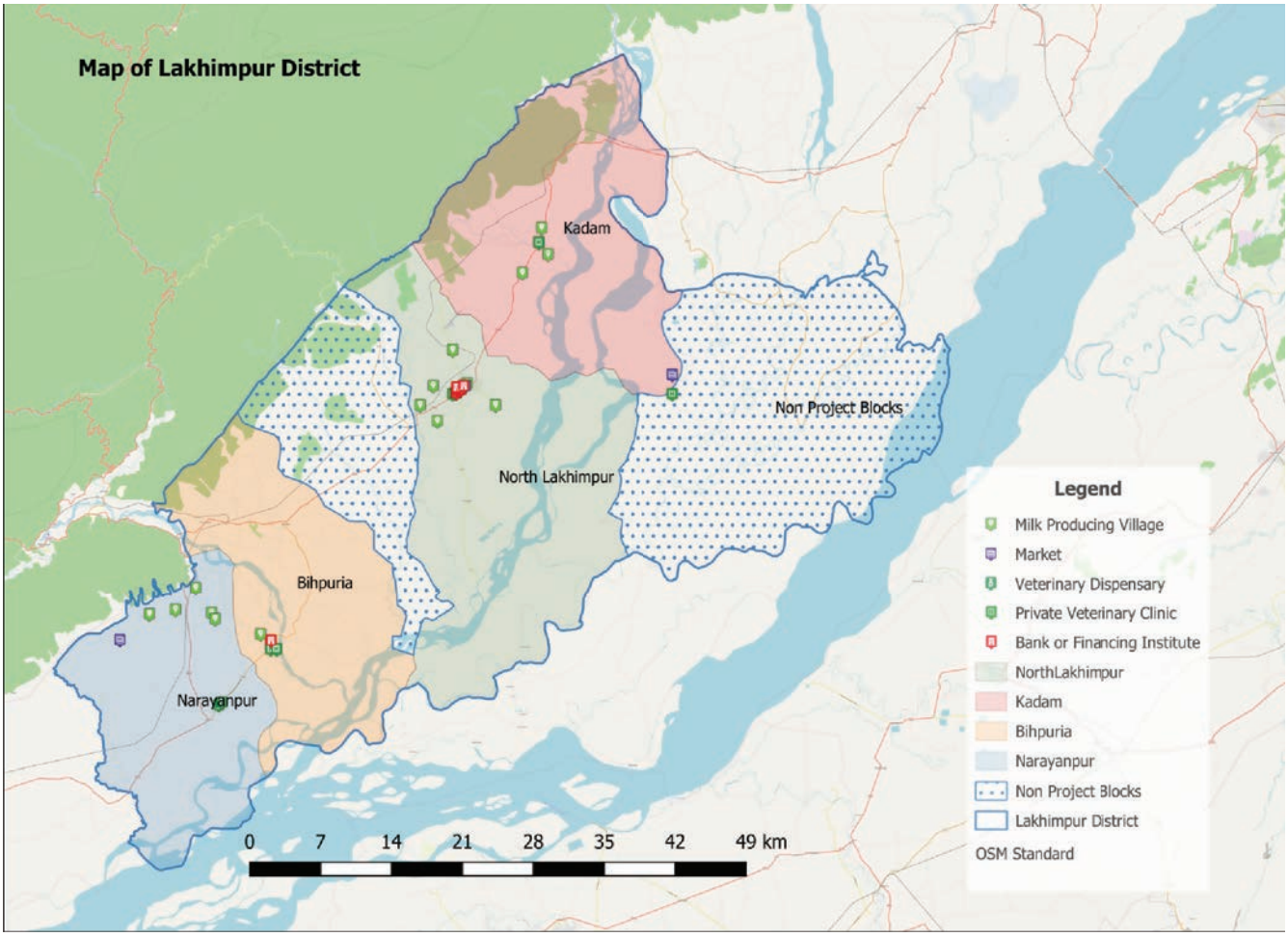
4.5.1 Cluster village identifications based on field visit

A total of four clusters in Lakhimpur district were identified for implementation of the project. The clusters that were selected include Narayanpur, Bihpuria, Kadam and North Lakhimpur covering the potential villages within for intervention with the informal dairy value chain actors. After an initial overview and discussion with some of the informed sources such as DVO, VOs/BVOs of the respective clusters, the ILRI enumerators finalized the villages as listed by the DDD as potential clusters from where the village-specific information was drawn. The names of villages are shown in Table 4.5.1.

Table 4.5.1: Cluster villages in Lakhimpur district

Dairy cluster	Names of the DDD-listed villages	Names of the ILRI-listed villages	Potential villages incorporated	Non-potential villages dropped
Narayanpur	Joypur, Modhupur, Vugpur, Sankarpur, Pathalipahar, Borbali, Bhakat	Joypur, Modhupur, Vugpur, Sankarpur, Pathalipahar, Borbali, Bhakat	0	0
Bihpuria	Bamungaon, Bogalmora, Bihpuria,	Bamungaon, Bogalmora, Bihpuria,	0	0
Kadam	Boginodi PGR, Majgaon, No. 2 Bokanola, Kadang, Gopalpur, Uttar Kolabari	Boginodi PGR, Majgaon, No. 2 Bokanola, Kadang, Gopalpur, Uttar Kolabari	0	0
North Lakhimpur	Rangsali, Hatilung, Jorhotia, Bogolijan, Lakhimpur	Rangsali, Hatilung, Jorhotia, Bogolijan, Lakhimpur, CD Road Ward No. 3, Choukhan (Telan), Changmaigaon, Bharalua, Panigaon, Lilabari, Moidungia, Naoboicha, Charaimari, Boginadi PGR, Majgaon, No. 2 Bokanola, Kadong, Gopalpur, Uttar Kolabari	CD Road Ward No. 3, Choukhan (Telan), Changmaigaon, Bharalua, Panigaon, Lilabari, Moidungia, Naoboicha, Charaimari, Boginadi PGR, Majgaon, No. 2 Bokanola, Kadong, Gopalpur, Uttar Kolabari	0

Figure 4.5: The map of the surveyed clusters in Lakhimpur district.



4.5.2 FGD participants' profile

Table 4.5.2 shows the FGD participants' profile in terms of gender and social status. The average number of participants across the project clusters in Lakhimpur district is 10.35 (male 7.05 68.12% and female 3.30 31.88%). Participants from the general category are pre dominant at 78.60% followed by participants from the OBC community (15%). Participants from the SC community are 1.35%, while ST people represented 5.05% among the total participants. In Naraynpur cluster, 100% of the farmers were from the 'general' category, while general category participants in Bihpuria and North Lakhimpur were 80%.

Table 4.5.2: Distribution of participants by gender and social status

Dairy cluster	Average no. of participants			% social status of participants			
	Male (%)	Female (%)	Total	General	SC	ST	OBC
Narayanpur	07.80 (83.87)	01.50 (16.13)	09.30	100.00	0	0	0.00
Bihpuria	09.40 (74.60)	03.20 (25.40)	12.60	80.00	0	10	10.00
Kadam	04.50 (42.06)	06.20 (57.94)	10.70	54.40	05.40	10.20	30.00
North Lakhimpur	06.50 (73.86)	02.30 (26.14)	08.80	80.00	0	0	20.00

4.5.3 Farming system by type of bovine stock

The dairy farming system based on type of bovine stock in the selected project clusters show that the district as a whole has 5,755 HH who have at least one dairy cattle or buffalo, representing 59.33% of HH among the total

HH across project clusters. The proportion of farming HH having local breed, improved breed and both local and improved are 80.84%, 12.14% and 7.02% respectively. As pointed out in Table 88, none of the FGD participants in any of the clusters of Lakhimpur district report the presence of buffalo stock in the APART villages. The proportion of farmers having improved breed of cattle is the highest in Kadam cluster (13.33%) followed by North Lakhimpur (12.71%).

Table 4.5.3: Distribution of farm HH by type of bovine stock

Dairy cluster	Total HH	Total farming HH (%)	% HH keeping cattle from local breeds	% HH keeping cattle from improved breeds	% HH keeping cattle from both local and improved breeds	% HH keeping buffaloes
Narayanpur	2,240	1,570 (70.09)	85.00	10.00	5.00	0
Bihpuria	400	330 (82.50)	77.50	12.50	10.00	0
Kadam	630	445 (70.63)	80.00	13.33	6.67	0
North Lakhimpur	6,430	3,410 (53.03)	80.86	12.71	6.43	0

Note: Figures in parentheses are the percentage of farming HH in total HH.

4.5.4. Farming system by rearing practices

Table 4.5.4 shows that almost 12.38 % of farm HH rear cattle in a fully stall-fed condition across project clusters, while the proportion of farmers rearing cattle in a partly stall-fed condition constitutes 87.62%. There is not any *khuti* system of rearing in any of the listed clusters. The farming system based on rearing system is closely related to the type of bovine stock as shown in Table 4.5.3. The fully stall-fed rearing condition increases with the increase in the number of improved cattle stock. (see Tables 88 and 89).

Table 4.5.4: Distribution of farm HHs by rearing practices

Dairy cluster	% fully stall fed	% partly stall fed	*% khuti* (forage herd) system
Narayanpur	8.20	91.80	0
Bihpuria	15.00	85.00	0
Kadam	13.33	86.67	0
North Lakhimpur	13.00	87.00	0

4.5.5 Women's participation in dairy production and income control

Female and male farmers were asked separately about women's role in dairy production and income control. Women's roles in performing the rearing activities were more compared to their control of income related to dairy production. Women's roles in farm activities depends on the nature of the farm and type of farm activities. Women's participation in dairy production activities is 31.37% compared to men's roles. Male members of the HH are predominantly involved in taking animals to the field for grazing, milking and marketing of milk, and cleaning and washing of animals. Women's control of dairy income is measured as 30.45% across the selected APART clusters of Lakhimpur district (Table 4.5.5).

Table 4.5.5: Women's participation in dairy production and in come control

Dairy cluster	No. of total HH	% women have role in milk production	% women have control in income from milk production
Narayanpur	1,570	40.00	32.00
Bihpuria	330	30.00	32.50
Kadam	445	28.33	23.00
North Lakhimpur	3,410	27.14	34.28

4.5.6 Average herd size (adult animals) of the farm HH according to type of bovine stock

The average herd size of adult animals according to the type of bovine stock is reported in Table 4.5.6. The number of adult indigenous cattle per HH is 1.45 across the project clusters with the highest of 1.5 and lowest of 1.4. The average improved cattle holding in each HH across selected project clusters is 2.12. The farmers in the entire listed clusters report the absence of buffaloes during the time the survey was conducted.

Table 4.5.6: Average herd size (adult animals) by the bovine stock in the project clusters

Dairy cluster	No. of local cows	No. of improved cows	Buffaloes
Narayanpur	1.4	1.60	0
Bihpuria	1.5	2.50	0
Kadam	1.5	2.30	0
North Lakhimpur	1.4	2.07	0

4.5.7 Milk productivity and production of the bovine stock at cluster level

As pointed out in the forgoing analysis of districts, the daily milk yield of the bovine stock is not uniform in the entire lactation length. Immediately after the calf is born, milk production gradually increases until it reaches peak yield. After conception, milk production decreases and the cycle repeat itself. In the selected project clusters of Lakhimpur, the daily milk productivity of local cows during the lean period is 0.46 litres across clusters. During peak lactation days of indigenous cattle, average productivity is 2.12 litres. The average lean and peak productivity of improved cattle stock is 2.10 and 9.41 litres respectively. The average milk yield of improved cattle is the highest in Bihpuria across the stages of lactation (11litres) and the lowest in Narayanpur cluster (8.40litres) (Table 4.5.7).

Table 4.5.7: Lowest and highest levels of average daily milk production per cow in the clusters

Dairy cluster	Milk production for local cows		Milk production of improved cows		Milk production of buffaloes	
	Low	High	Low	High	Low	High
Narayanpur	0.43	2.00	2.20	08.40	-	-
Bihpuria	0.50	2.00	1.75	11.00	-	-
Kadam	0.42	2.00	2.17	08.67	-	-
North Lakhimpur	0.50	2.14	2.29	09.57	-	-

Tables 4.5.8 to 4.5.10 show the average milk production of local and improved cattle stock (buffalo stock is nil in the selected project clusters of the district). Based on local cattle stock, the total milk production of all the clusters is 4,245.60 litres with the highest milk production recorded as 2,757.33 litres in North Lakhimpur followed by Narayanpur cluster (1,334.50 litres). The total milk production of improved cattle of all selected project clusters is 4,024.20 litres, with the highest milk production reported in North Lakhimpur as 2,660 litres. The milk production based on improved cattle stock is the lowest in Bihpuria cluster. The local cows share of milk production across APART clusters is 51.34% while improved cows account for 48.66%. Since the productivity of improved cattle stock is higher in the project district, a meager proportion of farming HH rearing improved cattle stock, 12.14%, contributes almost 49% of the total milk production indicating the potential role of cattle crossbreding on overall milk production of the district.

Table 4.5.8: Estimated total milk production based on total local cattle stock

Dairy cluster	Estimated no. of HH with local cattle	Average herd size (adult lactating animals)	Average milk production per local cow	Total milk production with local cattle stock*
Narayanpur	1,334.50	0.70	1.22	1,135
Bihpuria	255.75	0.75	1.25	240
Kadam	356.00	0.75	1.21	323
North Lakhimpur	2,757.33	0.70	1.32	2,548

*In estimating total milk production of local cows only the lactating animals were considered assuming 50% of the total adult local cattle as lactating.

Table 4.5.9: Estimated total milk production based on improved cattle stock

Dairy cluster	Estimated no. of HH with improved cattle	Average herd size (adult lactating animals)	Average milk production per improved cow	Total milk production with improved cattle stock*
Narayanpur	157.00	0.80	5.30	666
Bihpuria	41.25	1.25	6.38	329
Kadam	59.32	1.15	5.42	370
North Lakhimpur	433.41	1.04	5.93	2,660

*In estimating total milk production of improved cattle only lactating animals are considered assuming 50% of the total adult improved cattle as lactating.

Table 4.5.10: Estimated total milk production based on buffalo stock and total milk production across bovine stock

Dairy cluster	Estimated no. of HH with buffalo	Average herd size (adult animals)	Average milk production per buffalo	Total milk production with buffalo*	Total milk production across bovine stock#
Narayanpur	0	-	-	-	**1,801**
Bihpuria	0	-	-	-	**568**
Kadam	0	-	-	-	**693**
North Lakhimpur	0	-	-	-	**5,208**

*Total milk production is the summation of milk production across bovine stock in Tables 4.5.8 to 4.5.10.

4.5.8 Marketing behaviour of farmers at cluster level

All types of farms generate marketed surplus if production is higher than the domestic requirements. It is generally observed that farmers with local cattle stock keep a part of their milk produced for home consumption and offer to relatives while the remaining part is marketed to earn cash. Farmers with improved cattle stock produce primarily for the market to earn profit, while some portion of the produce is kept for HH consumption. Since total milk production is higher on commercial farms with crossbred/improved cattle the proportion of milk marketed is also high. On subsistence farms with one or two litres of milk production based on local cattle, more than 50% of milk produced is consumed at home. Table 4.5.11 shows that farm HH with local cattle across project clusters sell 43.63% of the total milk production, while farm HH with improved cattle stock sell 82.53% of their total HH milk production.

Table 4.5.11: Bovine stock percentage of milk sold per HH

Dairy cluster	% with local cows	% with improved cows	% with buffaloes
Narayanpur	40.00	76.00	0
Bihpuria	45.00	80.00	0
Kadam	46.67	87.67	0
North Lakhimpur	42.86	86.43	0

Table 4.5.11 presents the sources of milk sale in the project clusters. Selling milk in the neighbourhood and in the local market are important sources of milk sales in the majority of the clusters of Lakhimpur district. These are small holder dairy farmers rearing dairy animals of indigenous breed to cater to the local raw milk consumers in their neighbourhood. Considering the district as a whole based on the selected clusters, 35.21% of farmers sell milk locally, followed by selling to traders (32.71%). None of the selected clusters is found to sell milk to DCS. Private processors play an equally important role as 32.09% of farmers sell milk to private processors. The informal market actors such as milk traders and private processors together procure the milk of almost 64.8% of the producers establishing an informal value chain between producers to traders and producers to SMs/CPs or producers to consumers to SM.

Prices offered to producers by various marketing sources is the highest when farmers sell milk locally (INR 50/ litre) followed by INR 47.92/ litres when sourced to private processors. The farm gate price of the milk procured by traders is INR 42.50/litre as shown in Table 4.5.12.

Table 4.5.12: Percentage of milk sales by sources and their respective farm gate prices

Dairy cluster	Neighbours or local sale		To traders		To cooperatives		To private processors	
	%	Price/litre	%	Price/litre	%	Price/litre	%	Price/litre
Narayanpur	47.50	50.00	22.50	35.00	0	-	30.00	50.00
Bihpuria	35.00	50.00	35.00	45.00	0	-	30.00	45.00
Kadam	30.00	50.00	43.33	45.00	0	-	26.67	46.67
North Lakhimpur	28.33	50.00	30.00	45.00	0	-	41.67	50.00

4.5.9 Access to veterinary services

For the consumers' safety and quality of milk, adequate access to veterinary services is important. Table 4.5.13 presents the number of veterinary service providers which include local veterinarians, VFAs, CAHWs and AI practitioners providing services to farmers. Across clusters, an average of two local veterinarians operates with one female veterinarian in Narayanpur, while the average distance from the farm villages is 4.23 km. At cluster level, the distance between veterinarians and farm village's is 8.6km while farm villages of Bihpuria are closer to a doctor's residence/duty station. The average number of VFAs across project clusters (excluding Bihpuria) is 3.67 and villages are at an average 4.61 km from the VFA duty station/residence ranging from 1.83 km in Kadam cluster to almost 8 kms in Narayanpur. None of the farmers in Lakhimpur district report the presence of CAHWs. There are one to fourAI practitioners (*Gopal Mitra*) in the selected APARTclusters of Lakhimpur.

Table 4.5.13: Access to veterinary services at the selected project clusters of the district

Dairy cluster	No. of local veterinarian*		Distance from the FGD location/ village km	No. of VFA		Distance from the FGD location/ village km	No. of CAHW		Distance from the FGD location/village km
	Male	Female		Male	Female		Male	Female	
Narayanpur	0	1	8.6	4	0	8	0	0	0
Bihpuria	1	0	1	0	0	0	0	0	0
Kadam	1	0	2.16	2	0	1.83	0	0	0
North Lakhimpur	5	0	5.16	5	0	4	0	0	0

*Local veterinarian includes both private and government Employed.

4.5.10. Access to other services (input and breeding)

In this section, the availability of major inputs is discussed including as milk storage and transportation, feeding of cattle and natural mating. Farmers reported the availability of one or two shops where they can buy milk cans or other equipment specifically designed for milk storage and transportation. The average number of grocery shops where farmers buy concentrate feeds is 3.5 across project clusters with an average distance to supplier shops of 3.05 km. Pure feed shops are almost nil in most of the clusters as feeds are primarily sold in the grocery shops. The average number of breeding bulls owned within the study clusters is 1.75. The average distance of the villages from the bull owners is 2.9 km in the clusters as a whole (see Appendix Table A2).

4.5.11 Availability of producers/traders organizations and input supplying institutions at cluster level

Across districts, farmers report the absence of registered milk traders organizations, SHGs related to dairy farming practices, active milk producers organizations and DCS.

In regards to the availability of input supplying institutions in the selected project clusters such as dairy plant/ chilling plant/BMC, DDL, feed testing laboratory, feed mill and private veterinary clinic, farmers report that there is no dairy plant in any of the clusters, while BMC/chilling centres are found in Narayanpur and Lakhimpur. There is one DDL in the district veterinary dispensary of North Lakhimpur. While there are no feed testing laboratories in the district, there is one feed mill in North Lakhimpur cluster. There are two private veterinary clinics in North Lakhimpur, and one each in Narayanpur and Kadam where medicines for animal health care and consultation with the veterinary doctors are available (Table 4.5.14).

Table 4.5.14: Availability of input supplying institutions at cluster level

Dairy cluster	No dairy plant, chilling plant, BMC	No. DDL	No. feed testing laboratory	No. feed mill	No. private veterinary clinics
Narayanpur	1 BMC (Pathalipahar)	0	0	0	1
Bihpuria	0	0	0	0	0
Kadam	0	0	0	0	1
North Lakhimpur	1 (chilling plant); 1 BMC (Kachasal)	1	0	1 [NRL from Khoyamati (Near Thana)]	2

4.5.12 Major milk market actors and other infrastructure in the dairy value chain

The number of milk market actors involved in the dairy value chain of the selected project clusters is presented in Table 4.5.15. As mentioned before, these market actors are linked to the major town or market point of the cluster. The number of milk traders is in the range of five each in Narayanpur and Kadam to 40 in North Lakhimpur. There are no cottage industry owners in Bihpuria and Kadam clusters but there are two in Narayanpur and three in North Lakhimpur clusters. KII indicate that some of the cottage industry products such as ghee, curd and cream

is also available in the sweet shops. The number of sweet shops in North Lakhimpur town is the highest at 40 while lowest in Kadam at seven.

Table 4.5.15: Number of milk market actors at cluster level (based on KII and FGD)

Dairy cluster	Milk traders	Cottage industry owners	Sweet shop owners
Narayanpur	5	2	14
Bihpuria	15	0	20
Kadam	5	0	7
North Lakhimpur	40	3	40

The major linked markets where milk and milk products are traded are shown in Table 4.5.16. The major markets linked to these clusters are Bhogpur, Bandardewa, Bihpuria, Boginadi, Lakhimpur and North Lakhimpur. Farmers were asked if they accessed bank credit during 12 the months preceding the survey and to name the banks.Dairy farmers in Narayanpur and North Lakhimpur received credit from financial institutions including AGVB and SBI Naoboicha while farmers in other clusters did not access credit from formal banking institutions. Some of the unorganized commercial farms reported access to insurance services from the government supported insurance scheme under the NLM Guwahati in clusters excluding Bihpuria. Road conditions in the villages are blacktop 28.75%, gravel road 67.50% and earthen road 3.75% on average across clusters (Table 4.5.16).

Table 4.5.16: Markets and other infrastructure at cluster level

Dairy cluster	Markets with trading of milk and milk products*	Bank and other financing institutions	Insurance for livestock	Approach road quality (% of total cluster villages)		
				Blacktop	Gravel	Earthen
Narayanpur	Bhogpur (weekly), Bandardewa, Bihpuria	AGVB-Lakhimpur town	Oriental Insurance/ New India Assurance	45	55	0
Bihpuria	Bihpuria (weekly)	0	0	50	50	0
Kadam	Boginodi (weekly), Lakhimpur (daily)	0	Oriental Insurance/ New India Assurance	60	40	0
North Lakhimpur	Lakhimpur town (daily)	SBI-Naoboicha, AGVB-Lakhimpur town	Oriental Insurance/ New India Assurance	20	65	15

*Market frequency is included in parentheses (daily, biweekly or weekly).

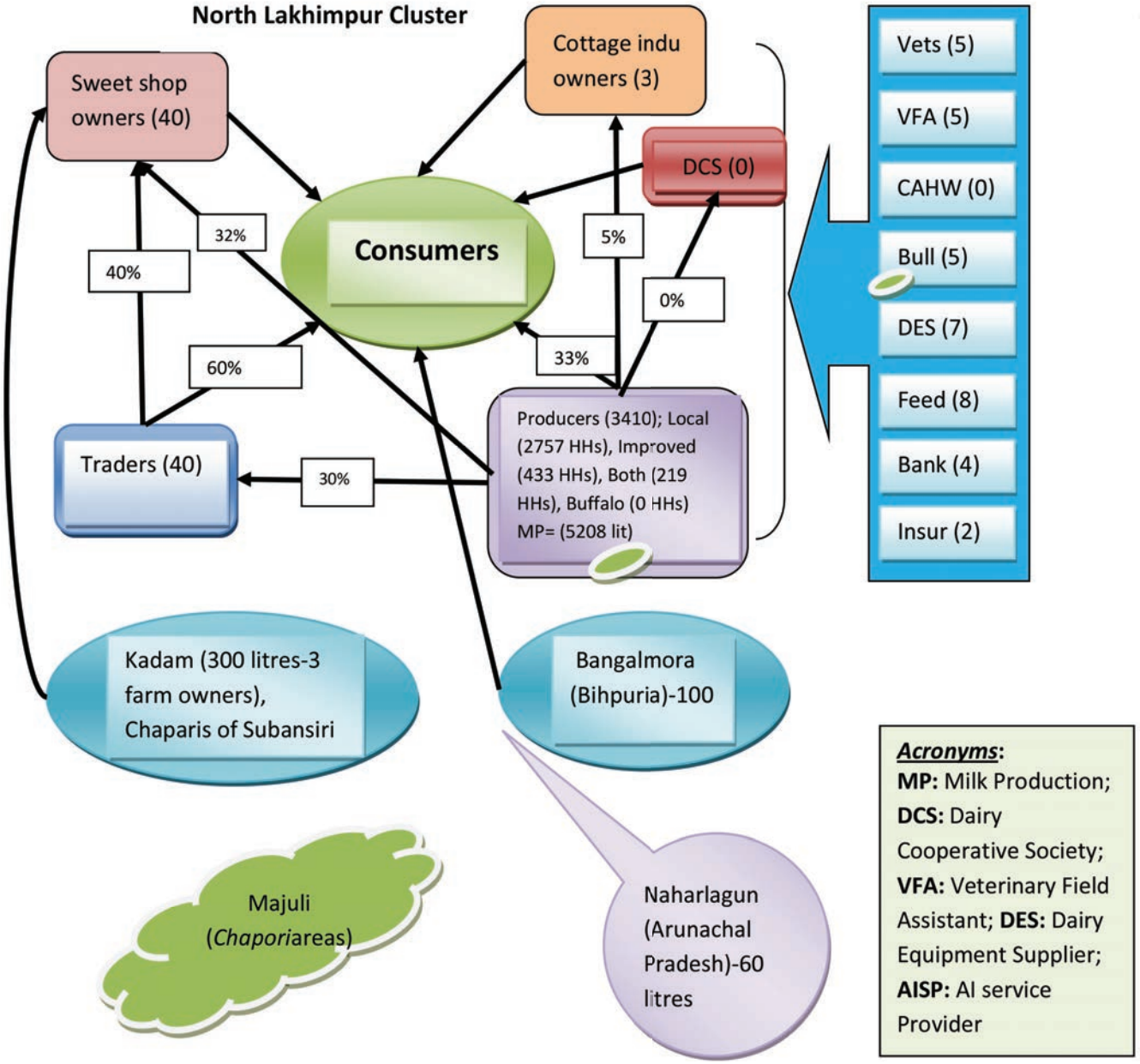
4.5.13 Progressive farmers at cluster level

Table 4.5.17 shows the number of progressive dairy farmers/milk traders/cottage industry owners. There are three progressive farmers, one each in Narayanpur, Kadam and North Lakhimpur clusters.

Table 4.5.17: Names and contacts of promising progressive entrepreneurs in dairy

Dairy cluster	No. of progressive farmers
Narayanpur	1
Bihpuria	0
Kadam	1
North Lakhimpur	1

Figure 4.5.1: Schematic representation of the value chain actors of the major recommended clusters.



4.5.15 Quick observations and recommendations

In Lakhimpur district, milk is entirely traded through informal actors. During the time of the survey, there was no active DCS in any of the clusters. Although there was a central dairy plant in North Lakhimpur, due to shortage of funds it was proposed to be handed over to WAMUL, and a DCS formed for that purpose gradually became inactive. Local cattle-based farming systems prevail, although there are a few commercial farmers keeping purebred exotic dairy animals. The informal market actors are the highest in Lakhimpur town who mainly procure milk from the *Chapori* areas of Majuli and from the Subansiri *Chapori* areas. For convenience of covering market actors to train them, the following sequence may be followed (as shown in Table 4.5.18) and effort should be made to track outside suppliers such as traders bringing milk from the *Chapori* areas of Majuli and Subansiri.

Table 4.5.18: Cluster level planning for conducting training in Lakhimpur district

Rank of importance	Name of the cluster	Possible no. of training sessions organized				Recommendations
		Producers (30)	SM (3)	CP (0)	MT (3)	
Most potential	North Lakhimpur	19	1.50	0.15	2	North Lakhimpur is the main district town of Lakhimpur. Two SMs' training can be organized by bringing a few from Kadam to make it close to a full session.
Medium potential	Narayanpur	5	0.70	0.10	0.25	CP's training can be merged with that of SMs because of negligible numbers. The market actors' numbers can be adjusted for these two clusters to make it close to a full training session.
	Bihpuria	3	1	0	1.25	
Less Potential	Kadam	3	0.35	0	0.25	The milk traders may be trained together with the traders of North Lakhimpur as few traders supply milk from Kadam to North Lakhimpur.

Note: When considered for producer's training, only commercial farms were considered with ownership of high yielding improved animal stock plus the *khuti* system of rearing farms; **Prod:** Dairy producers, **MT:** Milk traders; Figures within brackets indicate number of respective market actors.

4.6 Kokrajhar district

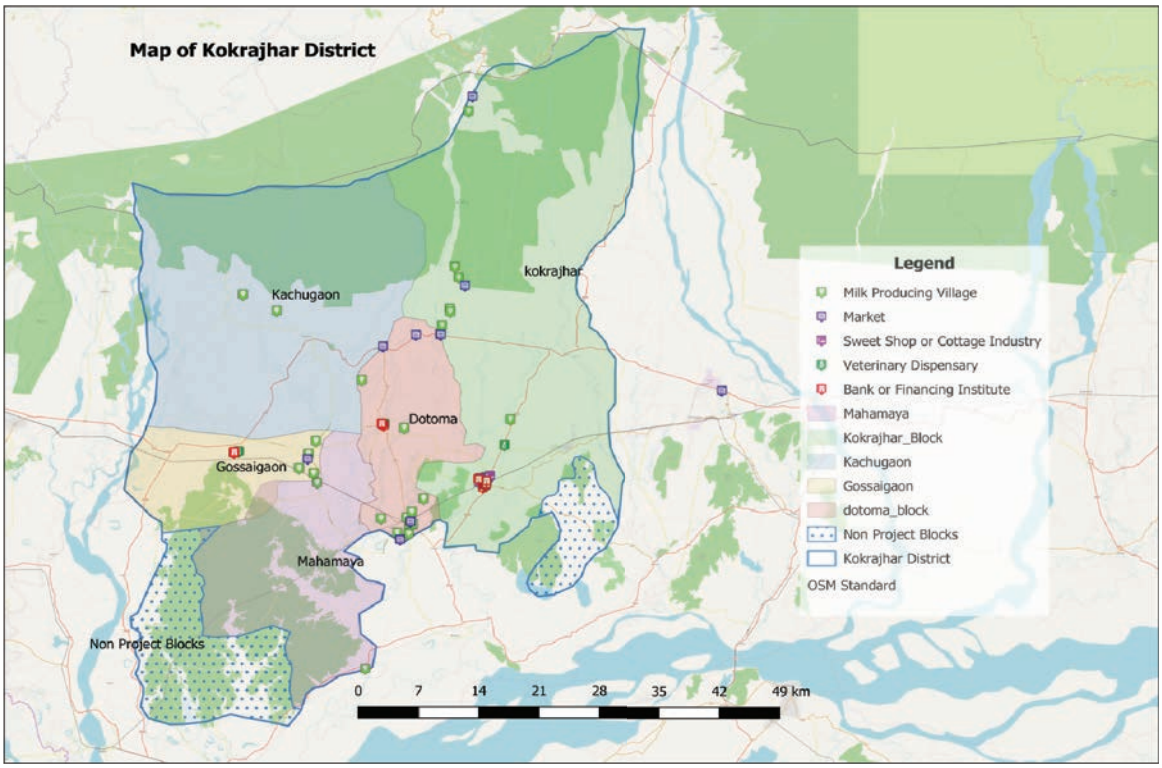
4.6.1 Cluster villages identification based on field visit

Clusters identified in Kokrajhar district for intervention with the dairy value chain actors under APART are Dotoma, Kokrajhar, Mahamaya, Gossaigaon and Kachugaon. After an initial overview of the farm clusters and discussion with some of the informed sources such as DVO, VOs/BVOs of the respective clusters, the enumerators from ILRI deployed for surveying finalized the cluster villages as listed by the DDD as potential clusters from where the village-specific information were drawn. The names of villages are presented in Table 4.6.1.

Table 4.6.1: Cluster villages in Kokrajhar district

Dairy cluster	Names of the DDD-listed villages	Names of the ILRI-listed villages	Potential villages incorporated	Potential villages dropped
Dotoma	Saralpara, Jharbari, Genduguri, Khalashi, Bangajhar, Karaitari, Duramari, Guwabari, Sanlatari, Totpara, Dupertol, Koraitolanathpara	Dotoma Bazaar, Molandubi, Gossainichina, Saralpara, Jharbari, Genduguri, Kalashi, Bangajhar, Karaitari, Duramari, Guwabari, Sanlatari, Totpara, Dupertol, Koraitolanathpara	Dotoma Bazaar, Molandubi, Gossainichina	0
Kokrajhar	Kokrajhar, Ghoramara, Uttar Patgaon, Guwabari, Bhojbasti, Bhetgaon, Rangalikhata, Pakniguri, Balajan, Haltugaon, Bhumki	Kokrajhar, Ghoramara, Uttar Patgaon, Guwabari, Rangalikhata,Balajan, Charaikhuda	Charaikhuda	Bhojbasti, Bhetgaon, Pakniguri, Haltugaon, Bhumki
Mahamaya	Araiani, Rupsi	Araiani, Rupsi	0	0
Gossaigaon	Bhouraguri, Sejari, Patialpara	Bhouraguri, Sejari, Patialpara	0	0
Kachugaon	Thakampur, Dolgaon	Thakampur, Dolgaon	0	0

Figure 4.6: The map of the surveyed clusters in Kokrajhar district.



4.6.2 FGD participants' profile

Table 4.6.2 shows the number of participants classified based on gender and social status. The average number of participants across the project clusters is 8.79 in Kokrajhar district (male 5.95 67.69% and female 2.54 32.31%). Among the participants across the project clusters, representation from ST community is the highest (61.2%) followed by the 'general' category (20%). Only a small proportion of participants from the SC community were represented (2%), while OBC people represented 16.80% among the total participants. In Gossaigaon cluster, participation from ST people is the highest at 78%, while lowest is in Mahamaya cluster. The participation rate of the different communities in the FGD is in accordance with the population cohort based on social status.

Table 4.6.2: Distribution of participants by gender and social status

Dairy cluster	Average number of participants			Social status of participants (%)			
	Male (%)	Female (%)	Total	General	SC	ST	OBC
Dotoma	7.4 (74.00)	2.6 (26.00)	10.0	20.00	5.00	60.00	15.00
Kokrajhar	5.5 (62.50)	3.3 (37.50)	8.8	15.00	0.00	55.00	30.00
Mahamaya	3.2 (56.14)	2.5 (43.86)	5.7	30.00	0.00	45.00	25.00
Gossaigaon	6.8 (70.10)	2.9 (29.90)	9.7	10.00	5.00	78.00	07.00
Kachugaon	8.3 (85.57)	1.4 (14.43)	9.7	25.00	0.00	68.00	07.00

Source: Field Survey, 2018

4.6.3 Farming system by type of bovine stock

The dairy farming system based on type of bovine stock in the selected project clusters as indicated in Table 4.6.3 shows that the district as a whole has 4,098 HH who have atleast one dairy cattle or buffalo, representing 57.20% of HH among the total HH across project clusters. The proportion of farming HH having local breed, improved breed and both local and improved are 89.67%, 6.29% and 2.96% respectively. Proportions of farming HH with buffalo stock constitute only 1.08% of the total HH (Table 4.6.3). The proportion of farmers having improved breed of cattle is the highest in Dotoma cluster (8.87%) followed by Mahamaya cluster (4.32%). Discussion with some of the key informants indicated there were once more buffalo farms reared in the *khuti* system in the northern part of the district bordering with Bhutan, but due to the problem of extremism the number of these farms has drastically reduced.

Table 4.6.3: Distribution of farm HHs by type of bovine stock

Dairy cluster	Total no. of HH	Total farming HH (%)	% HH keeping cattle from local breeds	%HH keeping cattle from improved breeds	% HH keeping cattle from both local and improved breeds	% HH keeping buffaloes
Dotoma	3,974	2,518 (63.36)	89.00	8.87	1.07	1.07
Kokrajhar	1,885	945 (50.13)	92.00	5.50	1.17	1.33
Mahamaya	330	160 (48.48)	88.50	6.50	6.00	0.00
Gossaigaon	600	380 (63.33)	90.52	4.32	2.22	2.94
Kachugaon	375	95 (25.33)	88.33	6.28	4.32	1.07

Note: Figures in parentheses indicate percentage of farming HH in total HH.

4.6.4 Farming system by rearing practices

Table 4.4.4 shows that almost 6.48% of farm HH rear cattle in a fully stall-fed condition across project clusters of Kokrajhar district, while the proportion of farmers rearing cattle in a partly stall-fed condition constitutes 92.38%. Among the total farming HH, 1.14% farm rear dairy animals in a *khuti* system. The farming system based on rearing practice is closely related to the type of bovine stock as pointed out in Table 4.6.3. The fully stall-fed rearing condition increases with the increase in number of improved cattle stock (see Tables 4.6.3 and 4.6.4).

Table 4.6.4: Distribution of farm HH by rearing practices

Dairy cluster	% fully stall fed	% partly stall fed	% *khuti* (forage herd) system
Dotoma	8.40	89.07	4.87
Kokrajhar	5.50	93.67	0.83
Mahamaya	4.30	95.70	0.00
Gossaigaon	7.50	92.50	0.00
Kachugaon	6.70	93.30	0.00

4.6.5. Women's participation in dairy production and income control

In the project clusters of Kokrajhar district, women's role in dairy production is higher (56.57%) compared to their male counterparts. Women's role on the control of income is an average of 63.24% for all of the selected project clusters of Kokrajhar district which is dominated by the ST community, with the cluster of Kachugaon having the highest percentage of women controlling dairy income (72%)(Table 4.6.5).

Table 4.6.5: Women's role in dairy production and income control

Dairy cluster	No. of total HH	% women have role in milk production	% women have control in income from milk production
Dotoma	2,518	50.67	61.33
Kokrajhar	945	55.83	51.67
Mahamaya	160	59.22	66.21
Gossaigaon	380	55.00	65.00
Kachugaon	95	62.11	72.00

4.6.6 Average herd size (adult animals) of the farm HH according to type of bovine stock

The average herd size of adult animals according to the type of bovine stock is reported in Table 4.6.6. The average number of adult indigenous cattle per HH is 2.02 across the project clusters with the highest in Gossaigaon cluster and the lowest in Kokrajhar. The average improved cattle holding in each HH across the selected project clusters is 2.58. The farmers in Mahamaya reported that none of the farmers in this cluster owned buffaloes during the time the survey was conducted. The average number of buffaloes held by the farmers of the remaining clusters is 3.46.

Table 4.6.6: Average herd size (adult animals) by the bovine stock in the project clusters

Dairy cluster	Local cows	Improved cows	Buffaloes
Dotoma	1.67	2.08	1.26
Kokrajhar	2.42	3.83	8.80
Mahamaya	2.50	2.20	0.00
Gossaigaon	1.80	2.50	1.77
Kachugaon	1.73	2.30	1.99

Source: Field Survey, 2018

4.6.7. Milk productivity and production of the bovine stock at cluster level

The daily milk yield of bovine stock is not uniform in the entire lactation length. Immediately after a calf is born, milk production gradually increases until it reaches peak yield. After conception, milk production decreases and the cycle is repeated. In the selected project clusters of Kokrajhar the daily milk productivity of local cows during the lean period is 0.74 litres for the clusters as a whole with Doroma having 0.87 litres as the highest and 0.55 as the lowest in the Mahamaya cluster. During the peak lactation days of indigenous cattle average productivity across clusters is 2.61 litres. The average lean and peak productivity of improved cattle stock is 2.02 and 8.06 litres respectively and of buffaloes is 1.30 and 5.84 litres respectively. The average milk yield of improved cattle is the highest in Kokrajhar cluster across the stages of lactation (5.66litres) and the lowest in Mahamaya cluster (4.54litres) (Table 4.6.7).

Table 4.6.7: Lowest and highest levels of average daily milk production per cow in the clusters

Dairy cluster	Milk production of local cows in litres		Milk production of improved cows in litres		Milk production of buffaloes in litres	
	Low	High	Low	High	Low	High
Dotoma	0.87	2.03	1.72	8.58	1.50	6.67
Kokrajhar	0.67	2.41	2.00	9.33	1.00	6.33
Mahamaya	0.55	2.50	2.58	6.50	-	-
Gossaigaon	0.85	2.89	1.82	7.34	1.20	5.49
Kachugaon	0.75	3.20	1.97	8.55	1.50	4.88

The average milk production of local, improved and buffalo stock of the district is presented in Tables 4.6.8 to 4.6.10. Based on local cattle stock, the total milk production across the clusters is 5,325.55 litres with highest milk production recorded as 2,713.31 litres in Dotoma followed by Kokrajhar. The total milk production of improved cattle in the selected project clusters is 1,942.10 litres, with the highest milk production reported again in Dotoma (1,196 litres) followed by Kokrajhar. The clusters with buffalo stock report that total milk production is 308.32 litres across the clusters. Looking at the proportionate share of total milk production by all three categories of bovine stock of the selected project districts, the local cows, improved cows and buffaloes share 70.30%, 25.64% and 4.07% of total milk production respectively. It is noted that the farming system of dairying in Kokrajhar is predominantly local cattle-based which requires that adequate attention be given to local cattle farming HHfor improving the production and productivity scenario of the district.

Table 4.6.8: Estimated total milk production based on total local cattle stock

Dairy cluster	Estimated no. of HH with local cattle	Average herd size (adult lactating animals)	Average milk production per local cow	Total milk production with local cattle stock*
Dotoma	2,241.02	0.84	1.45	2,713
Kokrajhar	0869.40	1.21	1.54	1,620
Mahamaya	0141.60	1.25	1.53	270
Gossaigaon	0343.98	0.90	1.87	579
Kachugaon	0083.91	0.87	1.98	143

*In estimating total milk production of local cows only the lactating animals were considered assuming 50% of the total adult local cattle as lactating

Table 4.6.9: Estimated total milk production based on improved cattle stock

Dairy cluster	Estimated no. of HH with improved cattle	Average herd size (adult lactating animals)	Average milk production per improved cow	Total milk production with improved cattle stock*
Dotoma	223.35	1.04	5.15	1,196
Kokrajhar	051.98	1.92	5.67	564
Mahamaya	010.40	1.10	4.54	52
Gossaigaon	016.42	1.25	4.58	94
Kachugaon	005.97	1.15	5.26	36

*In estimating total milk production of improved cattle only lactating animals are considered assuming 50% of the total adult improved cattle as lactating.

Table 4.6.10: Estimated total milk production based on buffalo stock

Dairy cluster	Estimated no. of HH with buffaloes	Average herd size (adult lactating animals)	Average milk production per improved cow	Total milk production with buffaloes*	Total milk production across bovine stock#
Dotoma	26.94	0.63	4.09	069.34	**3,979**
Kokrajhar	12.57	4.40	3.67	202.68	**2,387**
Mahamaya	00.00	0.00	0.00	00.00	**322**
Gossaigaon	11.17	0.89	3.35	33.07	**706**
Kachugaon	01.02	1.00	3.19	03.23	**183**

*In estimating total milk production of buffaloes only lactating animals were considered assuming 50% of the total adult buffaloes as lactating

Total milk production is the summation of milk production across bovine stock in Tables 4.6.8 to 4.6.10.

4.6.8 Marketing behaviour of farmers at cluster level

The per cent of milk sale out of total HH milk production for an average farm HH in Kokrajhar is presented in Table 4.6.11. All types of farms sell their surplus milk. Farmers with local cattle stock keep a part of their milk produced for home consumption and offer to relatives, and the remaining part is marketed to earn cash. Farmers with improved cattle stock produce primarily for the market to earn profit, while some portion of the produce is kept for HH consumption. Since total milk production is higher in commercial farms with crossbred/improved cattle the proportion of milk marketed is also high. On subsistence farms with one or two litres of milk production based on local cattle, more than 50% of milk produced is consumed at home. Table 4.6.11 shows that farm HH with local cattle across project clusters sell 66.23% of the total milk production, while farm HH with improved cattle stock sell 88.41% of their total HH milk production. Project clusters with presence of buffaloes sell 66.50% of their total milk production.

Table 4.6.11: Bovine stock percentage of milk sold per HH

Dairy cluster	% with local cows	% with improved cows	% with buffaloes
Dotoma	54.28	85.55	78.00
Kokrajhar	70.00	90.00	85.00
Mahamaya	65.00	86.00	-
Gossaigaon	73.00	92.00	45.00
Kachugaon	68.88	88.50	58.00

Table 4.6.12 presents the sources of milk sale in the project clusters. Selling milk to the traders is predominant in the majority of the clusters. The proportion of farmers selling milk to traders or vendors is 46.13% across project clusters. The smallholder dairy farmers rearing dairy animals of indigenous breed to cater to the local raw milk consumers in their neighbourhood constitute 32.47% of the total dairy producers for the district as a whole. Perusal of the table shows that 20.07% of farmers sell milk to private processors. Dotoma is the only cluster that sells milk to DCS (6.67%). The informal market actors such as milk traders and private processors together procure milk of almost 66.20% of the producers of the district establishing an informal value chain between producers to traders and producers to SMs/CPs or producers to consumers to SMs.

Prices offered to producers by various marketing sources are the highest when farmers sell milk locally (INR45/ litre) followed by INR 40/ litre when sourced to either milk vendors or private processors. As shown by empirical studies in Assam and the rest of India,cooperatives are weak in offering better prices to consumers;a similar finding is also reported in the study site of Dotoma in Kokrajhar district where cooperatives offer only INR 33/ litre (Table 4.6.12).

Table 4.6.12: Percentage of milk sale by sources and their respective farm gate prices

Dairy cluster	Neighbours or local sales		To traders		To cooperatives		To private processor s	
	%	Price/litre	%	Price/litre	%	Price/litre	%	Price/litre
Dotoma	61.00	48.33	26.00	40.64	6.67	33.00	6.00	40.00
Kokrajhar	13.33	46.00	71.67	39.17	0	-	15.00	40.00
Mahamaya	28.00	45.00	68.00	40.00	0	-	4.00	40.00
Gossaigaon	25.00	45.00	30.00	40.00	0	-	45.00	40.00
Kachugaon	35.00	45.00	35.00	40.00	0	-	30.00	40.00

Source: Field Survey, 2018

4.6.9 Access to veterinary services

Table 4.6.13 presents the number of veterinary service providers which include local veterinarians, VFAs, CAHWs and AI practitioners (*Gopal Mitra)* providing services to the farmers. Across clusters, an average of two local veterinarians operates, while the average distance from the farm villages is 2.92km. VFAs are an average of 2.93 km from villages ranging from 2.5 km in Kokrajhar cluster to almost 3.5 km in Dotoma cluster. Table 4.6.13 shows that none of the farmers in Kokrajhar reports accessto CAHWs. There is, however, one AI practitioner (*Gopal Mitra*) in each cluster except in Mahamaya and Kachugaon.

Table 4.6.13: Access to veterinary services at the selected project clusters of the district

Dairy cluster	No. of local veterinarians*		Distance from the FGD location/village km	No. of VFAs		Distance from the FGD location/village km	No. of CAHWs		Distance from the FGD location/village km
	Male	Female		Male	Female		Male	Female	
Dotoma	3	0	3.75	7	0	3.5	0	0	0
Kokrajhar	5	0	2.5	5	0	2.5	0	0	0
Mahamaya	2	0	0.0	0	0	0	0	0	0
Gossaigaon	2	0	2.5	2	0	2.8	0	0	0
Kachugaon	1	0	0.0	0	0	0	0	0	0

*Local veterinarian includes both private and government Employed.

4.6.10 Access to other services (input and breeding)

In this section the major inputs that a farmer accesses for milk storage and transportation, feeding of cattle and natural mating of animals are discussed. Except in Kachugaon cluster, farmers reported the availability of

one or two shops where they can buy milk cans or other equipment specifically designed for milk storage and transportation. Farmers in Kachugaon indicated that there is no such shop in their local or village market from where they can buy feeds for dairy animals. However, the average distance to shops of the selected villages of the remaining clusters is almost 4.33 km. pure feed shops are almost nil in most of the clusters as feeds are primarily sold in the grocery shops. Grocery shops where concentrate feeds are bought are located within the clusters of Dotoma, Kokrajhar and Gossaigaon with an average distance from the study villages of 3.57 km. Across the selected clusters, the average number of breeding bulls is 2.4 within an average distance of 1.7 km to other farm HH (see Appendix Table A2).

4.6.11 Availability of producers/traders organizations and input supplying institutions at cluster level

Farmers report that there are not any registered milk traders' organizations, SHGs on dairying and milk producers institutions in any of the clusters. Only one DCS is actively functioning in the bordering areas of Bhutan in Saralpara, Dotoma cluster (Table 4.6.14), indicating that the milk business in the remaining clusters is unorganized.

Table 4.6.14: Availability of producers/traders organizations at cluster level

Dairy cluster	No. of Milk traders organizations	No. of DCS
Dotoma	0	1 (Saralpara)
Kokrajhar	0	0
Mahamaya	0	0
Gossaigaon	0	0
Kachugaon	0	0

Regarding input supplying institutions, farmers report that there is no dairy plant in any of the clusters in Kokrajhar. While there is one DDL in the district veterinary dispensary, itwas not actively functioning at the time of the survey. There is no feed testing laboratory in any of the clusters, but there is one feed mill reported in Kokrajhar town. Table 4.6.15 indicates that there are three private veterinary clinics each in Dotoma and Kokrajhar clusters for obtaining medicines for animal health careand consultation with the veterinary doctors.

Table 4.6.15: Availability of input supplying institutions at cluster level

Dairy cluster	No. of dairy plant, chilling plant, BMC	No. of DDL	No. of feed testing laboratory	No. of feed mill
Dotoma	0	0	0	0
Kokrajhar	0	1	0	1
Mahamaya	0	0	0	0
Gossaigaon	0	0	0	0
Kachugaon	0	0	0	0

4.6.12 Major milk market actors and other infrastructure in the dairy value chain

In Table 4.6.16, the number of milk market actors involved in the dairy value chain of the selected project clusters is presented. These market actors are linked to the major town or market point of the cluster. The highest number of milk traders (20) and sweet shop owners (six major, four small) are in Kokrajhar cluster.. Farmers in Gossaigaon indicate that there are five CPs while the remaining clusters are not found to have any. The numbers of traders and sweet shop owners are the lowest in Dotoma cluster.

Table 4.6.16: Number of milk market actors at cluster level (based on KII and FGD)

Dairy cluster	No. of milk traders	No. of cottage industry owners	No. of sweet shop owners
Dotoma	4	0	2
Kokrajhar	20	0	10
Mahamaya	6	0	4
Gossaigaon	10	5	6
Kachugaon	3	0	5

The major linked markets where milk and milk products are traded are shown in Table 4.6.17. The major markets linked to these clusters are Kokrajhar town, Dotoma market, Fakiragram, Mahamaya, Bhaoraguri and Kachugaon. Farmers were asked if they had accessed bank credit during the 12 months preceding the survey and to name the banks. A few dairy farmers of only the Kokrajhar cluster received credit from formal financial sources. Some of the unorganized commercial farms in all of the clusters except Kachugaon reported access to insurance services from the government supported insurance scheme under the NLM Guwahati. All of the selected clusters have favourable road infrastructure with blacktop approach roads in 75% of the cluster villages in the APART district as a whole. The proportion of cluster villages having gravel and earthen roads are 13% and 12% respectively.

Table 4.6.17: Markets and other infrastructure at cluster level

Dairy cluster	Markets with trading of milk and milk products*	Bank and other financing institutions	Insurance for livestock	Approach road quality of the cluster villages		
				Blacktop	Gravel	Earthen
Dotoma	Kokrajhar (daily), Dotoma, Fakiragram (weekly)	0	New India Assurance/ Oriental Insurance	70	20	10
Kokrajhar	Kokrajhar town (daily)	SBI-Kokrajhar	New India Assurance/ Oriental Insurance	65	15	20
Mahamaya	Mahamaya (weekly)	0	New India Assurance/ Oriental Insurance	100	0	0
Gossaigaon	Bhaoraguri (weekly), Kokrajhar (daily)	0	New India Assurance/ Oriental Insurance	40	30	30
Kachugaon	Kachugaon (weekly)		0	100	0	0

*The frequency of markets is included in parentheses (daily, biweekly or weekly).

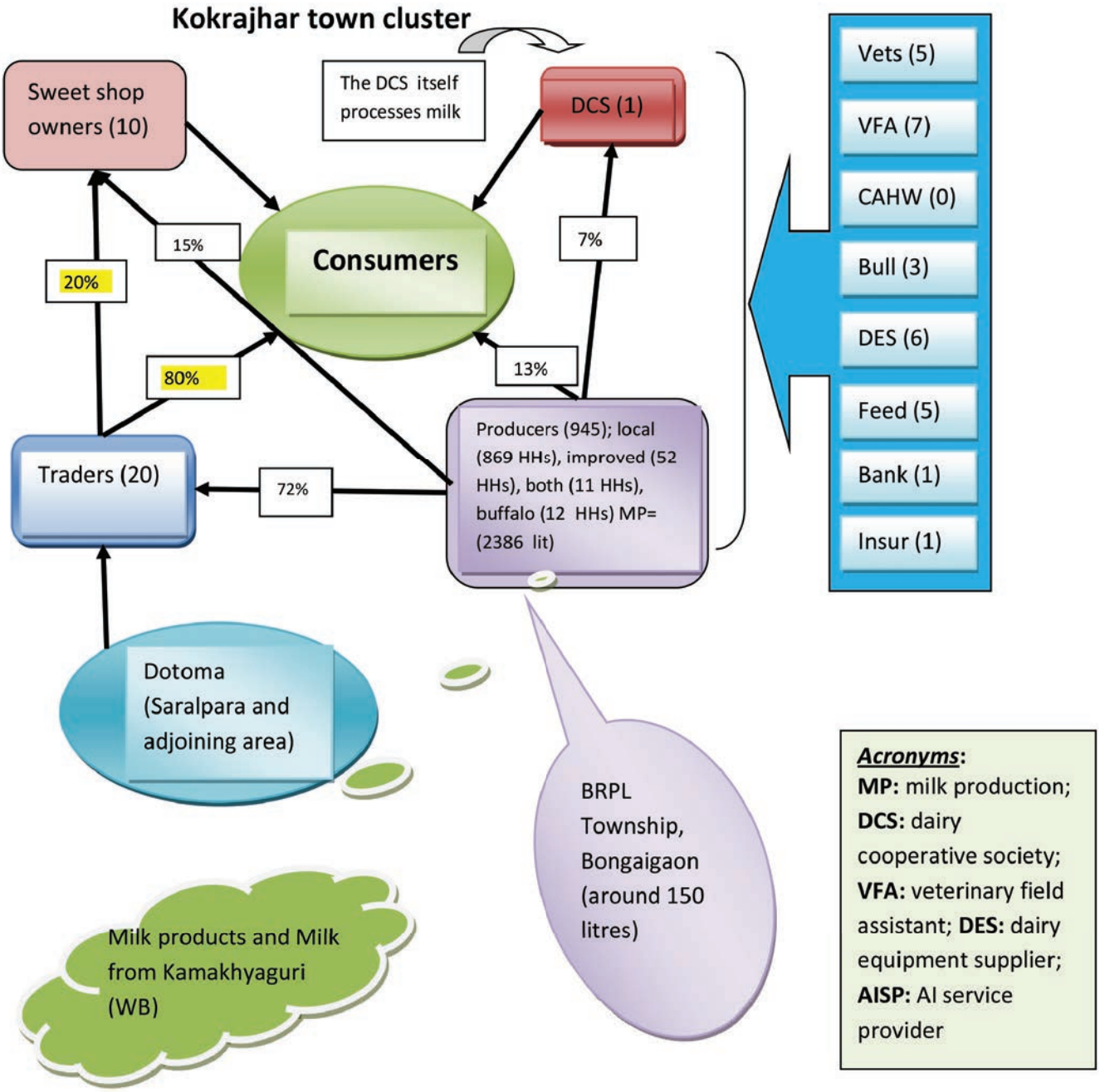
4.6.13 Progressive farmers at cluster level

Table 4.6.18 indicates the number of progressive dairy farmers. There are two and three such progressive farmers in Dotoma and Kokrajhar clusters respectively.

Table 4.6.18: Names and contacts of promising progressive entrepreneurs in dairy

Dairy cluster	No. of progressive farmers
Dotoma	2
Kokrajhar	3
Mahamaya	0
Gossaigaon	0
Kachugaon	0

Figure 4.6.1: Schematic representation of the value chain actors of the major recommended clusters.



4.6.15 Quick observations and recommendations

In Kokrajhar district, milk is not a favoured consumption item among the indigenous community. Kokrajhar town is the major cluster with relatively higher milk handling. At Kokrajhar town, most milk is supplied from three major areas: Jharbari, No. 2 Khalashi and Ouguri. These three milk producing areas are *Chapori* areas where almost 20 indigenous cattle *khutis* and 3 buffalo *khutis* are based. Very few farms with 8–10 improved cattle are found close to the town. In the cluster, some producers make dahi and cream at home to directly sell to consumers. Besides dahi, paneer and a small amount of milk are also supplied from Kamakhyaguri (West Bengal). Narabari, Borjhar and Tengabari villages have producers who rear improved cattle breeds but the milk is only supplied to the local markets of the areas and to the army camp and hostels of CIT, Kokrajhar. Milk from these villages isn't being supplied to Kokrajhar town. From Kokrajhar, around 500 litres of milk is supplied to Bongaingaon Refinery Township (retail sale). In Gossaigaon cluster, Dolgaon is the major milk producing village which has sizable improved breed cattle herds supplying milk to Gosaigaon market. A couple of vendors from West Bengal supply milk to the sweet shops at the Gossaigaon market. Kaljhar, Koraitola, Koraitari, Molandubi, Totpara and Saralpara are some major milk producing villages in the Dotoma cluster. In order to systematically provide training to market actors,the following sequence may be followed in the order of cluster-level preference.

Table 4.6.18: Cluster level planning for conducting training in Kokrajhar district

Rank of importance	Name of the cluster	Possible no. of training sessions				Recommendations
		Producers (12)	SM (1)	CP (0)	MT (2)	
Most potential	Kokrajhar	4	0.50	0	1.0	Kokrajhar and Dotoma can be grouped because of geographic proximity. Two full batch training sessions for SMs can be organized for the district as a whole.
	Dotoma	3	0.10	0	0.2	
Medium potential	Gossaigaon	3	0.30	0.25	0.5	Gossaigaon and Kachugaon are near to each other and one near to full batch training for milk traders may not be possible because of low presence of market actors at individual cluster level.
	Kachugaon	1	0.20	0	0.3	
Less Potential	Mahamaya	1	0.25	0	0.15	This cluster may be ignored or a few market actors may be invited to participate in other clusters' training.

Note: When considered for producer's training, only commercial farms were considered with ownership of high yielding improved animal stock plus the *khuti* system of rearing farms; **Prod:** Dairy producers, Figures within brackets indicate number of respective market actors.

4.7 Goalpara district

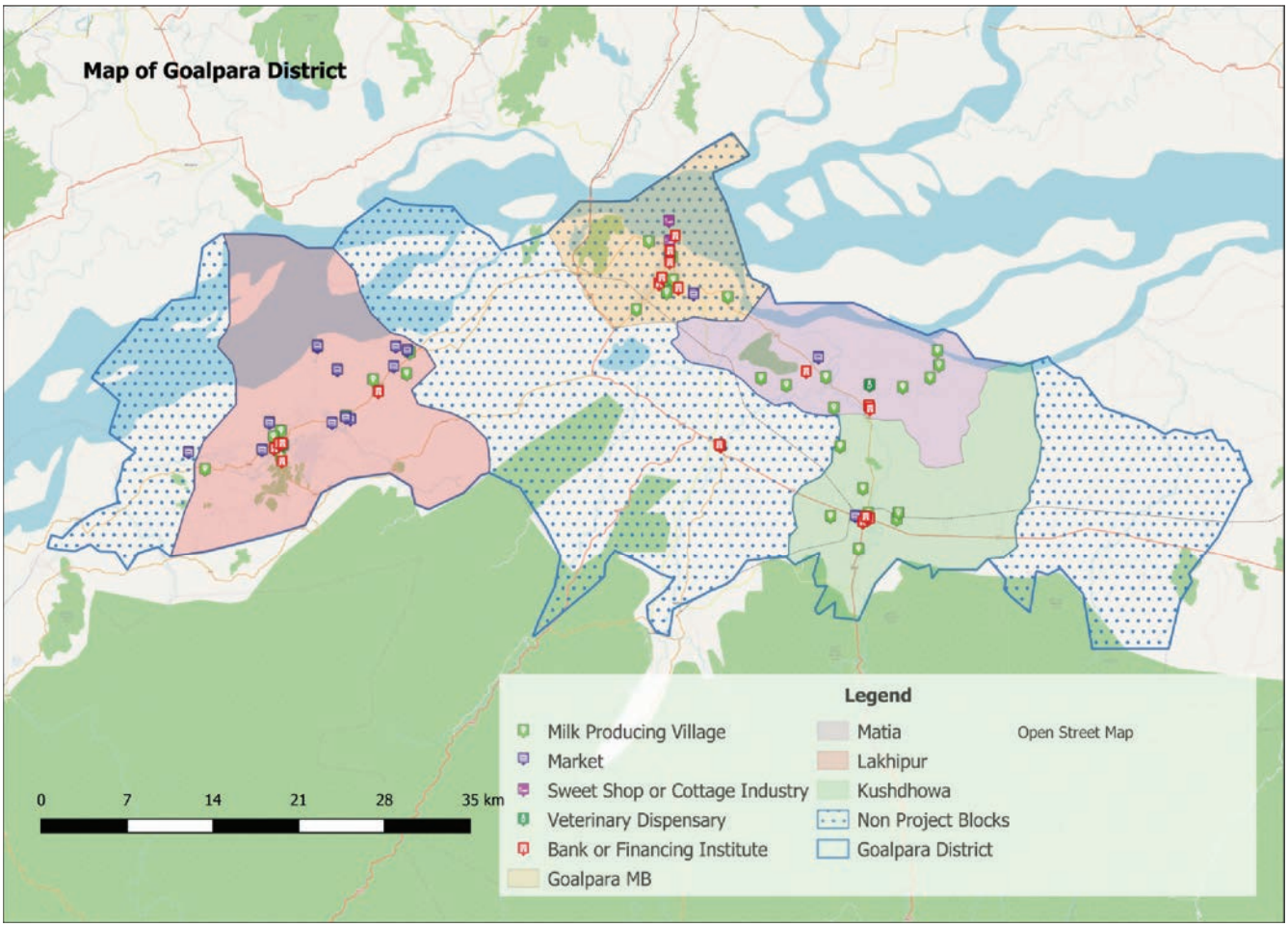
4.7.1 Cluster villages identification based on field visit

Four clusters in Kokrajhar district were identified for the implementation of the ensuing project. The selected clusters covering the potential villages for intervention with the informal dairy value chain actors are Kushdhowa, Matia, Goalpara M Board and Lakhipur. After an initial overview and discussion with some of the informed sources such as DVO, VOs/BVOs of the respective clusters, the ILRI enumerators finalized the villages as potential APART clusters from where the village specific information was drawn. The names of villages are shown in Table 4.7.1.

Table 4.7.1: Cluster villages in Goalpara district

Dairy cluster	Names of the DDD-listed villages	Names of the ILRI-listed villages	Potential villages incorporated	Non-potential villages dropped
Kushdhowa	Fafol, Santipur, Bakrakhuti,Pt. 1Thekasu, Khara, Lela, Nobogram	Fafol, Santipur, Bakrakhuti, Lela, Nobogram	0	Pt. 1Thekasu, Khara
Matia	Matia, Nepalikhuti, Bakaitari, Islampur, Mornoi, Sidhabari, Bohoti, Salmara, Bohoti Char Lalabori, Dohikota, Gojiajani,Takadibori	Matia, Nepalikhuti, Bakaitari, Sidhabari, Bohoti, Salmara, Bohoti Char Lalabori, Dohikota, Gojiajani,Takadibori	0	Islampur, Mornoi
Goalpara M Board	Santinagar, Goaltuli, Bapuji Nagar, MariomNagar, Bhalukdubi, Nayapara, Hasilapara	Santinagar, Goaltuli, Bapuji Nagar, MariomNagar, Bhalukdubi, Hasilapara, Dekdhowa	Dekdhowa	Nayapara
Lakhipur	Lakhipur, Manaspar, Folimari, Nidhanpur, Saktola, Boguan, Ambari, Batabari, Kurung, Rongsai, Hashdola, Takimari, Chunari, Dhumbanda, Bashbari, Tarangpur16	Lakhipur, Manaspar, Folimari, Nidhanpur, Saktola, Boguan, Ambari, Batabari, Kurung, Rongsai, Hashdola, Takimari, Chunari, Dhumbanda, Bashbari, Tarangpur16	0	0

Figure 4.7: The map of the surveyed clusters in Goalpara district.



4.7.2 FGD participants' profile

Table 4.7.2 shows the number of participants segregated by gender and social status in Goalpara district. The average number of participants across the project clusters is 8.50 in Goalpara district (male 6.05 71.18% and female 2.45 28.82%). Among the participants across the project clusters, representation of participants from the OBC community is the highest (43.75%) followed by the 'general' category (42.50%). The numbers of participants from the SC and ST communities were 2.50% and 11.25%.

Table 4.7.2: Distribution of participants by gender and social status

Dairy cluster	Average number of participants			% social status of participants			
	Male (%)	Female (%)	Total	Gen	Sc	ST	OBC
Kushdhowa	4.4 (59.46)	3.0 (40.54)	07.4	0	0	25	75
Matia	5.2 (57.78)	3.8 (42.22)	09.0	70	0	10	20
Goalpara M Board	9.4 (92.16)	0.8 (07.84)	10.2	10	0	10	80
Lakhipur	5.2 (70.27)	2.2 (29.73)	07.4	90	10	0	0

4.7.3 Farming system by type of bovine stock

The dairy farming system based on type of bovine stock in the selected project clusters shows that the district as a whole has 1,660 HH who have atleast one dairy cattle or buffalo, representing 54.88% of HH among the total HH across project clusters. The proportion of farming HH having local breed, improved breed and both local and

improved are 85.54%, 10.08% and 3.34% respectively Proportion of farming HH with buffalo stock constitutes only 1.04% of the total HH (Table 4.7.3).

Table 4.7.3: Distribution of farm HH by type of bovine stock

Dairy cluster	Total HH	Total farming HH (%)	% HH keeping cattle from local breeds	% HH keeping cattle from improved breeds	% HH keeping cattle from both local and improved breeds	% HH keeping buffaloes
Kushdhowa	942	483 (51.27)	86.00	08.00	6.00	0.00
Matia	3,252	2,332 (71.71)	85.00	10.14	3.14	1.43
Goalpara M Board	2,824	930 (32.93)	82.57	16.00	0.00	1.43
Lakhipur	5,082	2,895 (56.97)	88.58	06.18	4.24	1.36

Note: Figures in parentheses indicate percentage of farming HH in total HH.

4.7.4 Farming system by rearing practices

Table 4.7.4 shows that almost 13.79% of farm HH rear cattle in a fully stall-fed condition across project clusters, while the proportion of farmers rearing cattle in a partly stall-fed condition constitutes 85.85%. There is not any *khuti* system of rearing except in Matia cluster where1.43% of farmers keep local cattle or buffalo. The farming system based on rearing practice is closely related to the type of bovine stock as shown in Table 4.7.3. The fully stall-fed rearing condition increases with the increase of the number of improved cattle stock (see Tables 4.7.3 and 4.7.4).

Table 4.7.4: Distribution of farm HHs by rearing practices

Dairy cluster	% fully stall fed	% partly stall fed	% *khuti* (forage herd) system
Kushdhowa	21.00	79.00	0.00
Matia	11.00	87.57	1.43
Goalpara M Board	15.29	84.71	0.00
Lakhipur	07.85	89.08	0.00

4.7.5 Women's participation in dairy production and income control

Male and female participants were asked separately to describe women's role in dairy production and control of income related to dairy farming. Women's roles in performing the rearing activities were more compared to their role in the control of income. Again, women's roles in farm activities depend on the nature of the farm and type of farm activities. The fully commercial farms based on improved cattle stock require more physical labour usually performed by male members of the family, while subsistence farming is mostly conducted by women. Moreover, activities such as selling of milk in the market, grass collection, taking animals for grazing etc. are carried out mostly by the male members of the family while cleaning of cattle shed, feeding the cattle at home etc. are done mostly by the female members of the family. In regards to income control, many farmers reported that their decision to spend income gained through the sale of milk and milk products is carried out jointly by men and women after discussion. In the project clusters of Golaghat, women's roles in the total farming activities constitute 57.66% compared to men. However, women's control of income is measured as 38.99% for all the selected project clusters of Goalpara district (Table 4.7.5).

Table 4.7.5: Women's role in dairy production and income control

Dairy cluster	No. of farming HH	% women have role in milk production	% women have control in income from milk production
Kushdhowa	483	66.00	46.00
Matia	2,332	47.14	44.28
Goalpara M Board	930	54.29	40.00
Lakhipur	2,895	63.21	25.71

4.7.6 Average herd size (adult animals) of the farm HH according to type of bovine stock

The average herd size of adult animals according to the type of bovine stock in Goalpara district is reported in Table 4.7.6. The number of adult indigenous cattle per HH is 2.03 across the project clusters. Similarly, the average improved cattle holding in each HH across selected project clusters is 2.70. The farmers in Kushdhowa reported that none of the farmers in this clusters owned buffaloes during the time the survey was conducted. The average size of buffalo herd held by the farmers of the remaining clusters is 0.38.

Table 4.7.6: Average herd size (adult animals) by the bovine stock in the project clusters

Dairy cluster	Local cows	Improved cows	Buffaloes
Kushdhowa	1.8	2.6	0.00
Matia	2.3	2.5	0.60
Goalpara M Board	2.2	3.0	0.40
Lakhipur	1.8	2.7	0.14

Source: Field Survey, 2018

4.7.7 Milk productivity and production of the bovine stock at cluster level

The daily milk yield of the bovine stock is not uniform in the entire lactation length. Immediately after the calf is born, milk production gradually increases until peak yield is reached. At conception, milk production is low and the cycle repeats itself. In the selected project clusters of Goalpara the average daily milk productivity of local cows during the lean period is 0.73 litres (Table 4.7.7). During the peak lactation days of the indigenous cattle average productivity is 2.14 litres. The average lean and peak productivity of improved cattle stock are 2.53 and 9.70 litres and of buffaloes are 1.67 and 5.33 litres respectively.

Table 4.7.7: Lowest and highest levels of average daily milk production per cow in the clusters

Dairy cluster	Milk production of local cows		Milk production of improved cows		Milk production of buffaloes	
	Low	High	Low	High	Low	High
Kushdhowa	0.70	1.70	3.00	10.80	-	-
Matia	0.54	2.14	2.17	08.29	1	5
Goalpara M Board	0.96	1.86	2.14	09.28	2	4
Lakhipur	0.71	2.86	2.82	10.43	2	7

Tables 4.7.8 to 4.7.10 show the average milk production of local, improved and buffalo stock of the district. Based on local cattle stock, the total milk production across the clusters is 8,813 litres. The highest milk production for the local cattle stock among the selected clusters is 4,119.69 litres in Lakhipur, followed by Matia (almost 3,055 litres). The total milk production of the improved cattle in the selected APART clusters is 4,767.1litres, with the highest milk production reported in Lakhipur followed by Matia. The total milk production in the three clusters reporting the presence of buffalo stock is only 50.39 litres. The proportionate share of total milk production by all three categories of bovine stock of the selected project districts is the local cows 64.66%, improved cows 34.97% and buffaloes 0.37%.

Table 4.7.8: Estimated total milk production based on total local cattle stock

Dairy cluster	Estimated no. of HH with local cattle	Average herd size (adult lactating animals)	Average milk production per local cow	Total milk production with local cattle stock*
Kushdhowa	415.38	0.9	1.20	449
Matia	1,982.20	1.2	1.34	3,055
Goalpara M Board	767.90	1.1	1.41	1,191
Lakhipur	2,564.39	0.9	1.79	4,120

*In estimating total milk production of local cows only the lactating animals were considered assuming 50% of the total adult local cattle as lactating.

Table 4.7.9: Estimated total milk production based on improved cattle stock

Dairy cluster	Estimated no. of HH with improved cattle	Average herd size (adult lactating animals)	Average milk production per improved cow	Total milk production with improved cattle stock*
Kushdhowa	038.64	1.3	6.90	347
Matia	236.46	1.3	5.23	1,546
Goalpara M Board	148.80	1.5	5.71	1,274
Lakhipur	178.91	1.4	6.63	1,600

*In estimating total milk production of improved cattle only lactating animals are considered assuming 50% of the total adult improved cattle as lactating.

Table 4.7.10: Estimated total milk production based on buffalo stock

Dairy cluster	Estimated no. of HH with buffaloes	Average herd size (adult lactating animals)	Average milk production per improved cow	Total milk production with buffaloes*	Total milk production across bovine stock#
Kushdhowa	00.00	0.0	0.00	00.00	**795**
Matia	33.35	0.3	3.00	30.01	**4,630**
Goalpara M Board	13.30	0.2	3.00	07.98	**2,473**
Lakhipur	39.37	0.1	4.50	12.40	**5,732**

*In estimating total milk production of buffaloes only lactating animals were considered assuming 50% of the total adult buffaloes as lactating

#Total milk production is the summation of milk production across bovine stock in Tables 4.7.8 to 4.7.10.

4.7.8 Marketing behaviour of farmers at cluster level

All types of farms are found to sell their surplus milk. Farmers with local cattle stock keep a part of their milk produced for home consumption and offer to relativeswhile the remaining part is marketed to earn cash. Farmers with improved cattle stock produce primarily for the market to earn profit, while some portion of the produce is kept for HH consumption. Since total milk production is higheron commercial farms with crossbred/ improved cattle, the proportion of milk marketed is also higher. On subsistence farms with one or two litres of milk production based on local cattle, more than 50% of milk produced is consumed at home. Table 4.7.11 shows that farm HH with local cattle across project clusters sell 42.32% of their total milk production, while farm HH with improved cattle stock sell 86.68% of their total HH milk production. Project clusters with the presence of buffaloes sell 66.68% of their total milk production.

Table 4.7.11: Bovine stock percentage of milk sold per HH

Dairy cluster	% with local cows	% with improved cows	% with buffaloes
Kushdhowa	11.00	82.00	-
Matia	54.00	85.71	90.05
Goalpara M Board	36.43	90.43	50.00
Lakhipur	67.86	88.57	60.00

Based on a KII (Konika Sweets), it was understood that in Goalpara town, the milk production in the nearby villages is not sufficient to meet the demand of local customers. A large portion of the milk comes from Barpeta district (mainly from Kalgachia under Rupsi block) by crossing the river, Brahmaputra. A group of 10–12 farmers join together and sell their milk to the sweet shop in Goalpara town after reaching Kacharighat. Almost 20 sweet shops are in Goalpara town. Traders give the raw milk to the sweet shops and the sweet shops sell the afternoon milk to the consumers at INR 60/litre. There is no CP in Goalpara town. Because of low local milk production, Purabi sells milk in the district but does not buy milk as it does in districts like Barpeta, Nagaon etc.

Table 4.7.12 presents the sources of milk sale in the project clusters. Selling milk in the neighbourhood or selling in the local market is predominant in the majority of the clusters of Goalpara. These are small holder dairy farmers rearing dairy animals of indigenous breed to cater to the local raw milk consumers in their neighbourhood. Considering the district as a whole based on the selected clusters almost 50% of farmers sell milk locally, followed by selling to milk traders (28.30%). Selling milk to the DCS in all of the project clusters is only 4.75% pointing out that almost 95% of the total farmers in the selected cluster use informal channels to dispose milk. The informal market actors such as milk traders and private processors together procure milk of almost 45.42% of the producers establishing an informal value chain between producers to traders and producers to SMs/CPs or producers to consumers to SMs.

Prices offered to producers by various marketing sources is the highest when farmers sell milk locally (INR 48.33/ litre) followed by INR 46/ litres when sourced to private processor. As shown by empirical studies in Assam and the rest of India, cooperatives are weak in offering better prices to consumers; a similar finding is also reported in the study sites of Goalpara where cooperatives offer only INR 38/litres across clusters. Farmers' preference for marketing channels is in accordance with the prices they receive as shown in Table 4.7.12.

Table 4.7.12: Percentage of milk sale by sources and their respective farm gate prices

Dairy cluster	Neighbours or local sale		To traders		To cooperatives		To private processor	
	%	Price/litre	%	Price/litre	%	Price/litre	%	Price/litre
Kushdhowa	34.00	45.00	46.00	45.00	19.00	38.00	01.00	40
Matia	28.58	43.33	28.57	50.00	0	-	42.85	50
Goalpara M Board	67.54	55.00	32.86	46.00	0	-	0	-
Lakhipur	69.62	50.00	05.77	45.00	0	-	24.61	50

4.7.9 Access to veterinary services

For the consumers' safety and quality of milk, adequate access to veterinary services is important. Table 4.7.13 presents the number of veterinary service providers which include local veterinarians, VFAs, CAHWs and AI practitioners providing services to the farmers. Across clusters an average of 2.75 local veterinarians operate, while the average distance from the farm villages is 2.07 km. VFAs are located an average of 2.34 km from villages across clusters. There are four CAHW in the district as a whole and there are thee AI practitioners in Matia and one in Lakhipur clusters.

Table 4.7.13: Access to veterinary services at the selected project clusters of the district

Dairy cluster	No. of local veterinarian*		Distance from the FGD location/ village km	No. of VFA		Distance from the FGD location/ village km	No. of CAHWs		Distance from the FGD location/ village km
	Male	Female		Male	Female		Male	Female	
Kushdhowa	3	0	1.0	2	0	1.50	1	0	0.50
Matia	1	0	4.0	3	0	4.85	0	0	0.00
Goalpara M Board	5	0	1.0	6	0	1.50	1	0	0.50
Lakhipur	2	0	2.07	1	0	1.50	2	0	3.33

* Local veterinarian includes both private and govt. employed veterinarian

4.7.10. Access to other services (input and breeding)

As indicated in the Appendix Table A2, except in Matia cluster, farmers reported the availability of a few shops where they can buy milk cans or other equipment specifically designed for milk storage and transportation. Farmers across clusters indicated that there are on average 4.5 shops in their local or village market where they can buy feeds for dairy animal. However, the average distance to supplier shops of the selected villages of the clusters is almost 3.25 km. Pure feed shops are very few as feeds are primarily sold in the grocery shops. In all of the selected clusters, some farmers are found to provide natural mating services (3.25 across clusters).

4.7.11. Availability of producers/traders organizations and input supplying institutions at cluster level

Farmers report that there are a few registered milk traders organization. There is one active DCS in Lakhipur and seven DCS in Matia (Table 4.7.14). However, there are not any SHG related to dairy farming practices or active milk producer's institutions in any of the project clusters of Goalpara district.

Table 4.7.14: Availability of producers/traders organizations at cluster level

Dairy cluster	No. of milk traders organizations	No. of DCS
Kushdhowa	5(Lela,Santipur)	0
Matia	1(Bohoti)	7(Bohoti,Gojiajani,Matia,Bakaitari)
Goalpara M Board	1	0
Lakhipur	0	1(Manaspara)

Notes: Figures in parentheses are the major linked villages.

Farmers report that there areno dairy plants, DDLs, feed testing laboratoriesor feed mills. Table 4.7.15 indicates that there are two private veterinary clinics in Kushdhowa, three in Goalpara MB and three in Lakhipur where medicines for animal health care and consultations with the veterinary doctors are available.

Table 4.7.15: Availability of input supplying institutions at cluster level

Dairy cluster	No. of dairy plant, chilling plant, BMC	No. of DDL	No. of feed testing laboratory	No. of feed mill
Kushdhowa	1 (non-functional)	0	0	0
Matia	1 BMC (at Bahati)	0	0	0
Goalpara M Board	1 chilling centre (Balijana block)	0	0	0
Lakhipur	0	0	0	0

4.7.12. Major milk market actors and other infrastructure in the dairy value chain

In Table 4.7.16, the number of milk market actors involved in the dairy value chain of the selected project clusters

is presented. These market actors are linked to the major town or market point of the cluster.The table indicates that approximately 80 milk traders are present across the clusters while 64 sweet shop owners are found to be present in various market centres of the district. As the table points out, there is no cottage industry owner in Matia and Lakhipur as some of the cottage industry products such as ghee, curd and cream are available in the sweet shops. Based on FGD in Kushdhowa and Goalpara M Board, there are two and three cottage industry owners in these clusters respectively. The number of sweet shops in Goalpara M Board and Lakhipur town is the highest with 20 each while lowest are 12 sweet shops in Kushdhowa and Matia clusters.

Table 4.7.16: Number of milk market actors at cluster level (based on KII and FGD)

Dairy Cluster	No. of milk traders	No. of cottage industry owners	No. of sweet shop owners
Kushdhowa	10	2	12
Matia	20	0	12
Goalpara M Board	20	3	20
Lakhipur	30	0	20

The major linked markets where milk and milk products are traded are shown in table 4.7.17. The major markets linked to these clusters are Dudhnoi, Krishnai, Matia, Goalpara M Board, Sidhabari, Ambari, Basubari, Saktala, Chunari, Hashdoba, Tarangpur and Forest Gate. Farmers were asked if they had accessed bank credit during the 12 months preceding the survey and to name the banks.Dairy farmers of all of the clusters except Goalpara M Board reported that some of them had received credit from formal financial sources including Central Bank, UCO Bank, Allahabad Bank, and AGVB. Some of the unorganized commercial farms in Matia and Lakhipur reported access to insurance services from the government supported insurance scheme under the NLM Guwahati through New India Assurance/Oriental Insurance. Most of the selected clusters have favourable road infrastructure with blacktop approach roadsfor 71.25% of the listed cluster villages while 12.50% and 16.25% of cluster villages have gravel and earthen roads respectively.

Table 4.7.17: Markets and other infrastructure at cluster level

Dairy cluster	Markets with trading of milk and milk products*	Bank and other financing institutions	Insurance for livestock	Approach road quality (% of villages in the cluster)		
				Blacktop	Gravel	Earthen
Kushdhowa	Dudhnoi market	Central Bank,UCO Bank Dudhnoi	0	80	20	0
Matia	Krishnai, Matia, Nepali Khuti, Sidhabari, Dudhonoi	UCO, Allahabad Bank	Oriental Insurance/New India Assurance	30	20	50
Goalpara M Board	Forest Gate,Goalpara town, Local village	UBI, PNB, SBI, Central Bank of India	0	100	0	0
Lakhipur	Ambari, Basubari, Saktala, Lakhipur, Chunari Market, Hashdoba, Tarangpur	AGVB, SBI, UCO Bank, Central Bank of India	Oriental Insurance/New India Assurance	75	10	15

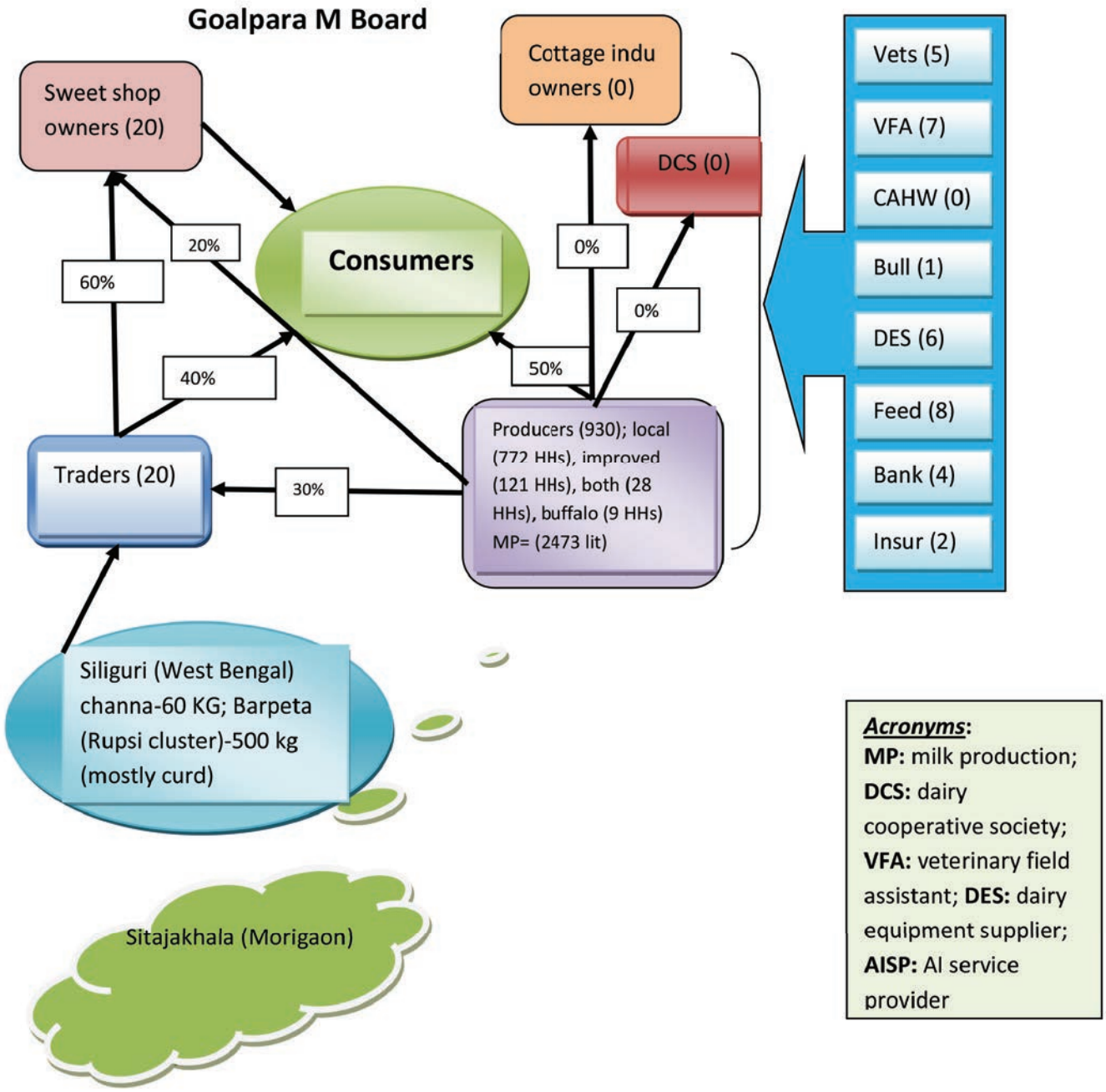
4.7.13 Progressive farmers at cluster level

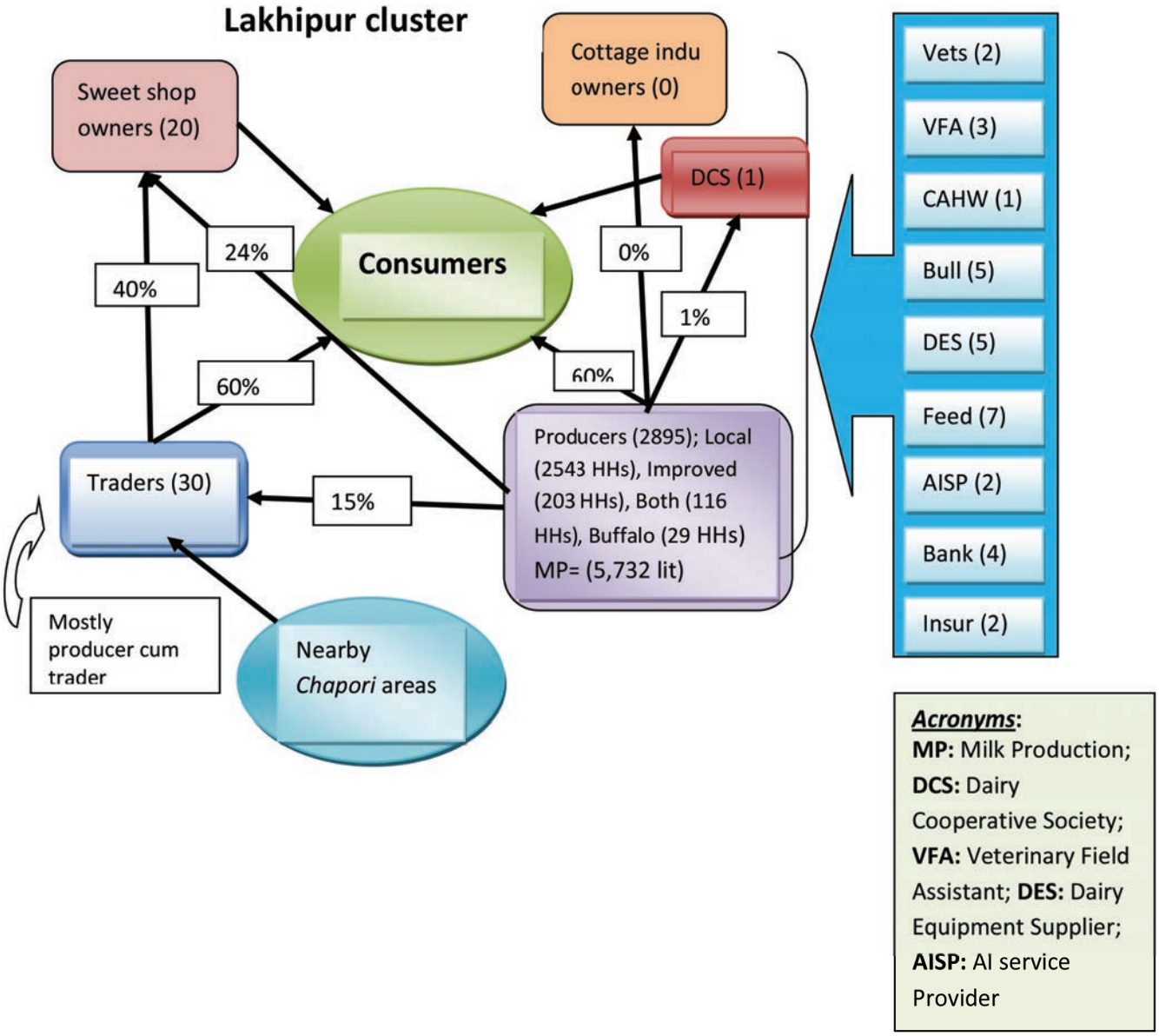
Table 4.7.18 indicates the number of progressive dairy farmers/milk traders/cottage industry owners. There is one such progressive farmer in Matia cluster and three in Goalpara M Board.

Table 4.7.18: Names and contacts of promising progressive entrepreneurs in dairy

Dairy cluster	No. of progressive farmers	Names and contacts
Kushdhowa	0	0
Matia	1	Pradeep Patgiri
Goalpara M Board	3	Asha Veterinary, Feed Agency, Goalpara Veterinary Entrepreneurs
Lakhipur	0	0

Figure 4.7.1: Schematic representation of the value chain actors of the major recommended clusters.





4.7.15 Quick observations and recommendations

Goalpara Municipality Board (MB) is the most important informal milk cluster in the district. There are 19 wards under the town municipality and all wards have some improved breed cattle farms but the number of such farms is low. Other areas that supply milk to the town are Karwala ward no. 13, Dastinagar, Nayapara, Notunbasti, ward no 11, Bapujinagar, Nepalibasti, Bhalukdubi, Mariomnagar etc. In these villages the percentage of improved breed cattle is more than that of indigenous breed cattle. There are some *khutis* in *Chapari* areas mainly in Barakhuti. Milk (both raw milk and curd) is being supplied from Barpeta district (from Rupsi cluster) by boats. There are some particular milk market points and in the evening, traders come to those points and sell milk retail. Moila pathar is one such major milk market point at Goalpara town. In Kuchdhowa cluster, the major milk producing villages are Lela, Dudhnoi, Fafal, Bakrakhuti etc. Milk from the villages is mainly supplied to Dudhnoi market and Krishnai market and some portion of milk is also supplied to these markets from the villages and *khutis* of Matia cluster.

In Matia cluster, the major milk markets within the cluster are Krishnai, Matia, Nepali Khuti and Sidhabari. Under the Matia cluster Salmara Bohoti, Dolbhanga, Gorubhanga, Nepali Khuti, Bakaitari, Duapara, and Dohikata Lalabori

etc. are major milk producing villages. There are some CPs in these villages that make only sweets by purchasing milk from the producers. They make sweets at home and sell at the nearest markets on specific market days (in case of weekly/biweekly markets). Many of the producers are facing the problem of selling the afternoon milk because of low market demand, resorting to preparing dahi from the afternoon milk or trying tosell to the village SMs. For training convenience, Kushdhowa cluster may be grouped with Matia cluster to find a reasonable number of training participants (market actors). In the Lakhipur cluster, Pakimari, Gablapam, Saukhana, Folimari, Saktola, Boguan, Rongsai etc. are some important milk producing villages. For convenience of covering market actors to train, the following sequence may be followed and effort should be made to track outside suppliers for quality check of the milk.

Table 4.7.19: Cluster level planning for conducting training in Goalpara district

Rank of importance	Name of the cluster	Possible no. of training sessions				Recommendations
		Producers (13)	SM (5)	CP (0)	MT (3)	
Most potential	Goalpara MB	2	1	0	1	1. Milk and processed items like channa, curd etc. come from Barpeta district and Siliguri. These traders may be tracked and trained on hygienic practices when training is conducted to traders of Goalpara MB. 2. Lakhipur is an independent cluster with a bigger market and retail milk sale and thus convergence of training with other clusters will be practically impossible.
	Lakhipur	3	1.50	0	1.1	
Medium potential	Matia	7	1.65	0.1	1	1. Market actors from Matia and Kushdhowa may be trained together at a convenient place because of these two clusters' geographic nearness.
	Kushdhowa	1	1.50	0.1	0.5	
Less Potential	Nil					

Note: When considered for producer's training, only commercial farms were considered with ownership of high yielding improved animal stock plus the *khuti* system of rearing farms; **Prod:** Dairy producers, **MT:** Milk traders; Figures within brackets indicate number of respective market actors.

4.8 Darrang district

4.8.1. Cluster villages identification based on field visit

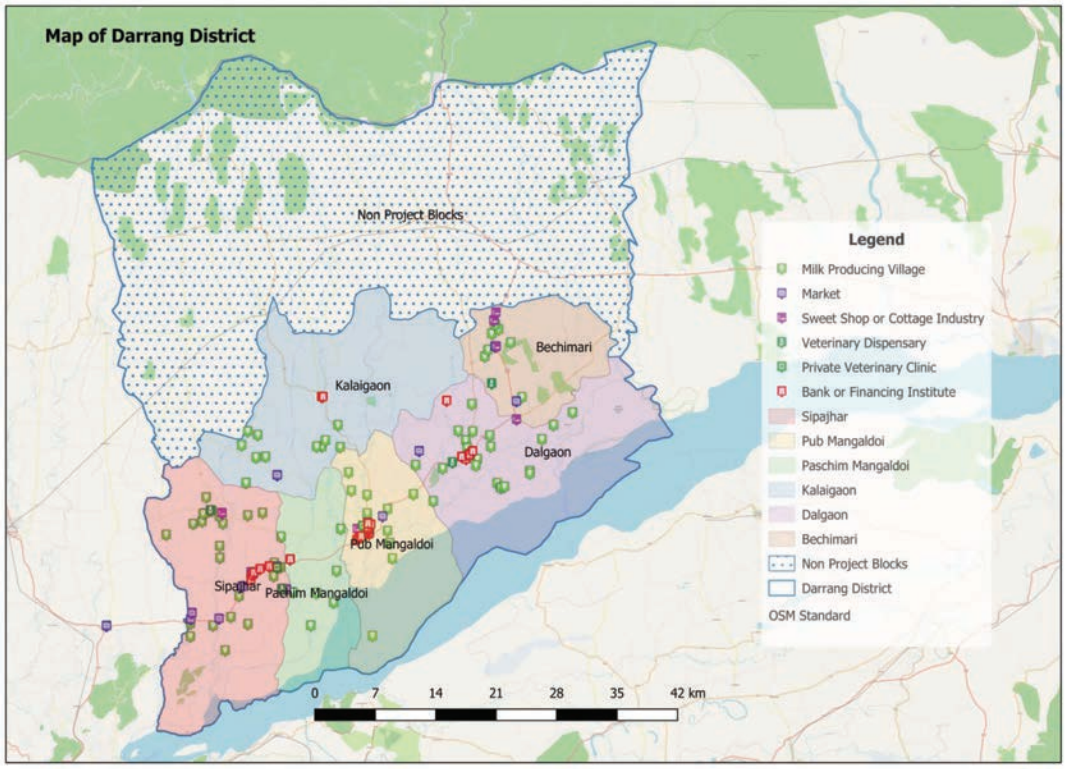
Six clusters were identified in Darrang district for the implementation of the ensuing project. The selected clusters covering the potential villages for the intervention of the informal dairy value chain are Paschim Mangaldoi, Pub Mangaldoi, Sipajhar, Kalaigaon, Dolgaon and Bechimari.After an initial overview and discussion with some of the informed sources such as DVO, VOs/BVOs of the respective clusters, the ILRI enumerators finalized the villages listed by the DDD as potential APART clusters from where the village-specific information was drawn. The names of villages are shown in Table 4.8.1.

Table 4.8.1: Cluster villages in Darrang district

Dairy cluster	Names of the DDD-listed villages	Names of the ILRI-listed villages	Potential villages incorporated	Potential villages dropped
Paschim Mangaldoi	Adhikari, Kanaichuba, Bengabora, Ranngamatim A and B, Medhichapori, Dariapara, Banagalpota123, Borthekerabari A and B, Gorkhowapara	Ranngamatim A and B, Medhichapori, Dariapara, Borthekerabari A and B, Gorkhowapara, Moamari, Serengchapari, Gerimari	Moamari, Serengchapari, Gerimari	Adhikari, Kanaichuba, Bengabora, Banagalpota12 3
Pub Mangaldoi	Latakhat, Balabari, Hirapara, Khatoniarpara, NC Bandia, K Bandia, Bandia, Baghpori, MMB NO1-10, Chapai, Saikiapara	Latakhat, Balabari, Hirapara, Khatoniarpara, NC Bandia,K Bandia, Bandia, Baghpori, MMB NO1-10, Chapai, Saikiapara, Boigarmari	Boigarmari	0
Sipajhar	Bhuktabari, Bijulibari, Maroi, Hazarikapara, Pakabangipara, Kabeichuba, Narikoli, Sutiakata, Sanowa, Singimari,Dumunichowki, Maruachowki, Hatemtola, Patharighat, Alikhapara, No. 1 Chengapara, Khas Dipila, Kamargaon, Digipara, Burha, Haripur, Burhadai, Padmajhar, Bamunjhar, Henagalpara, Kahitoli, Mahitoli, Jengerajhar, Bezbhagawati, Sarabari, Athiabari, Ramgaon, Hapamara, Bairagipara, Gargari	Bhuktabari, Bijulibari, Maroi,Hazarikapara, Pakabangipara, Kabeichuba, Narikoli, Sutiakata, Sanowa, Singimari, Dumunichowki, Maruachowki, Hatemtola, Patharighat, Alikhapara, No. 1 Chengapara, Khas Dipila, Kamargaon, Dighirpar, Burha, Haripur, Burhadai, PadmajhR, Bamunjhar, Henagalpara, Kahitoli, Mahitoli, Jengerajhar, Bezbhagawati, Sarabari, Athiabari, Ramgaon,Hapamara, Bairagipara, Gargari, Kharkhowapara	Kharkhowapara, Boriagaon1 and 2,	0

Dairy cluster	Names of the DDD-listed villages	Names of the ILRI-listed villages	Potential villages incorporated	Potential villages dropped
Kalaigaon	Kharkhowapara, Kamarpara, Borigaon1 and 2, Outola, Durgagaon, Akelibari, Bechimari, Shyampur, Arimari, Bilpar, Gadaijhar, Barkur14	Kamarpara, Outola, Durgagaon, Akelibari, Bechimari, Arimari	0	Kharkhowapar, Borigaon1 and 2,Bilpar, Gadaijhar, Barkur14
Dalgaon	Fakirpara, Bhutpukhuri, NizBaruajhar, Boigarmari, Islampur, Kheteswar No-1, Ghonsimalu, Alikakh, Bihudia, Pub and Pachim Baharbari, Nadirmukh, Muwamari, Pub and Pachim Kamarpara, Niz Nagajan, Kharupetia town committee-1-8, Kaniatari, Ghatara 1 and 2, Bherpori	Fakirpara, Bhutpukhuri, NizBaruajhar, Islampur, Kheteswar No.1, Alikakh, Bihudia, Pub and PachimBaharbari, Nadirmukh, Pub and Pachim Kamarpara, Niz Nagajan, Kharupetia town committee-1-8, Kaniatari, Ghatara 1 and 2, Bherpori, Arimari, Bilpar, Gadaijhar, No. 14 Barkur	Arimari, Bilpar, Gadaijhar, No. 14 Barkur	Boigarmari, Ghonsimalu, Muwamari
Bechimari	Baruajhar, Baruajhar 4 and 5, Bechimarigaon, Gondapukhuri, Nadirmukh, Madhupur	Baruajhar, Baruajhar 4 and 5, Bechimarigaon, Gondapukhuri, Nadirmukh, Madhupur	0	0

Figure 4.8: The map of the surveyed clusters in Darrang district.



4.8.2 FGD participants' profile

Table 4.8.2: Distribution of participants by gender and social status

Dairy cluster	Average number of participants			% social status of participants			
	Male (%)	Female (%)	Total	General	SC	ST	OBC
Paschim Mangaldoi	4.2	2.3	06.5	80.00	2.09	5.00	12.91
Pub Mangaldoi	3.6	3.7	07.3	68.66	0.00	0.00	31.43
Sipajhar	5.6	1.9	07.5	72.54	4.59	0.00	22.87
Kalaigaon	4.6	2.5	07.1	88.65	0.00	6.34	05.01
Dalgaon	7.2	3.1	10.3	85.45	0.00	0.00	14.55
Bechimari	7.2	1.6	08.8	90.00	0.00	0.00	10.00

4.8.3 Farming system by type of bovine stock

The dairy farming system based on type of bovine stock in the selected project clusters shows that the district as a whole has 15,481 HH who have atleast one dairy cattle or buffalo, representing 61.96% of HH among the total HH across project clusters. The proportion of farming HH having local breed, improved breed and both local and improved are 72%, 17% and 6% respectively. Proportion of farming HH with buffalo stock constitutes only 5% of the total HH (Table 4.8.3).

A field-level observation indicates that although there are villages from where milk comes to the major milk marketing centres, actual production takes place in the river blocks (Chapori). Unlike the other Chapori areas where milk production is based on local breeds of cattle and buffaloes, here milk production is driven by both local and crossbred cattle stock and also based on buffalo population. There are many such river blocks sourcing milk for the Darrang district, but primarily the important ones are ***No. 1 Magurmari, Kalaichar, Gorumara, Shyampur, Sonit Char,No. 4 Arimari) and Baldi Char****.*

Table 4.8.3: Distribution of farm HH by type of bovine stock

Dairy cluster	Total HH	Total Farming HH (%)	HH keeping cattle from local breeds	% HH keeping cattle from improved breeds	% HH keeping cattle from both local and improved breeds	% HH keeping buffaloes
Paschim Mangaldoi	1,529	0980 (64.09)	66.00	12.00	6.00	08.00
Pub Mangaldoi	2,705	1,850 (68.39)	60.83	24.17	5.00	10.00
Sipajhar	7,487	4,670 (62.37)	77.00	09.32	7.89	01.58
Kalaigaon	2,228	1,305 (58.57)	78.25	18.00	3.75	0
Dalgaon	6,054	3,256 (53.78)	59.63	26.37	7.68	06.32
Bechimari	2,564	1,420 (55.38)	88.00	11.33	0	00.33

4.8.4 Farming system by rearing practices

Table 4.8.4 shows that almost 18% of farm HH rear cattle in a fully stall-fed condition across project clusters, while the proportion of farmers rearing cattle in a partly stall-fed condition constitutes 81%. The *khuti* system of rearing is practiced in anaverage of 1% of HHs among total farm HH. The farming system based on rearing practice is closely associated with the type of bovine stock as shown in Table 4.8.3. The fully stall-fed rearing condition increases with the increase of the number of improved cattle stock (Tables 4.8.3 and 4.8.4).

Table 4.8.4: Distribution of farm HHs by rearing practices

Dairy cluster	% fully stall fed	% partly stall fed	% *khuti* (forage herd) system
Paschim Mangaldoi	28.00	68.00	4.00
Pub Mangaldoi	25.83	74.17	0.37
Sipajhar	10.21	68.37	0.37
Kalaigaon	04.50	95.50	0.00
Dalgaon	20.11	79.37	1.05
Bechimari	00.33	99.67	0.00

4.8.5 Women's participation in dairy production and income control

Women and men were asked separately about women's roles and control of income in dairy production.Women's roles in performing the rearing activities were proportionally higher compared to their role in the control of income. Again, the role of women in conducting farm activities depends on the nature of thearm and type of farm activities. The fully commercial farms based on improved cattle stock require more physical labour often performed by male family members, while subsistence farming is mostly conducted by women. Moreover, activities such as selling of milk in the market, grass collection, taking animals for grazing etc. are carried out mostly by the male members of the family while, cleaning of cattle shed, feeding the cattle at home etc. are done mostly by the female members of the family. In regard to income control, many farmers reported that their decision to spend income gained through the sale of milk and milk products is carried out jointly by discussing with each other. In the APART clusters of Darrang district, of the total farming activities carried out, women's role (45.83% is lower compared to their male counterparts. Women's role on the control of income is measured as 38.67% for all of the selected project clusters of Darrang district (Table 4.8.5).

Table 4.8.5: Women's role in dairy production and income control

Dairy cluster	No. of farming HH	% women have role in milk production	% women have control of income from milk production
Paschim Mangaldoi	0980	24	42
Pub Mangaldoi	1,850	36	39
Sipajhar	4,670	58	42
Kalaigaon	1,305	52	42
Dalgaon	3,256	37	37
Bechimari	1,420	68	30

4.8.6 Average herd size (adult animals) of the farm HH according to type of bovine stock

The average herd size of adult animalsaccording to the type of bovine stock is reported in Table 4.8.6. The number of adult indigenous cattle per HH is 2.73 across the project clusters. Similarly, the average improved cattle holding in each HH across selected APART clusters is 2.78. The farmers in Kathalguri and Sarupathar clusters reported that none of them owned buffaloes during the time the survey was conducted. The average size of buffalo herd held by the farmers of the remaining clusters is 3.27.

Table 4.8.6: Average herd size (adult animals) by the bovine stock in the project clusters

Dairy cluster	No. of local cows	No. of improved cows	No. of buffaloes
Paschim Mangaldoi	3.60	3.00	3.33
Pub Mangaldoi	2.30	3.00	5.40
Sipajhar	3.02	2.52	5.40
Kalaigaon	2.25	3.00	0.00
Dalgaon	2.78	2.84	2.50
Bechimari	2.40	2.30	3.00

Source: Field Survey, 2018

4.8.7 Milk productivity and production of the bovine stock at cluster level

The daily milk yield of the bovine stock is not uniform in the entire lactation length. Immediately after the calf is born, milk production gradually increases until reaching peak yield. At conception, milk production is low and the cycle repeats.In the selected project clusters of Darrang district the average daily milk productivity of a local cow during the lean period is 0.48 litres. During the peak lactation days of an indigenous cow the average productivity is 2.45 litres. The average lean and peak productivity of improved cattle stock is 3.51 and 11.27 litres and of buffaloes is 1.72 and 4.90 litres respectively.

Table 4.8.7: Lowest and highest levels of average daily milk production per cow in the clusters

Dairy cluster	Milk production for local cows litres		Milk production of improved cows litres		Milk production of buffaloes litres	
	Low	High	Low	High	Low	High
Paschim Mangaldoi	0.45	2.10	3.70	10.40	2.00	06.67
Pub Mangaldoi	0.46	2.25	3.33	10.33	2.00	05.00
Sipajhar	0.45	2.47	3.52	12.26	2.44	04.11
Kalaigaon	0.44	2.50	3.25	10.00	0	0
Dalgaon	0.55	2.89	2.26	09.32	1.88	09.13
Bechimari	0.50	2.50	3.00	09.33	2.00	04.50

Tables 4.8.8 to 4.8.10 show the average milk production of local, improved and buffalo stock of the district. Based on local cattle stock, the total milk production across the clusters is 22,821.58 litres. Based on improved cattle stock, Table 4.8.9 shows the total milk production of the improved cattle in the selected project clusters is 29,870 litres. The clusters reporting the presence of buffalo stock have an average productionof 5,275 litres of milk across the clusters. Among all the selected project districts, Darrang is found to have the highest milk production based on buffalo stock. The proportionate share of milk production across clusters is local cows 39.37%, improved cows 51.53% and buffaloes 9.10%. Since the productivity of improved cattle stock is relatively better in the project district, a relatively low proportion of farming HH rearing improved cattle stock i.e. 17% contributes almost 51.53% of the total milk production, while as high as 72% of the total farming HH rearing indigenous breed contributes 39.37% of total milk production across bovines. The predominance of indigenous cattle in the district and low milk productivity of the indigenous cattle indicate that the project clusters need to focus on cattle crossbreding to transform a large part of the farms from subsistence to commercial.

Table 4.8.8: Estimated total milk production based on total local cattle stock

Dairy cluster	Estimated no. of HH with local cattle	Average herd size (adult lactating animals)	Average milk production per local cow	Total milk production with local cattle stock*
Paschim Mangaldoi	0646.80	1.8	1.28	1,484
Pub Mangaldoi	1,125.36	1.2	1.36	1,754
Sipajhar	3,595.90	1.5	1.46	7,928
Kalaigaon	1,021.16	1.1	1.47	1,689
Dalgaon	1,941.55	1.4	1.72	4,642
Bechimari	1,249.60	1.2	1.50	2,249

*In estimating total milk production of local cows only the lactating animals were considered assuming 50% of the total adult local cattle as lactating.

Table 4.8.9: Estimated total milk production based on improved cattle stock

Dairy cluster	Estimated no. of HH with improved cattle	Average herd size (adult lactating animals)	Average milk production per improved cow	Total milk production with improved cattle stock*
Paschim Mangaldoi	117.60	1.5	7.05	1,244
Pub Mangaldoi	447.15	1.5	6.83	4,581
Sipajhar	435.24	1.3	7.89	4,327
Kalaigaon	234.90	1.5	8.63	2,334
Dalgaon	858.61	1.4	7.79	7,059
Bechimari	160.89	1.2	6.17	1,141

*In estimating total milk production of improved cattle only lactating animals are considered assuming 50% of the total adult improved cattle as lactating.

Table 4.8.10: Estimated total milk production based on buffalo stock

Dairy cluster	Estimated no. of HH with buffaloes	Average herd size (adult lactating animals)	Average milk production per improved cow litres	Total milk production with buffaloes*	Total milk production across bovine stock litres#
Paschim Mangaldoi	78.40	1.7	4.34	566	**3,294**
Pub Mangaldoi	185.00	2.7	3.50	1748	**8,083**
Sipajhar	73.79	2.7	3.28	652	**12,907**
Kalaigaon	0.00	0.0	0.00	00	**4,023**
Dalgaon	205.78	1.3	5.51	1,416	**13,117**
Bechimari	4.69	1.5	3.25	23	**3,413**

*In estimating total milk production of buffaloes only lactating animals were considered assuming 50% of the total adult buffaloes as lactating

#Total milk production is the summation of milk production across bovine stock in Tables 4.8.8 to 4.8.10.

4.8.8 Marketing behaviour of farmers at cluster level

All types of farms are found to sell their surplus milk. Farmers with local cattle stock keep a part of their milk

produced for home consumption and the remaining part is marketed to earn cash. Farmers with improved cattle stock produce primarily for the market to earn profit, while some portion of the produce is kept for HH consumption. Since total milk production is higheron commercial farms with crossbred/improved cattle the proportion of milk marketed is also high. On subsistence farms with one or two litres of milk production based on local cattle, more than 50% of milk produced is consumed at home. Table 4.8.11 shows that farm HH with local cattle across project clusters sell 38.95% of the total milk production, while farm HH with improved cattle stock sell 86.41% of their total HH milk production. Project clusters with presence of buffaloes sell 50.28% of their total milk production.

Table 4.8.11: Bovine stock percentage of milk sold per HH

Dairy cluster	% with local cows	% with improved cows	% with buffaloes
Paschim Mangaldoi	46.00	84.00	66.67
Pub Mangaldoi	48.33	86.67	63.33
Sipajhar	24.74	88.95	31.67
Kalaigaon	22.50	88.75	00.00
Dalgaon	52.11	83.42	90.00
Bechimari	40.00	86.67	50.00

Table 4.8.12 presents the sources of milk sale in the project clusters. Selling milk in the neighbourhood or selling in the local market is predominant in the majority of the clusters of Darrang. These are smallholder dairy farmers rearing dairy animals of indigenous breed to cater to the local raw milk consumers in their neighbourhood. Considering the district as a whole based on the selected clusters 48.70% of farmers sell milk locally, followed by selling to milk vendors (38.45). Selling milk to the DCS in all of the project clusters is only 0.97% pointing out that almost 99% of the total farmers in the selected cluster use informal channels to dispose of milk. The informal market actors such as milk traders and private processors together procure milk of almost 50% of the producers establishing an informal value chain between producers to traders and producers to SMs/CPs or producers to consumers to SMs.

Prices offered to producers by various marketing sources is the highest when farmers sell milk to private processors (INR43.32/litre) followed by INR42.75/ litre when sourced to local buyers. As shown by empirical studies in Assam and rest of India, cooperatives are weak in offering better prices to consumers; a similar finding is also reported in the study sites of Darrang where cooperatives offer only INR 38/litres across clusters.

There is a retail milk market in Kharupetia where some traders sell left over milk to the local consumers after the major portion of the milk sold to processing centres such as CPs and hotels. About 100 to 150 milk traders procure milk from the river blocks (Chapori) to take to the different market centres across the districts. The important centres to where maximum milk goes from these Chapori areas are Kharupetia, Mangaldoi town, Fakirpara, Balugaon etc.

Table 4.8.12: Percentage of milk sale by sources and their respective farm gate prices

Dairy cluster	Neighbours or local sale		To traders		To cooperatives		To private processors	
	%	Price/litre	%	Price/litre	%	Price/litre	%	Price/litre
Paschim Mangaldoi	20.00	45.00	68.00	36.40	0	-	12.00	46.25
Pub Mangaldoi	21.67	45.00	61.67	34.50	0	-	06.67	46.67
Sipajhar	50.00	42.11	16.32	37.87	5.79	38.00	21.05	41.12
Kalaigaon	62.50	42.50	27.50	40.00	0	-	10.00	45.00
Dalgaon	33.16	41.89	30.53	38.77	0	-	11.58	45.86
Bechimari	50.00	40.00	26.67	30.00	0	-	10.00	35.00

4.8.9 Access to veterinary services

Table 4.8.13 presents the number of veterinary service providers which include local veterinarians, VFA, CAHW and AI practitioners (mainly *Gopal Mitra*) providing services to the farmers. Across clusters an average of 1.33 local veterinarians operate, while the average distance from the farm villages is 4.80 km. VFAs are located on average 4.08 km from villages ranging from 1 km in Pub Mangaldoi cluster to almost 6 km in Paschim Mangaldoi and Kalaigaon clusters. None of the farmers in Darrang report access to CAHWs. There is an average of two AI practitioners in the guise of *Gopal Mitra* in each cluster with an average distance of 4.4 km from the sampled farm villages of clusters except in Paschim Mangaldoi.

Table 4.8.13: Access to veterinary services at the selected project clusters of the district

Dairy cluster	No. of local veterinarian*		Distance from the FGD location/ village km	No. of VFA		Distance from the FGD location/ village km	No. of CAHW		Distance from the FGD location/ village km
	Male	Female		Male	Female		Male	Female	
Paschim Mangaldoi	5	1	6.00	2	0	6.00	2	0	0
Pub Mangaldoi	2	0	1.00	3	0	1.00	0	0	0
Sipajhar	4	0	4.15	12	0	3.64	0	0	0
Kalaigaon	1	0	6.60	2	0	6.00	0	0	0
Dalgaon	1	0	4.41	4	0	3.75	0	0	0
Bechimari	1	0	6.66	1	0	4.10	0	0	0

*Local veterinarian includes both private and government.

4.8.10 Access to other services (input and breeding)

Except Pub Magaldoi, Kalaigaon and Bechimari cluster farmers reported the availability of three to five such shops where they can buy milk cans or other such equipment specifically designed for milk storage and transportation. Farmers across clusters reported that there areone to 10 grocery shops/pure feed shops in their local or village market where they can buy feeds for dairy animal. However, the average distance to shops is almost 3 km. In all of the selected clusters, farmers provide natural mating services with an average number of 2.5 breeding bull HH. The average distance of breeding services is 1.55 km (see Annexe Table A2).

4.8.11 Availability of producers/traders organizations and input supplying institutions at cluster level

Farmers report that there are five registered milk traders organization in Paschim Mangaldoi, one in Pub Mangaldoi and three in Dalgaon clusters. There are no SHG related to dairy farming practices or active milk producers' institutions. DCS exist in Pub Mangaldoi; Sipajhar and Dalgaon clusters (see Table 4.8.14).

Table 4.8.14: Availability of producers/traders organizations at cluster level

Dairy cluster	No. of milk traders organizations	No. of DCS
Paschim Mangaldoi	0	5
Pub Mangaldoi	1	1(Bandia)
Sipajhar	0	1(Haripur)
Kalaigaon	0	
Dalgaon	1	3(PachimPochabari,Nagajanetc.)
Bechimari	0	0

Farmers report that there is one BMC at Duni (Sipajhar), one at Athiabari (Kalaigaon) and one at Kharupetia (Dalgaon). As shown in Table 4.8.15 there is one DDL andone feed mill in Mangaldoi town. There is one private

veterinary clinic in Sipajhar and Bechimari clusters each, three in Mangaldoi and 10 in Dalgaon cluster from where medicines for animal health care/consultation with the veterinary doctors are available.

Table 4.8.15: Availability of input supplying institutions at cluster level

Dairy cluster	No. of dairy plant, chilling plant, BMC	No. of DDL	No. of feed testing laboratories	No. of feed mills	No. of private veterinary clinics
Mangaldoi town (Pachim Mangaldoi)	0	1	0	1 (Sanjukta feed mill)	3
Pub Mangaldoi	0	0	0	0	0
Sipajhar	1 (non-fuctional), 1 BMC (at Duni)	0	0	0	1
Kalaigaon	1 BMC (at Athiabari)	0	0	0	2
Dalgaon	1 (non-fuctional), 1 BMC (at Kharupetia)	0	0	0	10
Bechimari	0	0	0	0	1

4.8.12 Major milk market actors and other infrastructure in the dairy value chain

In Table 4.8.16, the number of milk market actors involved in the dairy value chain of the selected project clusters is presented. These market actors are linked to the major town or market point of the cluster.The number of milk traders range from two in Kalaigaon cluster to 150 in Dalgaon cluster. Most of these milk traders bring milk from the *Chapori* area and sell to CPs and SMs located in the major urban centres of the district.There is no cottage industry in Pub Mangaldoi, Kalaigaon and Bechimari as some of the cottage industry products such as ghee, curd and cream are available in the sweet shops. In the remaining clusters, there are one to eight cottage industries. The number of sweet shops in Dalgaon is the highest while lowest at two in Pub Mangaldoi.

Table 4.8.16: Number of milk market actors at cluster level (based on KII and FGD)

Dairy cluster	No. of milk traders	No. of cottage industries	No. of sweet shops
Mangaldoi town (Paschim Mangaldoi)	80	8	34
Pub Mangaldoi	4	0	2
Sipajhar	20	1	30
Kalaigaon	2	2	15
Dalgaon	150	5	40
Bechimari	4	0	10

The major linked markets where milk and milk products are traded are shown in Table 4.8.17. The major markets linked to these clusters are Aulichowka,Mangaldoi town, Badalguri, Islampur Chowk, Tengabari, Bordolguri Chok, Hazarikapara, Andharighat Chowk, Dipila, Sipajhar, Borbori, Bamunjhar, Baihata Chariali, Dumuni Chowki, Mangaldoi, Khandajan and Kharupetia. Farmers were asked if they had accessed bank credit during the 12 months previous to the survey and to name the banks.. A few farmers in Paschim Mangaldoi, Pub Mangaldoi and Sipajhar clusters reported that they availed bank loans from SBI, Central Bank of India, Indian Bank etc. Some of the unorganized commercial farms reported access to insurance services from the government supported insurance scheme under the NLM Guwahati. Such clusters are Paschim Mangaldoi and Sipajhar. The average number of villages having blacktop approach roads, gravel roads and earthen roads are 56.25%, 23.75% and 20% respectively out of the total villages across clusters.

Table 4.8.17: Markets and other infrastructure at cluster level

Dairy cluster	Markets with trading of milk and milk products*	Bank and other financing institutions	Insurance	Approach road quality (% of the total cluster villages)		
				Blacktop	Gravel	Earthen
Paschim Mangaldoi	Aulichowka Market,Mangaldoi town, Badalguri, Bhebarghat	Central Bank of India, Aulichowka, SBI, UBI, UCO, AGVB, Bandhan, MNSB, PNB-Mangaldoi	Oriental Insurance/New India Assurance, United India Insurance	45	25	30
Pub Mangaldoi	Mangaldoi town (daily), Tengabari, Dhula (weekly)	Indian Bank, AGVB	0	40	40	20
Sipajhar	Bordolgurichowk, Hazarikapara, Andharighat, Chowk, Dipila, Sipajhar (biweekly/daily), Borbori, Bamunjhar, Baihata Chariali, Dumuni Chowki, Mangaldoi, Khandajan	SBI, AGVB	Oriental Insurance/New India Assurance	70	10	20
Kalaigaon	Kalaigaon (weekly/daily)	UCO, AGVB		70	20	10
Dalgaon	Dalgaon (daily), Kharupetia (daily)	SBI, UBI, AGVB		60	20	20
Bechimari	Bechimari, Kharupetia					

*The frequency of markets is included in parentheses (daily, biweekly or weekly).

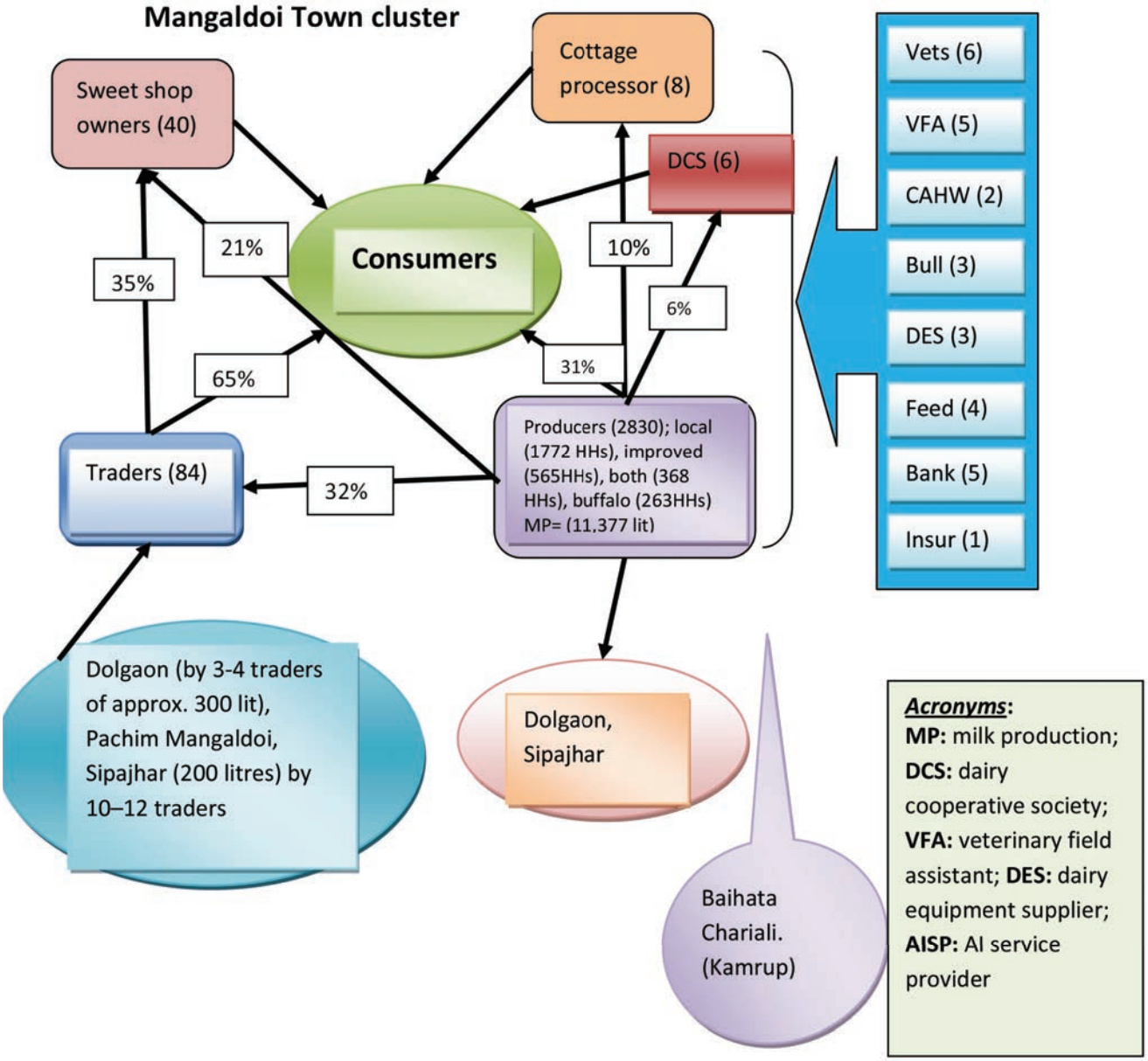
4.8.13 Progressive farmers at cluster level

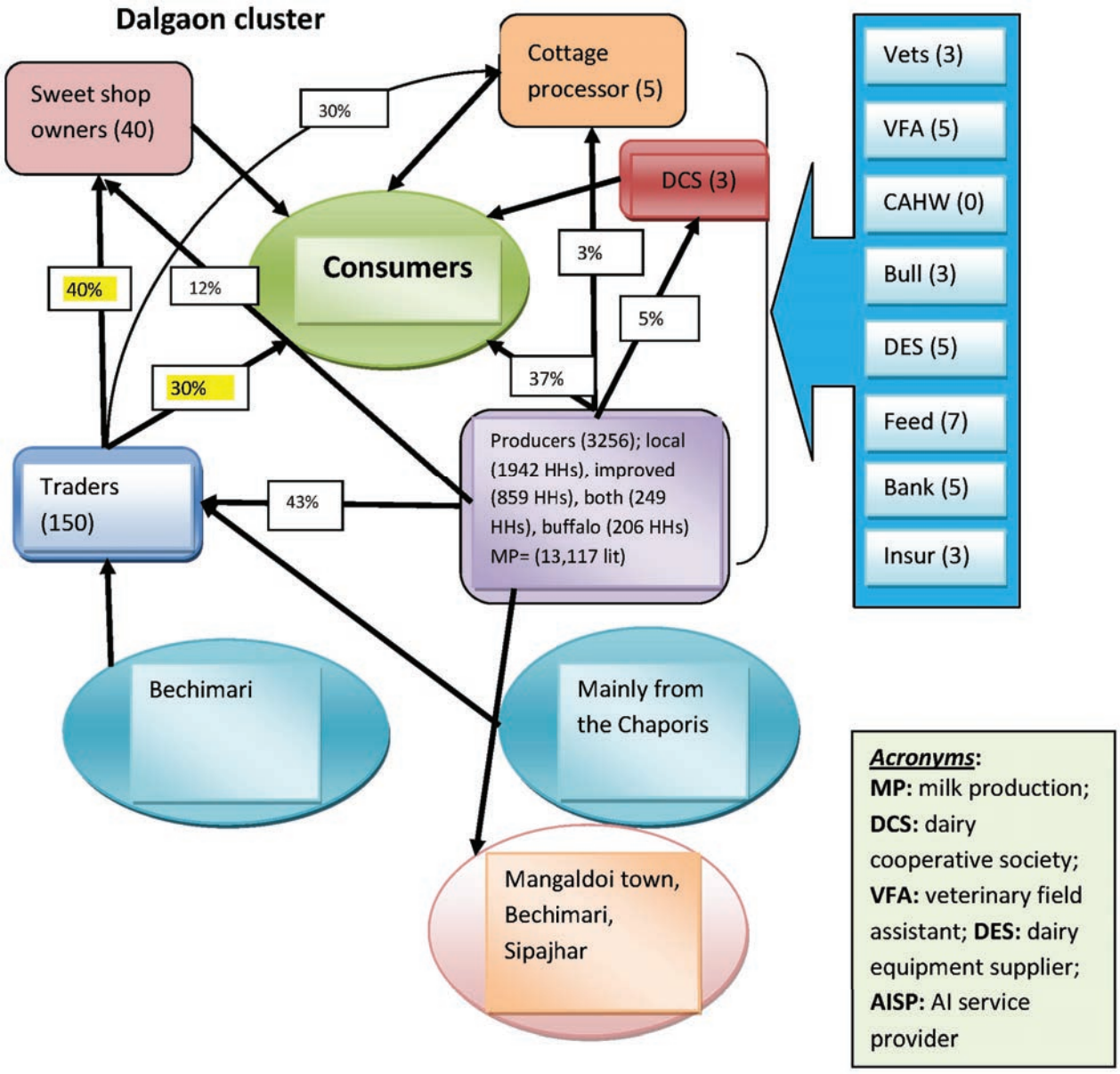
In Table 4.8.18 the progressive dairy farmers /CPs/SMs who can be considered entrepreneurs for the ongoing project from the selected clusters are shown. There are two such progressive farmers identified in Paschim Mangaldoi and Sipajhar each and one from Dalgaon.

Table 4.8.18: Names and contacts of promising progressive entrepreneurs in dairy

Dairy cluster	Number of entrepreneurs
Paschim Mangaldoi	2
Pub Mangaldoi	0
Sipajhar	4
Kalaigaon	1
Dalgaon	1
Bechimari	0

Figure 4.8.1: Schematic representation of the value chain actors of the major recommended clusters.





4.8.15 Summary and recommendations

The two important clusters with informal milk handling are Managaldoi town (Pub and Paschim Mangaldoi) and Dolgaon. Some major milk producing areas nearby to Managaldoi town are Serengchapari, Kharupetia, Bandiachapari, Puthimari, Nanglichar no. 2,3,4,5, Bangalpota, Gadhowachapari, Bakpuri, Moamari etc. Many farmers of the *Chapari* areas have indigenous cattle and buffaloes but some wards nearby the town have farms with improved breed cattle stock. Apart from the prominent sweet shops there are 4–5 cottage processors who sell apart from the processed products raw milk to the urban consumers of Mangaldoi. Milk is also supplied to some other markets like Baihata Chariali, Sipajhar and Solaigaon (esp. buffalo milk). Many of the milk traders supply their own milk to the sweet shops and/or pursue door to door retail sale. Next to Mangaldoi, Dolgaon cluster is the maximum milk producing cluster in Darang district. Char areas are the main milk producing areas. Around 200 litres of milk is supplied to Bechimari and some portion of milk is also supplied to Mangaldoi town. There is a retail milk market at Kharupetia where milk traders come from char areas and make retail sale of

residual milk after selling to SMs/CPs and local consumers. Kharupeta market is the main market in the cluster. No. 2 and 3 Madhab Gohain, Nadirpar, 1 and 3 no Sikanmati, Ulubari, Baruajhar no. 5 are some major milk producing villages in the Bechimari cluster. Apart from this the main milk producing villages are situated in char areas. For convenience of covering market actors to train, the following sequence may be followed:

Table 4.8.19: Cluster level planning for conducting training in Darrang district

Rank of importance	Name of the cluster	Possible no. of training sessions				Recommendations
		Prod (69)	SM (6)	CP (1)	MT (13)	
Most potential	Pachim Mangaldoi	6	1.70	0.40	5	1. Mangaldoi town is located under Pachim Mangaldoi cluster and milk mainly comes from some *Chapari* areas. Pub Mangaldoi can be merged with Pachim Mangaldoi for geographical nearness. 2. Market actors from Bechimari can participate in the training in Dalgaon cluster because these two clusters are adjoined.
	Pub Mangaldoi	15	0.10	0	0.2	
	Dalgaon	30	2	0.25	7.5	
	Bechimari	2	1	0	0.2	
Medium potential	Sipajhar	12	1.50	0.05	1	Market actors from Kalaigaon can participate in the training organized for the actors in Sipajhar cluster because of geographical proximity.
	Kalaigaon	4	0.75	0	0.1	
Less Potential	Nil					

Note: When considered for producer's training, only commercial farms were considered with ownership of high yielding improved animal stock plus the *khuti* system of rearing farms; **MT:** Milk traders; Figures within brackets indicate number of respective market actors.

4.9 Barpeta district

4.9.1 Cluster villages identification based on field visit

A total of four potential clusters have been identified in Nalbari district for the implementation of the on going project. The selected clusters covering the potential villages for the intervention of the informal dairy value chain are Mandia, Chenga, Rupsi, Bhawanipur, Goma Phulbari, Gobardhana, Barpeta, Bajali, Pakabatbari and Sarukshetri. After an initial overview and discussion with some of the informed sources such as DVO, VOs/BVOs of the respective clusters, the ILRI enumerators finalized the villages as listed by the DDD as potential clusters from where the village specific information were drawn. The names of villages are shown in Table 4.9.1.

Table 4.9.1: Cluster villages in Barpeta district

Dairy cluster	Names of the DDD-listed villages	Names of the ILRI-listed villages	Potential villages incorporated	Non-Potential villages dropped
Mandia	Ananda Bazar and adjacent village, Baghbar and adjacent village, Balikuchi and adjacent village, Bamundonga and adjacent village, Chaudhuribazar and adjacent village, Digirpan, 2no.Sesra, Tederapathar, Goroimari and adjacent village, GuralaBazaar and adjacent village, Janata Bazaar and adjacent village, Jania and adjacent village, Kadong Bazaar and adjacent Village, Kalpana andadjacent village, Mandia Bazaar and adjacent village, Manabas Bazaar and adjacent village, Medhirtari Bazaar and adjacent village, Milijuli and adjacent village, Pagola Bazaar and adjacent village,Rajibnagar and adjacent village, Kismat Moinbori, Pashim Moinboru, Uttar Moinbori, Joypur, Dhakaliapara, Soilmari, Hatsara, Chandmama, Chatra Moinbori,	Ananda Bazaar and adjacent village, Baghbar and adjacent Kismat Moinbori, Pashim Moinboru, Uttar Moinbori, Joypur, Dhakaliapara, Soilmari, Hatsara, Chandmama, Chatra Moinbori,	0	village, Balikuchi and adjacent village, Bamundonga and adjacent village, Chaudhuri Bazaar and adjacent village, Digirpan, No.2Sesra, Tederapathar, Goroimari and adjacent village GuralaBazaar and adjacent village, Janata Bazar and adjacent village, Jania and adjacent village, Kadong Bazaar and adjacent village, Kalpana and adjacent village, Mandia Bazaar and adjacent village, Manabas Bazaar and adjacent village, Medhirtari Bazaar and adjacent village, Milijuli and adjacent village, PagolaBazaar and adjacent village, Rajibnagar and adjacent village

Dairy cluster	Names of the DDD-listed villages	Names of the ILRI-listed villages	Potential villages incorporated	Non-Potential villages dropped
Chenga	Bahari, Niz-Bahari, Haripur, Bandali, Fulbari, Kakdhowa, Madrassa, Gelabil, Ganakpara, Bampara, No. 19 Batgaon, Kadamtola, Saruchenga, Nizchenga, Subha,	Bahari, Niz-Bahari, Haripur, Bandali, Fulbari, Kakdhowa, Madrassa, Gelabil, Ganakpara, Bampara, No. 19 Batgaon, Kadamtola, Saruchenga, Nizchenga, Subha,	0	0
Rupsi	Chenimari, Bebulamari,Khudrakuchi, Titapani, Bankabhanga, Langa, Banghugi, Khattartari, Boralipam, Rampur, Khelly, Raha, Dharampur, Haldia pathar, Haldhia Gaon, Bheragaon, Jamerpur, Ghugubari, Guileza, Lasanga, Moamari, Kawarjahi, Besimari, Kachukati, Khatakuchi, Kalgachia, Gunialguri, Balarpathar, Amguri, Sutirpathar, Kharbali, Balaipathar, Billartari, Deukhura, Dimapur, Monokocha, Tapeswara, Da Bondia,	Chenimari, Bebulamari, Khudrakuchi, Titapani, Bankabhanga, Langa, Banghugi, Khattartari, Boralipam, Rampur, Khelly, Raha, Dharampur, Haldia pathar, Haldhia Gaon, Bheragaon, Jamerpur, Ghugubari, Guileza, Lasanga, Moamari, Kawarjahi, Besimari, Kachukati, Khatakuchi, Kalgachia, Gunialguri, Balarpathar, Amguri, Sutirpathar, Kharbali, Balaipathar, Billartari, Deukhura, Dimapur, Monokocha, Tapeswara, Da Bondia,	0	0
Bhawanipur	Katalagaon, Katalapathar, Nakuchi Gaon, Nakuchipathar, Tangala, Bangalipara22, Dabaliapara, Duttakuchi, Jogirpam, Kadamguri, Nagarjhar, Sulkipara, Ambari, Patlijhar, Hazipara, Joypur, Ghilajari, Noonmati, Kaljhar, Itarbhita, Kujarpith, parts of Kadamguri	Katalagaon, Katalapathar, Nakuchi Gaon, Nakuchipathar, Tangala, Bangalipara22, Dabaliapara, Duttakuchi, Jogirpam, Kadamguri, Nagarjhar, Sulkipara, Ambari, Patlijhar, Hazipara, Joypur, Ghilajari, Noonmati, Kaljhar, Itarbhita, Ujarpith, Parts of Kadamguri	0	0
Goma Phulbari	Gogerpar, Barsuha, Dakreswar6, Palhaji, Goroimaripathar, Goroimari Gaon,	Gogerpar, Barsuha, Dakreswar6, Palhaji, Goroimaripathar, Goroimari Gaon,	0	o

Dairy cluster	Names of the DDD-listed villages	Names of the ILRI-listed villages	Potential villages incorporated	Non-Potential villages dropped
Gobardhana	Satboinitup, Balabhitha, Kalahabhanga, Bhuluki, Raipur, N. 4 and 10 wards of Barpeta Road town, Khoirabari, Dumani, Nichuka, Monipur, Uttar Athiabari, No. 1 and 2 wards of Barpeta Road, Moutupuri, Borborijhar, Halapukhuri	Satboinitup, Balabhitha, Kalahabhanga, Bhuluki, Raipur, No. 4 and 10 wards of Barpeta Road town, Khoirabari, Dumani, Nichuka, Monipur, Uttar Athiabari, No. 1 and 2 wards of Barpeta Road, Moutupuri, Borborijhar, Halapukhuri	0	0
Barpeta town	Fingua, Amadh, Niz Barala10, Bagodi, Kahikuchi, Bhoiraguri, Khardhara, Panicilla, Hahchora, Debradi	Mandia, Jania market and adjoining villages, Goroimari market and adjoining villages, Kayakuchi market and adjoining villages, Palhaji, Howli, Dattakuchi, Dabaliapara, Kadamguri, Coloni	Mandia, Jania market and adjoining villages, Goroimari market and adjoining villages, Kayakuchi market and adjoining villages, Palhaji, Howli, Dattakuchi, Dabaliapara, Kadamguri, Coloni	Fingua,Amadh,Niz Barala10, Bagodi, Kahikuchi, Bhoiraguri, Khardhara, Panicilla, Hahchora, Debradi,
Bajali	Baghmara, Bondhosidhani, Gharh, Rehabari, Daisingri, Okoia, Bamkhata, Doloigaon, Bhogpur, Muguria, Badankuchi, Bhaluki, Panimara, Balipara, KhudraBhaluki, Nalipara, Dumuria, Bedana, Titkataji, Helena, Jalikhata, Kuchbigha, NizChatisamuka, Kharadhara, Bamunpara, Bilpar, Goroimari, Bagapara, Patacharkuchi, Sarasapla, Bamunkuchi, Dharamtola, Gobindapur, Pathsalagaon, Raipur, Birkala, Haripur, Bhutanta Mohitara, BhutantaSaderi, Borsaderi, Kurubaha	Balipara, Bamunpara, Baghmara, Gharh, Rehabari, Daisingri, Okoia, Bamkhata, Doloigaon, Bhogpur, Badankuchi, Panimara, Balipara, KhudraBhaluki, Nalipara, Bedana, Titkataji, Helena, Jalikhata, Kuchbigha, NizChatisamuka, Bamunpara, Bilpar, Goroimari, Bagapara, Sarasapla, Bamunkuchi, Dharamtola, Gobindapur, Pathsalagaon, Raipur, Birkala, Haripur, BhutantaMohitara, Bhutanta Saderi, Borsaderi, Kurubaha, Lechera, Bhethua	Lechera, Bhethua	Kharadhara, Bhaluki, Patacharkuchi, Bondhosidhani, Muguria, Dumuria (*These are predominantly the formal sector villages.*)
Pakabatbari	Banbahar, Bhaukamari, KayakuchiGaon, Moralortari, Marisha, Chakravita6	Banbahar, Bhaukamari, Kayakuchi gaon, Moralortari, Marisha, Chakravita6	0	o
Sarukshetri	Amrikhowa1	Amrikhowa1	0	0

Although the Rupsi cluster was selected as a potential cluster under APART, a few of the villages are river blocks with rough road condition along with the embedded challenge of deputing manpower for effective implementation of the project. These villages include Titapani, Bheragaon, Jamerpur, Khatakuchi, Moamari, Kawarjahi and Kachukati. A few other villages were dropped from APARTdue to active penetration of AMUL in those villages. AMUL has opened milk collection centres inthe Rupsi block villages of Kalgachia, Aditpur, Baliguri, Janata, Deokura and Kokila. These collection centres coverthe majority of the project villages as shown below:

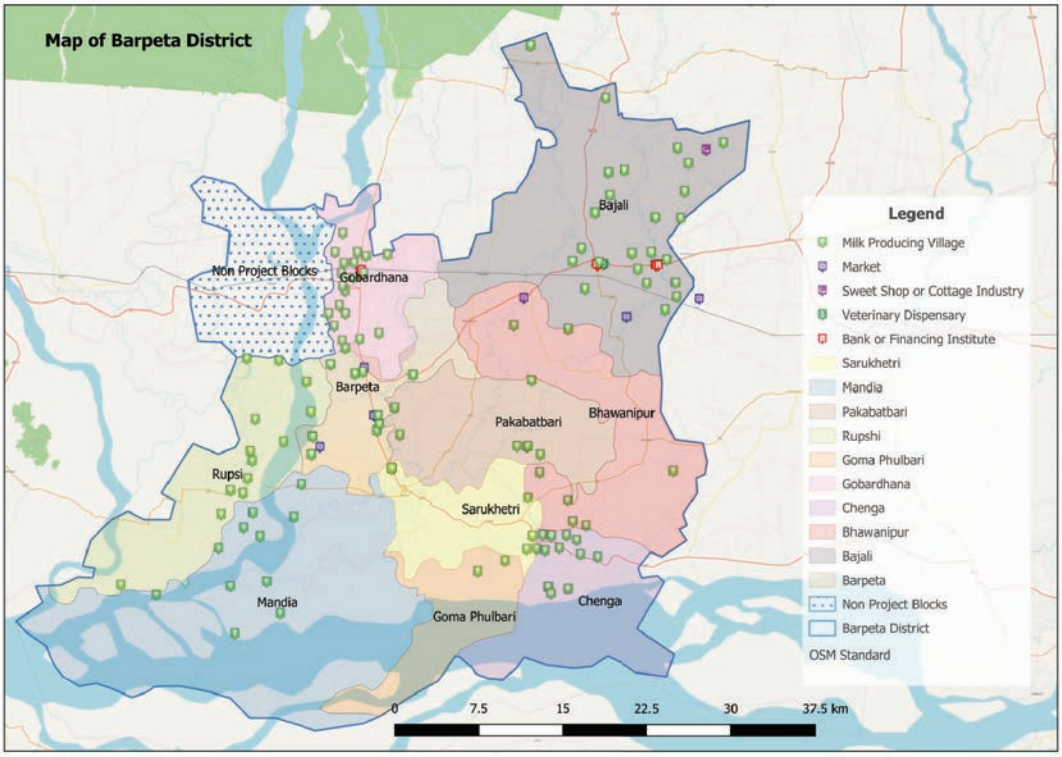
Table 4.9.2: AMUL milk collection centres

Kalgachia:	*Chenimari, Bebulamari, Lachanga, Besimari, Kalgachia, Gunalguri, Balarpathar, Amguri, Kharbali, Balaipathar, Bilartari, Monokocha, Tapeswara, Dabndia*
Aditpur:	*Chenimari, Bogulamari, Khudrakuchi (Balagaon), Titapani, Bankabhanga, Langla, Tapeswar*
Baliguri:	*Bangugi, Kattatari*
Janata:	*Kalgachia*
Deokura:	*Haldia pathar, Haldia Gaon, Ghugubari, Guileza, Lasanga, Moamari, Dimapur, Monokocha*
Kokila:	*Monokocha, Da-bandia, Tapeswara*

Apart from a few local vendors procuring milk from the project villages to the markets within the cluster such as in Kalgachia and Janata Bazaar, there are traders (6–7) from Goalpara town who come to Janata and other adjacent villages to collect milk. Processed milk such as curd is also sourced to Goalpara from this cluster. As informed by the VO of the SVD in Kalgachia, Hatsara village under Mandia cluster (as per the list) falls under Rupsi block. The VO also informs that the village Sutirpathar does exist at present as River Brahmaputra has receded and is currently connected to Jania.

In Mandia, the definition of cluster is not as per the requirements of being a cluster. Instead, there are several markets mentioned within the cluster and the adjoining villages. What guidelines were followed in selection of the villages was not clear.

Figure 4.9: The map of the surveyed clusters in Barpeta district.



4.9.2 FGD participants' profile

The number of participants segregated by gender and social status is presented in Table 4.9.3. The average number of participants across the project clusters is 8.92 in Barpeta district (male 7.29 81.73% and female 1.63 18.27%. The participants are predominantly from the 'general' category (74.87%) followed by participants from the OBC community (6.49%). No participants from ST were found, while SC people's representation is 16.32% among the total participants. In Mandia and Rupsi cluster, 100% of the farmers were from the general category as the population of these clusters is the Bengali-speaking Muslim community.

Table 4.9.3: Distribution of participants by gender and social status

Dairy cluster	Average number of participants			% social status of participants			
	Male (%)	Female (%)	Total	General	SC	ST	OBC
Mandia	8.19 (86.17)	1.21 (13.83)	9.40	100.00	00.00	0.00	00.00
Chenga	6.22 (74.31)	2.15 (25.69)	8.37	068.25	00.00	0.00	08.59
Rupsi	5.17 (63.83)	2.93 (36.17)	8.10	100.00	00.00	0.00	00.00
Bhawanipur	6.59 (78.08)	1.85 (21.92)	8.44	046.23	32.15	0.00	21.62
Goma Phulbari	9.22 (86.98)	1.38 (13.02)	10.60	065.21	00.00	0.00	34.79
Gobardhana	7.59 (85.28)	1.31 (14.72)	8.90	084.29	00.00	0.00	15.71
Barpetatown	8.22 (95.92)	0.35 (4.08)	8.57	082.31	00.00	0.00	17.69
Bajali	6.21 (70.01)	2.66 (29.99)	8.87	057.47	10.28	0.00	32.25
Pakabatbari	7.22 (89.25)	0.87 (10.75)	8.09	069.38	12.31	0.00	18.31
Sarukshetri	8.32 (84.21)	1.56 (15.79)	9.88	075.54	10.21	0.00	14.25

4.9.3 Farming system by type of bovine stock

The dairy farming system characterized by type of bovine stock in the selected project clusters shows that the district as a whole has 12,914 HH who have atleast one dairy cattle or buffalo, representing 44.94% of HH among the total HH across project clusters of Barpeta. The proportion of farming HH having local breed, improved breed and both local and improved are 77.19%, 10.80% and 5.59% respectively Proportion of farming HH with buffalo stock constitute 5.42% of the total HH (Table 4.9.4), as buffaloes are primarily held only in Sarukhetri cluster. The proportion of farmers having improved breed of cattle is relatively higher in Bajali and Sarukhetri clusters followed by Chenga and Gobardhana.

Table 4.9.4: Distribution of farm HH by type of bovine stock

Dairy cluster	Total HH	Total farming HH	% HH keeping cattle from local breeds	% HH keeping cattle from improved breeds	% HH keeping cattle from both local and improved breeds	% HH keeping buffaloes
Mandia	4,500	2,700	77.84	08.65	04.26	09.25
Chenga	2,500	1,420	67.00	12.50	15.35	04.65
Rupsi	6,840	2,599	84.68	09.44	05.88	00.00
Bhawanipur	3,520	1,232	85.00	10.00	03.50	01.50
Goma Phulbari	1,500	0370	84.81	08.75	06.44	00.00
Gobardhana	5,230	2,330	83.75	10.42	05.83	00.00
Barpetatown	4,058	1,684	85.85	08.25	04.65	01.25
Bajali	1,025	0675	73.00	17.00	10.00	00.00
Pakabatbari	1,420	0624	80.00	08.00	05.00	07.00
Sarukshetri	0400	0280	50.00	15.00	05.00	30.00

In the selected villages that constitute Goma Phulbari cluster, the local veterinary officer and VFAs reported that the number of dairy farmers in the majority of villages is decreasing with few villages being badly affected by soil erosion caused by Brahmaputra river on its northern bank. As per the comments of the VFA, a large part of some selected villages of the cluster have been wiped out and villagers have rehabilitated themselves to other places outside the district. A similar problem is seen in the Rupsi block as villages like Sutirpathar were flooded and part of the village is connected to Jania now.

4.9.4 Farming system by rearing practices

Table 4.5.9 presents that only 7.26% farm HH rear cattle in a fully stall-fed condition across project clusters, while the proportion of farmers rearing cattle in a partly stall-fed condition constitutes 89.68%. There is *khuti* system of rearing clusters like Mandia, Rupsi, Barpeta and Sarukhetri as these clusters are adjacent to River Brahmaputra and *Chapori* areas provide unique opportunities for open grazing. The farming system based on rearing practice is proportionately related to the type of bovine stock owned by the farming HH of the project clusters as in Table 4.9.3. The fully stall-fed rearing condition increases with the increase of the number of improved cattle stock (see Tables 4.9.4 and 4.9.45).

Table 4.9.5: Distribution of farm HH by rearing practices

Dairy cluster	% fully stall fed	% partly stall fed	% *khuti* (forage herd) system
Mandia	09.23	84.66	06.11
Chenga	13.28	86.72	00.00
Rupsi	06.35	87.77	05.88
Bhawanipur	05.60	94.40	00.00
Goma Phulbari	05.19	94.81	00.00
Gobardhana	06.85	93.15	00.00
Barpeta town	05.11	88.68	06.21
Bajali	10.00	90.00	00.00
Pakabatbari	06.10	93.90	00.00
Sarukshetri	04.92	82.69	12.39

4.9.5 Women's participation in dairy production and income control

Women and men were asked separately to describe women's role in dairy production and their control of income earned from milk products. Women's role in performing the rearing activities were more compared to their role in the control of income. Again, understanding the role of women in conducting farm activities depends on the nature of the farm and type of farm activities. In the project clusters of Barpeta district, women's role is higher compared to their male counterparts across the project clusters (62.08%). On the other hand, women's role in the control of income is measured as 36.79% for all four of the selected APART clusters of Barpeta district (Table 4.9.6).

Table 4.9.6: Women's role in dairy production and income control

Dairy cluster	No. of total farming HH	% women have role in milk production	% women have control of income from milk production
Mandia	2,700	62.00	31.67
Chenga	1,420	65.85	38.45
Rupsi	2,599	58.43	28.87
Bhawanipur	1,232	60.00	45.78
Goma Phulbari	0370	68.34	39.67
Gobardhanaa	2,330	57.33	28.45
Barpetatown	0684	60.45	30.00
Bajali	0675	55.67	50.00
Pakabatbari	0624	65.87	41.00
Sarukshetri	0280	66.90	34.00

4.9.6 Average herd size (adult animals) of the farm HH according to type of bovine stock

The average herd size of adult animals according to the type of bovine stock is shown in Table 4.9.7 for Barpeta district. The number of adult indigenous cattle per HH is 1.87 across the project clusters. The average improved cattle holding in each HH across selected project clusters is 2.73. In Rupsi, Goma Phulbari, Gobardhana and Bajali clusters none of the farmers owned buffaloes during the time the survey was conducted. However, the average herd size of buffaloes owned by farmers across remaining clusters is 1.94.

Table 4.9.7: Average herd size (adult animals) by the bovine stock in the project clusters

Dairy cluster	No. of local cows	No. of improved cows	No. of buffaloes
Mandia	1.40	2.34	2.65
Chenga	1.50	2.00	2.00
Rupsi	1.70	2.65	0.00
Bhawanipur	1.20	2.00	1.50
Goma Phulbari	2.41	2.75	0.00
Gobardhana	1.75	2.58	0.00
Barpetatown	2.10	2.65	1.34
Bajali	2.50	2.60	0.00
Pakabatbari	2.15	3.77	2.15
Sarukshetri	2.00	4.00	2.00

Source: Field Survey, 2018

4.9.7 Milk productivity and production of the bovine stock at cluster level

The daily milk yield varies in the entire lactation length showing an inverted U-shaped trend. Immediately after the calf is born, milk production gradually increases until it reaches peak yield. After conception, milk production is low and the cycle repeats. In the selected APART clusters of Barpeta the daily milk productivity of local cows during the lean period is 0.58 litres for the clusters as a whole. During peak lactation day's indigenous cattle give on average 2.38 litres. The average lean and peak productivity of improved cattle stock is 2.47 and 7.91 litres and of buffaloes 0.96 and 3.90litres/day respectively. The average milk yield of improved cattle is the highest in Chenga across the stages of lactation (6litres/cow/day) and the lowest in Pakabatbari cluster (5.64litres/cow/day) (Table 4.9.8).

Table 4.9.8: Lowest and highest levels of average daily milk production per cow in the clusters

Dairy cluster	Milk production for local cows litres		Milk production of improved cows litres		Milk production of buffaloes litres	
	Low	High	Low	High	Low	High
Mandia	0.25	2.45	2.25	08.45	1.00	3.00
Chenga	0.38	1.75	2.00	10.00	0.58	4.65
Rupsi	0.41	2.11	2.00	08.66	-	-
Bhawanipur	1.00	2.75	2.65	08.95	2.00	5.00
Goma Phulbari	0.63	2.50	2.70	00.00	-	-
Gobardhana	0.94	2.50	2.41	08.68	-	-
Barpetatown	0.48	2.00	2.10	08.88	0.58	3.25
Bajali	0.70	2.10	2.30	08.50	-	-
Pakabatbari	0.48	2.68	2.33	08.96	0.58	3.49
Sarukshetri	0.50	3.00	4.00	08.00	1.00	4.00

Table 4.9.9, 4.9.9to 4.9.11 shows the average milk production of local, improved and buffalo stock of the district. Based on local cattle stock, the total milk production across the clusters is approximately 12,529 litres with highest milk production of local cattle stock recorded as 2,936.82 litres in Gobardhana followed by Rupsi cluster with almost 2,357. The total milk production of the improved cattle in the selected project clusters is almost 9,222 litres, with the highest milk production reported to be 1,737 litres in Gobardhana followed by Rupsi (1,733) again. The clusters reporting the presence of buffalo population reared in either for aged herd system or on farm reported total milk production of 1,200 litres across the clusters. The proportionate share of total milk production by all three categories of bovine stock of the selected APART clusters is local cows 54.59%, improved cows 40.18% and buffaloes 5.23%. Compared to the other districts the share of milk production of buffalo stock is higher. Similarly, the indigenous cattle stock also contributes significantly to overall milk production of the select project clusters.

Table 4.9.9: Estimated total milk production based on total local cattle stock

Dairy cluster	Estimated no. of HH with local cattle	Average herd size (adult lactating animals)	Average milk production per local cow	Total milk production with local cattle stock*
Mandia	2,101.68	0.70	1.35	1,986
Chenga	0951.40	0.75	1.07	0760
Rupsi	2,200.83	0.85	1.26	2,357
Bhawanipur	1,047.20	0.60	1.88	1178
Goma Phulbari	0313.80	1.21	1.57	0592
Gobardhana	1,951.38	0.88	1.72	2,937
Barpeta	1,445.71	1.05	1.24	1,882
Bajali	0492.75	1.25	1.40	0862
Pakabatbari	0499.20	1.08	1.58	0848
Sarukshetri	0140.00	1.00	1.75	0245

*In estimating total milk production of local cows only the lactating animals were considered assuming 50% of the total adult local cattle as lactating.

Table 4.9.10: Estimated total milk production based on improved cattle stock

Dairy cluster	Estimated no. of HH with improved cattle	Average herd size (adult lactating animals)	Average milk production per improved cow	Total milk production with improved cattle stock*
Mandia	233.55	1.17	5.35	1,462
Chenga	177.50	1.00	6.00	1,065
Rupsi	245.35	1.33	5.33	1,733
Bhawanipur	123.20	1.00	5.80	0715
Goma Phulbari	032.38	1.38	5.85	0260
Gobardhana	242.79	1.29	5.55	1,737
Barpeta town	138.93	1.33	5.49	1,011
Bajali	114.75	1.30	5.40	0806
Pakabatbari	049.92	1.89	5.65	0531
Sarukshetri	042.00	2.00	6.00	0504

*In estimating total milk production of improved cattle only lactating animals are considered assuming 50% of the total adult improved cattle as lactating.

Table 4.9.11: Estimated total milk production based on buffalo stock

Dairy cluster	Estimated no. of HH with buffaloes	Average herd size (adult lactating animals)	Average milk production per improved cow	Total milk production with buffaloes*	Total milk production across bovine stock#
Mandia	249.75	1.33	2.00	661.84	**4,110**
Chenga	66.03	1.00	2.62	172.67	**1,998**
Rupsi	0.00	0.00	0.00	0.00	**4,090**
Bhawanipur	18.48	0.75	3.50	48.51	**1,941**
Goma Phulbari	0.00	0.00	0.00	0.00	**852**
Gobardhana	0.00	0.00	0.00	0.00	**4,673**
Barpeta	21.05	0.67	1.92	27.01	**2,920**
Bajali	0.00	0.00	0.00	0.00	**1,668**
Pakabatbari	43.68	1.08	2.04	95.56	**1,475**
Sarukshetri	84.00	1.00	2.50	210.00	**959**

*In estimating total milk production of buffaloes only lactating animals were considered assuming 50% of the total adult buffaloes as lactating.

Total milk production is the summation of milk production across bovine stock in table 4.9.8 to 4.9.10.

As on 2018, the approximate milk production in Gobardhanaa block is 20,000 litres (as reported by the local veterinary officer).

4.9.8 Marketing behaviour of farmers at cluster level

The marketed surplus of milk according to bovine stock is presented in Table 4.9.12. Marketed surplus is the left over milk after keeping for HH consumption and offering to relatives. Farmers with improved cattle stock produce primarily for market to earn profit, while some portion of the produce is kept for HH consumption. On the other hand, farmers with local cattle keep most of their produce for home consumption and if production is a little higher, they resort to disposing of the surplus through local sale. Since total milk production is more on commercial farms with crossbred/improved cattle the proportion of milk marketed is also high. On subsistence farms with one or two litres of milk production based on local cattle, more than 50% of the milk produced is generally consumed at home. Table 4.9.12 shows that farm HH with local cattle across project clusters sell 47.37% of the total milk production, while farm HH with improved cattle stock sell 85.52% of their total HH milk production. The project clusters with presence of buffaloes sell 60.63% of their total milk production.

Table 4.9.12: Bovine stock percentage of milk sold per HH

Dairy cluster	% with local cows	% with improved cows	% with buffaloes
Mandia	48.25	85.00	68.25
Chenga	50.00	84.65	73.55
Rupsi	65.66	80.00	00.00
Bhawanipur	60.00	88.00	45.00
Goma Phulbari	40.00	88.75	00.00
Gobardhana	46.67	91.36	00.00
Barpetatown	51.13	86.25	55.29
Bajali	34.00	86.00	-
Pakabatbari	48.00	85.23	61.66
Sarukshetri	30.00	80.00	60.00

Table 4.9.13 presents the major marketing channels in the project clusters. Selling milk in the neighbourhood or in the local market is a predominant source of milk sale (50.50%). Unlike the other districts, milk is sold by the subsistence farmers to the retail milk market in most parts of the clusters of the district. Prominent retail milk markets are on Barpeta Road (Gobardhana cluster) Goroimari, Coloni (Goma Phulbari cluster) Madia (Mandia cluster), Palhaji (Sarukhetri cluster) etc. Consumers, traders and processors of the district as well as from outside the district largely buy milk from these markets. Across the project clusters, selling milk to traders and private processors together constitute 35.28% of the total milk producers. Selling milk to the DCS across the project clusters is 14.22%. In clusters such as Bajali and Rupsi, milk is prominently sourced to formal sectors such as Purabi, Amuletc through DCS and collection centres. The average prices offered to producers by various marketing sources is the highest when farmers sell milk locally (INR38.63/litre). As obvious from empirical findings across India that cooperatives are weak in offering better prices to consumers, the DCS price in the study sites of Barpeta is only INR 37/litre. In Bajali cluster where milk is mainly sourced by Purabi they offer on average INR 35.20/litre which is the lowest among the prices offered by DCS. The price offered by private processors is INR 38.13/litre across the project clusters; the lowest price offered by private processors is in Bhawanipur and Goma Phulbari clusters.

Table 4.9.13: Percentage of milk sale by sources and their respective farm gate prices

Dairy cluster	Neighbours or local sale		To traders		To cooperatives		To private processors	
	%	Price/litre	%	Price/litre	%	Price/litre	%	Price/litre
Mandia	68.26	40.00	20.59	35.00	00.00	-	11.15	38.00
Chenga	72.12	40.00	12.33	36.00	01.77	36.00	13.78	40.00
Rupsi	15.24	35.00	10.51	40.00	65.00	40.00	09.25	40.00
Bhawanipur	12.50	40.00	57.50	40.00	10.00	37.00	05.00	35.00
Goma Phulbari	57.50	36.25	20.75	36.00	00.00	-	21.75	35.00
Gobardhana	39.17	37.92	42.50	36.71	00.00	-	18.33	38.33
Barpetatown	48.62	38.42	20.55	38.15	00.00	-	30.83	40.00
Bajali	25.00	40.00	02.00	45.00	65.40	35.20	07.60	40.00
Pakabatbari	81.60	39.25	06.22	35.26	0.00	-	12.18	40.00
Sarukshetri	85.00	40.00	05.00	35.00	0.00	-	10.00	35.00

Tea shop in Balipara village in Bajali cluster collects 130 litres of milk from the locality and the restis sourced either to DCS or markets in Patacharkuchi.

4.9.9 Access to veterinary services

Table 4.9.14 presents the number of veterinary service providers which include local veterinarians, VFAs, CAHWs and AI practitioners such as Gopal Mitra providing services to the farmers. Across clusters an average of 1.6 local veterinarians operate, while the average distance from the farm villages is 4.06 km. VFAs are located on average 2.94 km from villages at his duty ranging from 1 km in Rupsi cluster to almost 5.5 km in Bhawanipur cluster. None of the farmers in Barpeta report having access to a CAHW. There are one (in Chenga) to 10 (in Gobardhana) AI practitioners (Gopal Mitra) in the clusters of Barpeta district.

Table 4.9.14: Access to veterinary services at the selected project clusters of the district

Dairy cluster	No. of local veterinarian*		Distance from the FGD location/village km	No. of VFA		Distance from the FGD location/ village km	No. of CAHW		Distance from the FGD location/ village km
	Male	Female		Male	Female		Male	Female	
Mandia	1	0	1	2	0	0	0	0	0
Chenga	1	0	5	1	0	2.50	0	0	0
Rupsi	1	0	1	1	0	1	0	0	0
Bhawanipur	2	0	5.5	2	0	5.50	0	0	0
Goma Phulbari	2	0	2	4	0	2	0	0	0
Gobardhana	4	0	4.7	9	0	3.95	0	0	0
Barpetatown	3	0	5	2	0	1.50	1	0	2
Bajali	5	0	8.2	7	0	3.66	0	0	0
Pakabatbari	0	0	0	0	0	0	0	0	0
Sarukshetri	1	0	2	1	0	2	0	0	0

*Local veterinarian includes both private and governmentEmployed.

4.9.10 Access to other services (input and breeding)

Except in Goma Phulbari, Pakabatbari and Sarukhetri clusters, farmers reported the availability of at least one shop from where they can buy milk cans or other equipment specifically designed for milk storage and transportation. The highest number of shops is found in the Gobardhana cluster (20). However, the average distance to shops of the selected villages of the remaining clusters is almost 4 km. Shops where concentrate feeds are bought within the clusters are located on average almost 3 km from cluster villages (see AnnexeTable A2). There are no farmers in any of the APART clusters of this district providing natural mating services of purebred exotic bulls on a commercial basis. However, there are a few farmers with bulls (mostly indigenous/community bulls) used for breeding purposes and the average number of such bulls is 2.7across clusters with an average distance from the farmers of 1.54 km.

4.9.11 Availability of producers/traders organizations and input supplying institutions at cluster level

Farmers report that there is not any registered milk traders organization in the selected clusters. Similarly, there are not any SHGs related to dairy farming practices or active milk producers Institutions. However, the clusters show the presence of DCS in the selected clusters ranging from two in Bhawanipur to three in Rupsi, Barpeta and Bajali each (Table 4.9.15)

Table 4.9.15: Availability of producers/traders organizations at cluster level

Dairy cluster	No. of milk traders organizations	No. of DCS
Mandia	0	0
Chenga	0	0
Rupsi	0	3
Bhawanipur	0	2
Goma Phulbari	0	0
Gobardhana	0	0
Barpeta town	0	0
Bajali	0	3
Pakabatbari	0	0
Sarukshetri	0	0

In the Gobardhanaa cluster milk production is carried out by diverse social groups and the formation of DCS is difficult due to the failure to unite the farmers. As per the comments from a few farmers in the clusters, efforts were made to form DCS in a few villages but they are currently defunct existing in name only. As per the comments of the local veterinary officer and VFA, the active informal retail milk market inside Barpeta Road town market contributes to the challenge of DCS formation. The prices in the retail milk market fluctuate heavily ranging from INR 70–90 in the festive season to as low as INR 20–30 in the lean season. The high rates in the retail milk market during the festive season discourage farmers from supplying milk to the DCS drying up the DCS's milk collection in such periods although lower prices in the retail market makes supplying to DCS profitable. Such retail milk markets exist in several interior village markets in Barpeta district that contributes to the challenges of DCS formation in these areas also. In Chenga cluster it is evident through discussion with the FGD participants that the opportunity to exploit advantages of DCS formation is high because of milk marketing constants in the cluster.

Farmers report that there is one BMC in Bajali cluster, one at Kalgichia (Rupsi), two at Howli (Bhawanipur), two at Gobardhana and one at Barpeta town. There is one DDL at Barpeta town. None of the clusters has a feed testing laboratory. Farmers in Gobardhana cluster report that there is one feed mill in Satboni area. Table 4.9.15 indicates that there are a few private veterinary clinics in clusters such as Mandia, Rupsi, Bhawanipur, Gobardhanaa, Barpeta, Bajali and Sarukshetri clusters from where medicines for animal health care/consultation with the veterinary doctors are available.

Table 4.9.16: Availability of input supplying institutions at cluster level

Dairy cluster	No. of dairy plant, chilling plant, BMC	No. of DDL	No. of feed testing laboratory	No. of feed mill	No. of private veterinary clinic
Mandia	0	0	0	0	1 (Mandia)
Chenga	0	0	0	0	0
Rupsi	1 (at Kalgachia)	0	0	0	1 (Kalgachia)
Bhawanipur	1 (construction incomplete), 2 BMC	0	0	0	1
Goma Phulbari	0	0	0	0	0
Gobardhana	2Asomi and TMSS (at Sarbhog)	0	0	1 (Satboni)	2 (at Barpeta Road)
Barpeta town	1	1	0	0	1 (Barpeta)
Bajali	1 (Konimara MCC), 2 BMC (at Baghmara and Barbang)	0	0	0	2 (Nityananda, Pathsala)
Pakabatbari	0	0	0	0	0
Sarukshetri	0	0	0	0	1 (Palhaji)

4.9.12 Major milk market actors and other infrastructure in the dairy value chain

In Table 4.9.17, the number of milk market actors involved in the dairy value chain of the selected APART clusters of Nalbari district is presented. These market actors are linked to the major town or market point of the cluster. The number of milk traders is in the range of two in Pkabatbari to 40 in Barpeta town. For the convenience of training of milk traders, Barpeta Road (for Gobardhana cluster) and Barpeta town can be important training venues and traders and SMs can be invited to participate in the training. There are 30 cottage industry owners in Barpeta town, a few in Sarbhog area and Barpeta road (four) along with seven in Mandia. One training venue could be Barpeta town and one on Barpeta Road where cottage industry owners of Sarbhog may be invited to participate. The number of sweet shops in Barpeta town is the highest at 35 followed by 20 in Gobardhana cluster. Clusters such as Rupsi, Pakabatbari andSarukshetri may be avoided for economic training arrangements for SMs as the number of such sweet shops is low.

Table 4.9.17: Number of milk market actors at cluster level (based on KII and FGD)

Dairy cluster	No. of milk traders	No. of cottage industry owners	No. of sweet shop owners
Mandia	32	7	12
Chenga	0	0	15
Rupsi	10	0	8
Bhawanipur	12	0	10
Goma Phulbari	4	0	10
Gobardhanaa	35	4	20
Barpeta town	40	30	35
Bajali	25	2	22
Pakabatbari	2	0	6
Sarukshetri	5	0	10

The major linked markets where milk and milk products are traded are shown in Table 4.9.18. The major markets linked to these clusters are Mandia, Jania, Bohori, Kalgachia, Howly, Bhawanipur, Kayakuchi, Goroimari, Colony, Barpeta Road, Simaluguri, Barpeta town, Pathsala, Bajali and Palhaji. Farmers were asked if they accessed bank credit during the 12 months preceding the survey and to name the banks.Dairy farmers of some clusters reported receiving credit from formal financial sources such as PNB, AGVB, Axis Bank, Syndicate Bank, IDBI bank etc. Some of the unorganized commercial farms of all of the clusters reported access to insurance services from the government supported insurance scheme under the NLM Guwahati in clusters like Chenga, Gobardhanaa, Barpeta and Bajali. The percentage of villages having black top approach roads, gravel roads and earthen roads are respectively 36.50%, 32.50% and 33% in the project district as a whole.

Table 4.9.18: Markets and other infrastructure at cluster level

Dairy cluster	Markets with trading of milk and milk products*	Bank and other financing institutions	Insurance for livestock	Approach road quality (% of total cluster villages)		
				Blacktop	Gravel	Earthen
Mandia	Mandia, Jania	0	0	60	10	30
Chenga	Bohori	PNB	New India Assurance/ Oriental Insurance	20	30	50
Rupsi	Kalgachia	0	0	35	55	10
Bhawanipur	Howly, Bhawanipur, Kayakuchi	0	0	40	30	30
Goma Phulbari	Goroimari, Colony	0	0	20	40	40
Gobardhana	Barpeta Road, Simaluguri	SBI, AGVB, Axis, Syndicate Bank	New India Assurance/ Oriental Insurance	50	20	30
Barpeta town	Barpeta town	SBI, PNB, Canara Bank, UBI	New India Assurance/ Oriental Insurance	30	40	30
Bajali	Pathsala, Bajali	AGVB Tihu, IDBI Barpeta Road, AGVB-Nityananda, SBI, UCO, AXIS Bank	New India Assurance/ Oriental Insurance	60	20	40
Pakabatbari		0	0	30	60	10
Sarukshetri	Palhaji	0	0	20	20	60

Due to poor credit worthiness of small holder dairy farmers, formal financial institutions rarely extend financial support in terms of making bank loans available to these farmers. However, considering the dairy development with the emergence of large dairy farm owners in Bajali cluster, several formal financial institutions such as SBI, UCO Bank, Canara Bank, AGVB, AXIS Bank, HDFC bank and Overseas Bank have come forward to extend credit support.The insurance service facility in the Bajali cluster is discouraging.[2]

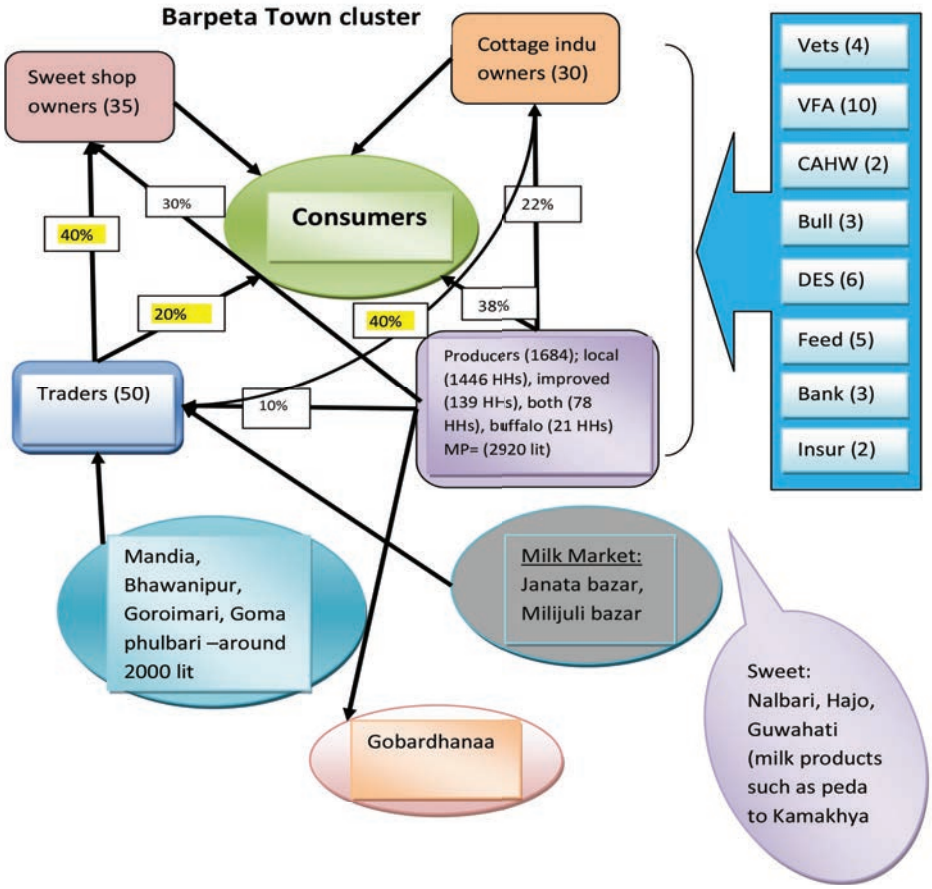
4.9.13 Progressive farmers at cluster level

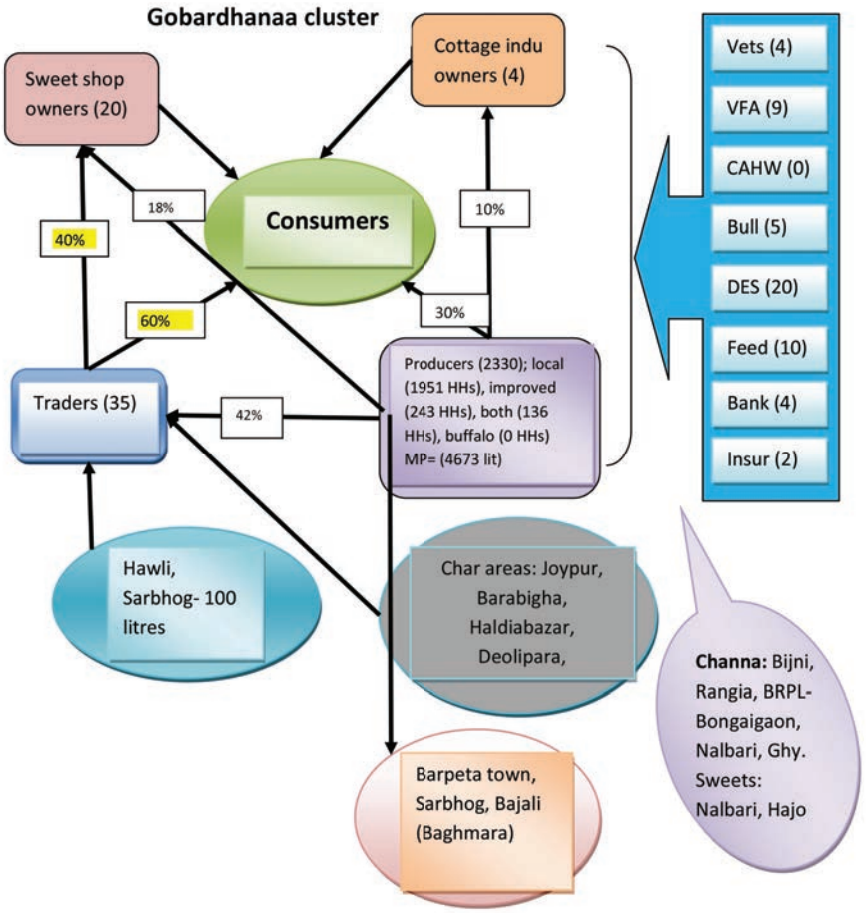
Table 4.9.19 indicates the number of progressive dairy farmers.

Table 4.9.19: Names and contacts of promising progressive entrepreneurs in dairy

Dairy cluster	Number of progressive farmers
Mandia	4
Chenga	0
Rupsi	0
Bhawanipur	0
Goma Phulbari	0
Gobardhana	1
Barpeta	0
Bajali	1
Pakabatbari	0
Sarukshetri	0

Figure 4.9.1: Schematic representation of the value chain actors of the major recommended clusters.





4.9.15 Quick observations and recommendations

In Barpeta district, two important informal milk clusters are Barpeta and Gobardhana where the highest numbers of cottage processors and sweet shop owners are present. Unlike the other districts, milk is mostly traded in retail milk markets. In Barpeta town cluster such markets are in Mandia, Palhaji, Kayakuchi, Goroimari, Barpeta Colony, Howly, Milijuli market etc. from where the traders collect milk and sell to sweet shops/cottage processors and urban consumers of Barpeta. Barpeta town has the highest number of cottage processors.One prominent retail milk market is located in the heart of Barpeta Road of Gobardhana cluster.As per the comments of the local veterinary officer and VFA the active informal retail milk market inside Barpeta Road contributes to the challenge of DCS formation. The prices in the retail milk market fluctuate heavily ranging from INR 70–90 in the festive season to as low as IN/R 20–30 in the lean season. The high rates in the retail milk market during festive season discourage farmers from supplying milk to the DCS drying up the DCS's milk collection in such periods, albeit lesser prices in the retail market makes supplying to DCS profitable. Retail milk market exists in several interior village markets in Barpeta district that contribute to the challenges of DCS formation in these areas too. In Chenga cluster it is evident through discussion with the FGD participants that the opportunity to exploit advantages of DCS formation is high with milk marketing constraints in the cluster. Although Bajali and Rupsi clusters are important in terms of milk production, active penetration of formal sector buyers to these clusters have left limited scope for development through informal sector intervention. Clusters like Amrikhowa based on *khuti* system of buffalo rearing face the challenge of erosion from the Brahmaputra river and many of the villages have been wiped out. For convenience of covering market actors to train the following sequence may be followed and effort should be made to track outside suppliers for quality check of the milk.

Table 4.9.20: Cluster level planning for conducting training in Barpeta district

Rank of importance	Name of the cluster	Possible no. of training sessions				Recommendations
		Producers (30)	SM (7)	CP (2)	MT (10)	
Most potential	Barpeta town	2	1.75	1.50	3	1. In Barpeta town milk mainly comes from retail milk markets and some production clusters such as Kayakuchi, Palhaji, Goroimari, Colony, Duttakuchi, Milijuli market, Jania and Mandia. Training should be imparted by identifying the commercial farmers of those clusters. 2. Barpeta Road is the main market centre of Gobardhanaa cluster with an active retail milk market in the heart of the town where milk comes from the listed production villages. Traders can be identified and trained from this market. For better coverage some market actors can be brought to Barpeta Road from Howli and Sarbhog.
	Gobardhanaa	9	1	0.10	2.75	
Medium potential	Bajali	2	0.75	0.10	1.25	1. Bajali is an important production cluster with active coexistence of the formal sector (several DCS procuring milk). Mandia and Bhawanipur are considered independent clustersin spite of some milk coming to Barpeta town.
	Mandia	4	0.60	0.35	1.60	
	Bhawanipur	4	0.50	0	0.60	
Less Potential	Chenga	4	0.75	0	0	1. Market actors in these clusters are less and thus these clusters may be prioritized lower in terms of organizing training.
	Rupsi	3	0.40	0	0.50	
	Sarukhetri	0.5	0.25	0	0.50	
	Pakabatbari	1	0.30	0	0.10	
	Goma Phulbari	1	0.50	0	0.20	

Note: When considered for producer's training, only commercial farms were considered with ownership of high yielding improved animal stock plus the *khuti* system of rearing farms; **Prod:** Dairy producers MT**:** Milk traders; Figures within brackets indicate number of respective market actors.

4.10 Nagaon district

4.10.1. Cluster village identifications based on field visit

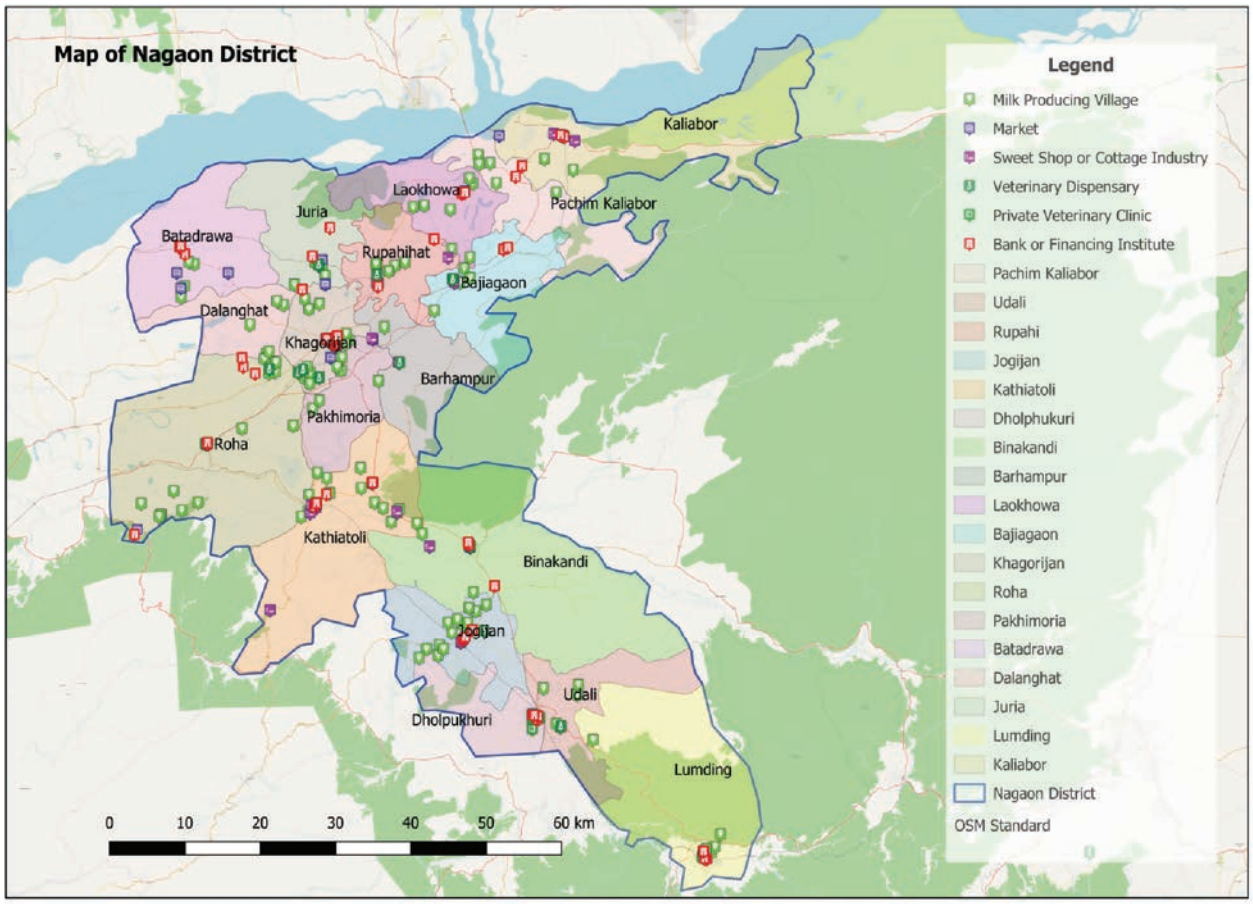
A total of 18 potential clusters have been identified in Nagaon district for the implementation of the ongoing project. The number of clusters is the highest in Nagaon among all the selected project districts of the state. After an initial overview and discussion with some of the informed sources such as DVO, VOs/BVOs of the respective clusters, the ILRI enumerators finalized the villages as listed by the DDD as potential APART clusterswhere the village-specific information was drawn. The names of villages are shown in Table 4.10.1.

Table 4.10.1: Cluster villages in Nagaon district

Dairy cluster	Names of the DDD-listed villages	Names of the ILRI- listed villages	Potential villages incorporated	Non-potential villages dropped
Paschim Kaliabor	Kuhimari, Hatiandha,Goroimari, Kulidanga, Dhuanikhowa, Lakhanabandha, Pataliati	Kulidanga, Goroimari, Hatiandha	0	Kuhimari, Dhuanikhowa, Lakhanabandha, Pataliati,
Lumding	Ward no2, Pub Lumding, Murabasti, Christanbasti, Tarabasti, Chandurabasti, Derakotha-1,2,3,4,	ward no2, Pub Lumding, Murabasti, Christanbasti, Tarabasti, Chandmari (11 no Ward), Lal Charul Chandurabasti, Derakotha-1,2,3,4,	Chandmari (11 no. Ward), Lal Charul	0
Roha	Sariohtoli, Kholihomari, Pachim Bola, Banduradua, Silbheta, Hatbar, Dhuadoloni, Pubgula, Balichara Mikirgaon, Balichera Doloni, Buraraja	Buraraja, Balichera, Pubgula, Silbheta, Kholihomari, Pachim Bola	NIL	Sariohtoli, Banduradua, Hatbar, Dhuadoloni
Dholpukhuri (Hojai)	Pub Bhalukmari, Borpukhuri, Singrabasti, Dakhin Bidyanagar, Maina Pather, Dighalbari, Kumarakata	Singaribasti, Mainapathar, Kumarkata (Theplaguri), PachimAtala	PachimAtala,	Pub Bhalukmari, Borpukhuri, Dakhin Bidyanagar, Dighalbari
Udali	Majudali, Pubdali, Lachitpather, Dakhingudali, Kacharigaon, Borjoha	Majudali, Pubdali, Lachitpather, Dakhingudali, Kacharigaon, Borjoha, Juthang Basti, Bamungaon, PipulPukhuri	Juthang Basti, Bamungaon, PipulPukhuri	0
Juria	Bogoriguri, Kaowimari, Niz-juria, Mohgura, Dighalati,	Kaowimari, Bogoriguri, Tinsukia, Mahguri Gaon, NizJuria, Dighalati	Tinsukia,	0
Batadrawa	Saharia, Batabori, Ahomgaon, Dhupguri Kachari, Baruaati	Saharia, Dhupguri Kacharigaon, Ahomgaon, Baruaati	0	Batabori

Dairy cluster	Names of the DDD-listed villages	Names of the ILRI- listed villages	Potential villages incorporated	Non-potential villages dropped
Bajiagaon	Kacharigaon, Samogurigrant, Kuruabahi, Auniati, Hahchari Baraligaon	Barmabil, Singia Phukanghat, Samoguri Grant, Karuabahi, Kanuwamari, Barmabil, Sonaribari,	Bhamabil. Singha Phukanghat, Kanuwamari, Sonaribari	Kacharigaon, Auniati, Baraligaon
Barhampur	Kakiani, Singia, Putani	Kakiani, Putani	0	Singia
Laokhowa	Kabuki Jaroni, Uttar Beloguri, Uttar Bhumuraguri, MahBorali, DhakhinBhumuraguri	Borunguri, Lailuri, Kathpara	Borunguri, Lailuri, Kathpara	Kabuki Jaroni, Uttar Beloguri, Uttar Bhumuraguri, Mah Borali, Dhakhin Bhumuraguri
Khagorijan	AlengiSatra, Kumargaon, Kokalipather, Sensua	Alengi Satra, Kumargaon, Kokalipather, Sensua, Baligaon, Birah Bebejia	Baligaon, BirahBebejia	0
Pakhimoria (SP)	Morongial, Kataiani, Jharani, Na Bebejia	Morongial, Jharani, Na Bebejia, Sutahaibar, Begenati	Sutahaibar, Begenati	Kataiani
Dalanghat	Niz- Hatichung, Darangial, Phulaniati, Gedarbori, Samuagaon,	Niz- Hatichung, Darangial, Phulaniati, Gedarbori, Samuagaon	0	0
Kathiatali	Debnarikal, Ghilani, Bandura, Charaibari, Dakhinpat	Palaraha, Kathalguri, Jummawar, Mazarati Gaon, Raja Gaon, Burhapatia Gaon	Palaraha, Kathalguri, Jummawar, Mazarati Gaon, Raja Gaon, Burhapatia Gaon	Debnarikal, Ghilani, Bandura, Charaibari, Dakhinpat
Kaliabor	Satial, Sakmuthi, Dolgaon, BarpetaDoloni, Nizarigaon	Basudevbari, Satial, Sakmuthi, Doloni	Basudevbari	Barpeta, Nizarigaon
Rupahihat	KeriaChapori, Geomari, Jarathiani, Thanatup, Batamari	Geomari, Batamari, Puthikhaiti, Kuchgaon, Rupahi, Saidaria	Puthikhaiti, Kuchgaon, Rupahi, Saidaria	KeriaChapori, Jarathiani, Thanatup
Jogijan	Gopalnagar, Dankigaon, Alinagar, Kathalpur, Pubsolmarijan,	Fatepur, Islamnagar, Dimrupar	Fatepur, Islamnagar, Dimrupar	Gopalnagar, Dankigaon, Alinagar, Kathalpur, Pubsolmarijan,
Binakandi	Sarupather, Bheloguripather, Block no-48, Bheloguri, Chang Maji	Sarupather, Bheloguripather, Block no-48, Bheloguri, Chang Maji	0	0
Nagaon town	0	2 No. PanigaonKacha Ali, PanigaonChayali, Charikhuti, Basbari, Dakhinpat, Barjoha, Kenduguri, Katimari Grant/Pathar, Harapatty, ChotoRupahi	No. 2 PanigaonKecha Ali, PanigaonChayali, Charikhuti, Basbari, Dakhinpat, Barjoha, Kenduguri, Katimari Grant/Pathar, Harapatty, ChotoRupahi	0

Figure 4.10: The map of the surveyed clusters in Nagaon district.



4.10.2 FGD participants' profile

The number of participants segregated by gender and social status is presented in Table 4.10.2. The average number of participants across the project clusters is 8.78 in Nagaon district (male 5.46 62.19% and female 3.32 37.81%). The participants are predominantly from the 'general' category (71.77%) followed by participants from the OBC community (13.08%). Participation from the ST community was 8.07%, while SC people's representation is only 7.11% among the total participants.

Table 4.10.2: Distribution of participants by gender and social status

Dairy cluster	Average number of participants			% social status of participants			
	Male	Female	Total	Gen	Sc	ST	OBC
Paschim Kaliabor	5.21	3.22	08.43	72.28	07.00	10.14	10.58
Lumding	6.15	2.18	08.33	60.29	05.34	25.22	09.24
Roha	4.62	3.91	08.53	78.26	00.00	05.23	16.51
Dholpukhuri (Hojai)	7.11	1.59	8.70	58.33	5.96	25.33	10.38
Udali (Lanka)	6.31	2.11	8.42	85.45	0.00	12.31	2.24
Juria	3.22	6.15	9.37	56.73	15.28	9.89	18.19
Batadrawa (Dhing)	6.19	2.88	9.07	96.28	0.00	0.00	3.72
Bajiagaon	6.59	3.77	10.36	79.18	15.23	0.00	5.59
Barhampur	6.62	3.22	9.84	89.65	0.00	0.00	10.35
Laokhowa	5.13	2.45	7.58	56.21	10.28	2.34	31.77
Khagorijan	3.41	4.96	8.37	60.18	4.50	0.00	35.32
Fakimara	5.62	3.85	9.47	79.38	12.23	3.17	5.22
Dalanghat	6.14	2.81	8.95	88.17	0.00	0.00	11.83
Kathiatali	7.24	1.66	8.90	65.21	12.38	9.79	12.62
Kaliabor	3.22	2.53	5.75	58.23	5.61	30.87	5.29
Rupahihat	4.97	6.21	11.18	67.35	15.29	4.62	12.74
Jogijan(Jogijan)	5.20	3.18	8.38	55.67	18.95	0.00	25.38
Binakandi (Doboka)	5.29	3.20	8.49	85.07	0.00	6.38	8.55
Nagaon town	4.28	2.56	6.84	57.28	16.28	9.15	17.29

4.10.3 Farming system by type of bovine stock

The dairy farming system characterized by type of bovine stock in the selected project clusters show that the district as whole has 19,371 HH who have atleast one dairy cattle or buffalo, representing 64.53% HH among the total HH across project clusters in Nagaon district. According to breed of cattle for the selected clusters as a whole, the proportion of farming HH having local breed, improved breed and both local and improved are 79.37%, 13.83% and 5.92% respectively. Proportions of farming HH with buffalo stock constitute a meager 0.88% of the total HH (see Table 4.10.3), as buffaloes are held only in a few clusters. The proportion of farmers having improved breed of cattle is higher in Jogijan and Dholpukhuri (30% and 25% respectively).

Table 4.10.3: Distribution of farm HH by type of bovine stock

Dairy cluster	Total HH	Total farming HH	% HH keeping cattle from local breeds	%HH keeping cattle from improved breeds	% Hs keeping cattle from both local and improved breeds	% HH keeping buffaloes
Paschim Kaliabor	1,160	680	87.33	10.33	2.33	0.00
Lumding	1,585	980	78.00	16.00	6.00	0.00
Roha	890	525	88.50	6.00	5.00	0.50
Dholpukhuri (Hojai)	1,982	900	67.00	25.00	7.00	1.00
Udali (Lanka)	3,150	2,000	70.00	20.00	10.00	0.00
Juria	4,729	3,300	80.83	10.83	3.33	5.01

Dairy cluster	Total HH	Total farming HH	% HH keeping cattle from local breeds	%HH keeping cattle from improved breeds	% Hs keeping cattle from both local and improved breeds	% HH keeping buffaloes
Batadrawa (Dhing)	1,301	780	90.33	4.67	5.00	0.00
Bajiagaon	3,335	2,500	89.40	10.60	0.00	0.00
Barhampur	290	210	84.00	6.00	10.00	0.00
Laokhowa	930	680	86.67	7.67	5.67	0.00
Khagorijan	656	240	80.00	15.00	5.00	0.00
Fakimara	1,550	985	67.80	23.00	8.20	1.00
Dalanghat	1,165	920	77.40	9.60	6.00	7.00
Kathiatali	2,676	1,876	90.17	8.50	0.00	1.33
Kaliabor	120	50	70.00	20.00	10.00	0.00
Rupahihat	2,800	1,170	71.67	15.00	13.33	0.00
Jogijan (Hojai)	900	525	63.33	30.00	6.67	0.00
Binakandi (Doboka)	1,800	1,050	86.25	10.75	3.00	0.00
Nagaon town	3,500	2,100	79.65	13.28	7.07	0.00

4.10.4 Farming system by rearing practices

Table 4.10.4 presents that 15.97% farm HH rear cattle in a fully stall-fed condition across project clusters, while the proportion of farmers rearing cattle in a partly stall-fed condition constitutes 84.03%. There is not any *khuti* system of rearing in any of the project clusters in Nagaon. The farming system based on rearing practice is proportionately related to the type of bovine stock owned by the farming HH of the project clusters as in Table 4.10.3. The fully stall-fedfarming system increases with the increase of the number of improved cattle stock (see Table 4.10.3 and Table 4.10.4).

Table 4.10.4: Distribution of farm HHs by rearing practices

Dairy cluster	% fully stall fed	% partly stall fed	*% khuti* (forage herd) system
Paschim Kaliabor	87.00	13.00	0.00
Lumding	70.00	30.00	0.00
Roha	90.67	09.33	0.00
Dholpukhuri (Hojai)	77.00	23.00	0.00
Udali (Lanka)	82.50	17.50	0.00
Juria	90.56	09.44	0.00
Batadrawa (Dhing)	88.21	11.79	0.00
Bajiagaon	89.40	10.60	0.00
Barhampur	94.00	06.00	0.00
Laokhowa	90.67	09.33	0.00
Khagorijan	85.00	15.00	0.00
Fakimara	79.80	20.20	0.00
Dalanghat	83.40	16.60	0.00
Kathiatali	92.00	08.00	0.00
Kaliabor	75.33	24.67	0.00

Dairy cluster	% fully stall fed	% partly stall fed	% *khuti* (forage herd) system
Rupahihat	72.19	27.90	0.00
Jogijan(Hojai)	78.83	21.17	0.00
Binakandi (Binakandi)	86.00	14.00	0.00
Nagaon town	82.00	18.00	0.00

4.10.5 Women's participation in dairy production and income control

Women and men were asked separately to describe women's role in dairy farming and their control of related income. Women's roles in performing the rearing activities were more compared to their role in the control of income. Again, understanding the role of women in conducting farm activities depends on the nature of the farm and type of farm activities. In the project clusters of Nalbari district, women's role is less (47.79%) compared to their male counterparts.Women's role incontrol of income is measured as 39.49% for all of the 18 selected APART clusters of Nagaon district (Table 4.10.5).

Table 4.10.5: Women's role in dairy production and income control

Dairy cluster	No. of total farming HH	% women have role in milk production	% women have control in income from milk production
Paschim Kaliabor	680	48.33	43.28
Lumding	980	40.00	45.00
Roha	525	55.83	42.33
Dholpukhuri (Hojai)	900	45.28	38.65
Udali (Lanka)	2,000	40.00	29.36
Juria	3,300	33.33	29.69
Batadrawa (Dhing)	780	39.56	35.28
Bajiagaon	2,500	48.78	33.09
Barhampur	210	50.02	42.77
Laokhowa	680	48.38	36.05
Khagorijan	240	49.79	38.25
Fakimara	985	50.65	45.29
Dalanghat	920	54.29	41.70
Kathiatali	1876	45.28	45.98
Kaliabor	50	64.72	50.18
Rupahihat	1170	58.68	38.19
Jogijan(Hojai)	525	48.95	40.08
Binakandi (Doboka)	1,050	38.29	35.65
Nagaontown	2,100	47.79	39.49

4.10.6 Average herd size (adult animals) of the farm HH according to type of bovine stock

The average herd size of adult animals according to the type of bovine stock is shown in Table 4.10.6. The number of adult indigenous cattle per HH is 1.63 across the project clusters. The average improved cattle holding in each HH across selected project clusters is 2.36 adult cattle heads. The farmers in clusters such as Paschim Kaliabor, Lumding, Udali, Batadrawa, Laokhowa, Khagorijan, Dalanghat, Kaliabor, Rupahihat, Jogijan and Binakandi reported that none of the farmers owned buffaloes during the time the survey was conducted. The average herd size of buffaloes in the remaining clusters is 3.20 cattle heads.

Table 4.10.6: Average herd size (adult animals) by the bovine stock in the project clusters

Dairy cluster	No. of local cows	No. of improved cows	No. of buffaloes
Paschim Kaliabor	2.00	2.33	0.00
Lumding	1.80	2.60	0.00
Roha	1.64	3.00	2.00
Dholpukhuri (Hojai)	0.65	2.37	3.00
Udali (Lanka)	1.80	1.75	0.00
Juria	2.00	2.50	3.20
Batadrawa (Dhing)	2.00	2.00	0.00
Bajiagaon	1.50	2.60	4.50
Barhampur	0.75	2.00	3.50
Laokhowa	2.00	2.33	0.00
Khagorijan	1.85	2.66	0.00
Fakimara	1.67	2.80	2.50
Dalanghat	2.00	2.60	0.00
Kathiatali	1.43	2.33	3.67
Kaliabor	1.25	2.00	0.00
Rupahihat	2.00	2.23	0.00
Jogijan(Hojai)	1.50	2.10	0.00
Binakandi (Doboka)	1.43	2.22	0.00
Nagaon town	1.63	2.36	0.00

Source: Field Survey, 2018

4.10.7 Milk productivity and production of the bovine stock at cluster level

The daily milk yield varies in the entire lactation length showing an inverted U-shaped trend. Immediately after the calf is born, milk production gradually increases until peak yield is reached. At conception, milk production is low and the cycle repeats. In Nagaon the daily milk productivity of local cows during the lean period is 0.52 litres for the clusters as a whole. During the peak lactation days of the indigenous cattle average productivity is 2.11 litres. The average lean and peak productivity of improved cattle stock is 2.57 and 8.82 litres and of buffaloes across clusters is 1.71 and 4.47 litres/day respectively.

Table 4.10.7: Lowest and highest levels of average daily milk production per cow in the clusters

Dairy cluster	Milk production for local cows litres		Milk production of improved cows litres		Milk production of buffaloes litres	
	Low	High	Low	High	Low	High
Paschim Kaliabor	0.42	2.50	3.00	9.33	0.00	0.00
Lumding	0.45	2.20	2.50	11.20	0.00	0.00
Roha	0.50	2.75	1.67	8.80	1.00	3.00
Dholpukhuri (Hojai)	0.50	2.00	2.20	8.50	2.00	4.50
Udali (Lanka)	0.50	2.00	2.50	6.50	0.00	0.00
Juria	0.60	1.80	3.50	11.17	2.00	5.00
Batadrawa (Dhing)	0.42	2.00	1.83	7.67	0.00	0.00
Bajiagaon	0.83	1.83	2.50	8.76	1.00	3.50
Barhampur	0.53	2.00	1.50	6.92	1.87	2.56

Dairy cluster	Milk production for local cows litres		Milk production of improved cows litres		Milk production of buffaloes litres	
	Low	High	Low	High	Low	High
Laokhowa	0.50	2.00	3.67	7.67	0.00	0.00
Khagorijan	0.50	2.00	2.83	6.83	0.00	0.00
Fakimara	0.50	2.00	2.20	10.40	1.50	4.00
Dalanghat	0.55	2.00	2.20	10.60	1.25	5.00
Kathiatali	0.58	2.25	3.50	10.23	2.50	5.33
Kaliabor	0.50	2.00	2.50	8.00	0.00	0.00
Rupahihat	0.50	2.00	2.00	8.00	0.00	0.00
Jogijan(Hojai)	0.50	2.30	3.20	8.67	0.00	0.00
Binakandi(Doboka)	0.50	2.40	3.00	9.50	0.00	0.00
Nagaon town	0.52	2.11	2.57	8.82	0.00	0.00

Tables 4.10.8 to show the average milk production of local, improved and buffalo stock of the district. Based on local cattle stock, the total milk production across the clusters is approximately 17,223 litres. The total milk production of the improved cattle in the selected project clusters is almost 17,971 litres, with the highest milk production reported to be in Juria cluster. The clusters in Nagaon district reporting the presence of buffalo have total milk productionof 1,589 litres across the clusters. The proportionate share of total milk production by all three categories of bovine stock of the selected project clusters is local cows 46.82%, improved cows 48.86% and buffaloes 4.32%.

Table 4.10.8: Estimated total milk production based on total local cattle stock

Dairy cluster	Estimated no. of HH with local cattle	Average herd size (adult lactating animals)	Average milk production per local cow litre	Total milk production with local cattle stock* litre
Paschim Kaliabor	593.84	1.00	1.46	867
Lumding	764.40	0.90	1.33	912
Roha	464.63	0.82	1.63	619
Dholpukhuri (Hojai)	603.00	0.33	1.25	245
Udali (Lanka)	1400.00	0.90	1.25	1575
Juria	2667.39	1.00	1.20	3201
Batadrawa (Dhing)	704.57	1.00	1.21	853
Bajiagaon	2235.00	0.75	1.33	2229
Barhampur	176.40	0.38	1.27	84
Laokhowa	589.36	1.00	1.25	737
Khagorijan	192.00	0.93	1.25	222
Fakimara	667.83	0.84	1.25	697
Dalanghat	712.08	1.00	1.28	908
Kathiatali	1691.59	0.72	1.42	1711
Kaliabor	35.00	0.63	1.25	27
Rupahihat	838.54	1.00	1.25	1048
Jogijan(Hojai)	332.48	0.75	1.40	349
Binakandi (Doboka)	905.63	0.72	1.45	0939
Nagaon town	1,672.65	0.82	1.31	1,804

*In estimating total milk production of local cows only the lactating animals were considered assuming 50% of the total adult local cattle as lactating

Table 4.10.9: Estimated total milk production based on improved cattle stock

Dairy cluster	Estimated no. of HH with improved cattle	Average herd size (adult lactating animals)	Average milk production per improved cow litre	Total milk production with improved cattle stock* litre
Paschim Kaliabor	70.24	1.17	6.17	505
Lumding	156.80	1.30	6.85	1396
Roha	31.50	1.50	5.24	247
Dholpukhuri (Hojai)	225.00	1.19	5.35	1426
Udali (Lanka)	400.00	0.88	4.50	1575
Juria	357.39	1.25	7.34	3277
Batadrawa (Dhing)	36.43	1.00	4.75	173
Bajiagaon	265.00	1.30	5.63	1940
Barhampur	12.60	1.00	4.21	53
Laokhowa	52.16	1.17	5.67	345
Khagorijan	36.00	1.33	4.83	231
Fakimara	226.55	1.40	6.30	1998
Dalanghat	88.32	1.30	6.40	735
Kathiatali	159.46	1.17	6.87	1275
Kaliabor	10.00	1.00	5.25	53
Rupahihat	175.50	1.12	5.00	978
Jogijan(Hojai)	157.50	1.05	5.94	982
Binakandi (Doboka)	112.88	1.11	6.25	783
Nagaon town	278.88	1.18	5.69	1,.874

*In estimating total milk production of improved cattle only lactating animals are considered assuming 50% of the total adult improved cattle as lactating.

Table 4.10.10: Estimated total milk production based on buffalo stock

Dairy cluster	Estimated no. of HH with buffaloes	Average herd size (adult lactatinganimals)	Average milk production per cow litre	Total milk production with buffaloes* litre	Total milk production across bovine stock# litre
Paschim Kaliabor	0.00	0.00	0.00	0.00	**1,372**
Lumding	0.00	0.00	0.00	0.00	**2,308**
Roha	2.63	1.00	2.00	5.25	**872**
Dholpukhuri (Hojai)	9.00	1.50	3.25	43.88	**1,715**
Udali (Lanka)	0.00	0.00	0.00	0.00	**3,150**
Juria	165.33	1.60	3.50	925.85	**7,404**
Batadrawa (Dhing)	0.00	0.00	0.00	0.00	**1,026**
Bajiagaon	57.50	2.25	3.00	388.13	**4,557**

Dairy cluster	Estimated no. of HH with buffaloes	Average herd size (adult lactatinganimals)	Average milk production per cow litre	Total milk production with buffaloes* litre	Total milk production across bovine stock# litre
Barhampur	3.74	1.75	2.00	13.08	**150**
Laokhowa	0.00	0.00	0.00	0.00	**1,081**
Khagorijan	0.00	0.00	0.00	0.00	**453**
Fakimara	9.85	1.25	2.75	33.86	**2,729**
Dalanghat	64.40	0.00	0.00	0.00	**1,643**
Kathiatali	24.95	1.84	3.92	179.25	**3,166**
Kaliabor	0.00	0.00	0.00	0.00	**80**
Rupahihat	0.00	0.00	0.00	0.00	**2,027**
Jogijan (Hojai)	0.00	0.00	0.00	0.00	**1,331**
Binakandi (Doboka)	0.00	0.00	0.00	0.00	**1,722**
Nagaon Town	0.00	0.00	0.00	0.00	**3,678**

*In estimating total milk production of buffaloes only lactating animals were considered assuming 50% of the total adult buffaloes as lactating.

#Total milk production is the summation of milk production across bovine stock in Tables 4.10.8, 4.10.9 and 4.10.10.

4.10.8 Marketing behaviour of farmers at cluster level

The marketed surplus of milk according to bovine stock is presented in Table 4.10.11. Marketed surplus is the left over milk after keeping for HH consumption and offering to relatives. Farmers with improved cattle stock produce primarily for the market to earn profit, while some portion of the produce is kept for HH consumption. On the other hand, farmers with local cattle keep most of their produce for home consumption and if production is slightly higher they resort to dispose of the surplus through local sale. Since total milk production is high on commercial farms with crossbred/improved cattle, the proportion of milk marketed is also high. On subsistence farms with one or two litres of milk production based on local cattle, close to 50% of milk produced is generally consumed at home. Table 4.10.11 shows that farm HH with local cattle across project clusters sell 42.14% of the total milk production, while farm HH with improved cattle stock sell 81.43% of their total HH milk production. The few project clusters with presence of buffaloes sell 55.12% of their total milk production.

Table 4.10.11: Percentage of mild sold per HH by type of stock

Dairy cluster	% with local cows	% with improved cows	% with buffaloes
Paschim Kaliabor	43.33	85.00	00.00
Lumding	44.21	92.00	00.00
Roha	45.00	83.00	20.00
Dholpukhuri (Hojai)	67.50	80.00	52.00
Udali (Lanka)	52.50	78.00	00.00
Juria	38.00	81.00	31.00
Batadrawa (Dhing)	40.00	83.33	00.00
Bajiagaon	32.00	80.00	55.12
Barhampur	30.00	85.00	55.00
Laokhowa	63.33	76.67	00.00

Dairy cluster	% with local cows	% with improved cows	% with buffaloes
Khagorijan	35.00	85.00	00.00
Fakimara	38.00	83.00	80.00
Dalanghat	38.54	83.06	80.25
Kathiatali	31.82	87.27	67.50
Kaliabor	50.00	80.00	00.00
Rupahihat	28.00	68.83	00.00
Jogijan(Hojai)	38.72	78.33	00.00
Binakandi (Doboka)	42.50	76.25	00.00
Nagaon town	42.14	81.43	00.00

In Table 4.10.12 the major marketing channels are indicated used by the farmers in the project clusters. Selling milk in the neighbourhood or in the local market constitute 34.51% followed by selling milk to traders (almost 33%). Across the project clusters, selling milk to traders and private processors together constitute 56% of the total milk producers. Selling milk to the DCS across the project clusters is 9.34%. The average prices offered to producers by various marketing sources is the highest when farmers sell milk locally (INR 40/litre) followed by INR 37.63/ litre when sourced to private processors. As obvious from empirical findings across India that cooperatives are weak in offering better prices to consumers, the price in the study sites of Nagaon is also found to be low atINR 35/litre. The price offered by milk traders/vendorsis UN/r35.12/litre across the project clusters.

Table 4.10.12: Percentage of milk sale by sources and their respective farm gate prices

Dairy cluster	Neighbours or local sale		To traders		To cooperatives		To private processors	
	%	Price/litre	%	Price/litre	%	Price/litre	%	Price/litre
Paschim Kaliabor	20.00	40.00	0.00	-	0.00	-	80.00	40.00
Lumding	10.00	40.00	22.00	34.40	0.00	-	68.00	32.00
Roha	33.33	40.00	50.83	35.00	6.67	35.00	11.67	40.00
Dholpukhuri (Hojai)	80.00	40.00	15.00	35.00	0.00	-	5.00	40.00
Udali (Lanka)	22.50	40.00	57.50	35.00	0.00	-	20.00	35.00
Juria	38.33	40.00	48.33	35.00	0.00	-	13.33	35.00
Batadrawa (Dhing)	46.67	40.00	13.33	35.00	0.00	-	40.00	35.00
Bajiagaon	48.00	40.00	28.20	35.00	23.75	35.00	4.8	35.00
Barhampur	25.00	40.00	30.00	35.00	30.00	-	45.00	35.00
Laokhowa	20.00	40.00	43.33	35.00	0.00	-	36.67	40.00
Khagorijan	40.00	40.00	46.67	35.00	13.33	35.00	0.00	-
Fakimara	28.00	40.00	44.00	32.50	0.00	-	28.00	35.00
Dalanghat	16.00	40.00	48.00	35.00	36.00	36.00	0.00	-
Kathiatali	48.33	40.00	48.33	35.00	0.00	-	3.30	40.00
Kaliabor	20.00	40.00	30.00	35.00	0.00	-	50.00	40.00
Rupahihat	55.00	40.00	31.67	35.00	5.00	35.00	8.33	40.00
Jogijan(Hojai)	20.00	40.00	0.00	-	53.33	35.00	26.67	40.00
Binakandi (Doboka)	50.00	40.00	35.00	40.00	0.00	-	15.00	40.00
Nagaon own	34.51	40.00	33.00	35.12	9.43	37.00	23.06	37.63

4.10.9 Access to veterinary services

Table 4.10.13 presents the number of veterinary service providers.An average of 1.18 local veterinarians per cluster operate, while the average distance from the farm villages is 3.78 km. At cluster level, farm villages of Kathiatoli cluster are 8 km from a veterinarian which is the highest among all the clusters, while farm villages of Kaliabor are closely located to a doctor's residence/duty station. VFAs are located 3.34 km on average from villages with an average presence of 1.59 VFAs per cluster. None of the farmers in Nalbari have access to a CAHW, except Batadrawa and Dalanghat. There is one AI practitioner (Gopal Mitra) in the cluster villages of Roha, Udali, Juria, Batadrawa, Dalanghat and Binakandi while in PascimKaliabor, six AI practitioners are found to render services.

Table 4.10.13: Access to veterinary services at the selected project clusters of the district

Dairy cluster	No. of local veterinarian*		Distance from the FGD location/village km	No. of VFA		Distance from the FGD location/ village km	No. of CAHW		Distance from the FGD location/ village km
	Male	Female		Male	Female		Male	Female	
Paschim Kaliabor	1	0	6	1	0	2	0	0	0
Lumding	2	0	1.5	2	0	3.8	0	0	0
Roha	0	1	5	3	0	5.6	0	0	0
Dholpukhuri (Hojai)	1	0	4.75	2	0	4.75	0	0	0
Udali (Lanka)	1	0	2.37	1	0	2.37	0	0	0
Juria	1	0	6.25	3	0	3.33	0	0	0
Batadrawa (Dhing)	1	0	2.75	2	0	2.16	1	0	2
Bajiagaon	2	0	5.4	1	0	4	0	0	0
Barhampur	1	0	2.75	2	0	3.5	0	0	0
Laokhowa	1	0	2.16	1	0	2.16	0	0	0
Khagorijan	1	0	2.58	1	0	2.58	0	0	0
Fakimara									
Dalanghat	1	0	1.62	1	0	1.62	1	0	0.5
Kathiatali	2	0	8	3	0	7.6	0	0	0
Kaliabor	2	0	1	0	1	1	0	0	0
Rupahihat	1	0	2.41	2	0	2.41	0	0	0
Jogijan(Hojai)	1	0	3.5	1	0	1.5	0	0	0
Binakandi (Doboka)	2	0	7.75	4	0	6.5	0	0	0
Nagaon town	4	0	4.21	7	0	5.00	0	0	0

*Local veterinarian includes both private and governmentEmployed.

4.10.10 Access to other services (input and breeding)

Except in Paschim Kaliabor, Dholpukhuri, Bajiagaon, Barhampur,Laokhowa, Khagorijan, Fakimara, Dalanghat, Kaliabor, Rupahihat and Jogijan clusters, farmers in remaining clusters reported the availability of atleast one shop where they can buy milk cans or other equipment specifically designed for milk storage and transportation. The presence of pure feed shops are less in most of the clusters as feeds are primarily sold in the grocery shops. The average number of grocery shops where concentrate feeds are bought is three per cluster with an average

distance of 2.75 km from cluster villages (see AnnexeTable A2). In all the selected clusters, no farmer is found providing natural mating services of purebred exotic bulls on a commercial basis. However, there are few farmers having bulls (mostly indigenous breed/community bulls) used for breeding purposes and the average number of such bulls is 1.61 with average distance from the farmers' location of 1.57 km.

4.10.11 Availability of producers/traders organizations and input supplying institutions at cluster level

Farmers report that there are not any registered milk traders organizations in the selected clusters (except one in Dalanghat). Similarly, there are not any SHGs related to dairy farming practices or active milk producer's institutions. However, the clusters that have active DCS are Lumding, Khagorijan and Dalanghat (see Table 4.10.14).

Table 4.10.14: Availability of producers/traders organizations at cluster level

Dairy cluster	No. of milk traders organizations	No. of DCS
Paschim Kaliabor	0	0
Lumding	0	2(ChristanBasti,Changmari 11 no Ward)
Roha	0	0
Dholpukhuri (Hojai)	0	3
Udali (Lanka)	0	0
Juria	0	0
Batadrawa (Dhing)	0	0
Bajiagaon	0	0
Barhampur	0	2
Laokhowa	0	0
Khagorijan	0	2(BirahBebejia,AlengiSatra)
Fakimara	0	0
Dalanghat	1(Somua Gaon)	2(Darangial,NizHatichung)
Kathiatali	0	0
Kaliabor	0	0
Rupahihat	0	0
Jogijan(Hojai)	0	3
Binakandi(Doboka)	0	0
Nagaon town	1	2

Notes: Figures in parentheses are the major linked villages.

Farmers report that there is one dairy plant of DDD at Bebejia in Dalanghat cluster and one BMC/chilling centre at Roha, Barhampur, Khagorijan, Dalanghat, Kaliabor, Nagaon town each; none of the respondents in the FGD of all of the project clusters reported the availability of DDL (except one DDL at Nagaon town), feed testing laboratory or feed mill. Table 4.10.15 indicates that there are three private veterinary clinics in Khagorijan cluster, one in Batadrawa and Raha each and two in Kathiatoli where medicines for animal health care/consultation with the veterinary doctors are available.

Table 4.10.15: Availability of input supplying institutions at cluster level

Dairy cluster	No. of dairy plant, chilling plant, BMC	No. of DDL	No. of feed testing laboratory	No. of feed mills	No. of private veterinary clinics
Paschim Kaliabor	0	0	0	0	0
Lumding	0	0	0	0	0
Roha	1 BMC/Chilling Centre	0	0	0	1 (Raha town)
Dholpukhuri (Hojai)	0	0	0	0	0
Udali (Lanka)	0	0	0	0	0
Juria	0	0	0	0	0
Batadrawa (Dhing)	0	0	0	0	1 (Dhing)
Bajiagaon	0	0	0	0	0
Barhampur	1 BMC/Chilling Centre	0	0	0	0
Laokhowa	0	0	0	0	0
Khagorijan	1 BMC/Chilling Centre	0	0	0	3 (Sharma Meical, Paresh Medicos, Pushpa Medicos)
Fakimara	0	0	0	0	0
Dalanghat	1 (in Bebejia under TMSS)	0	0	0	0
Kathiatali	3 BMC/chilling centres	0	0	0	2
Kaliabor	1 BMC/chilling centre (Jakhalabandha)	0	0	0	0
Rupahihat	0	0	0	0	0
Jogijan(Hojai)	0	0	0	0	0
Binakandi (Doboka)	0	0	0	0	0
Nagaon town	1 (under DRDA)	1	0	0	5 (at Nagaon town)

4.10.12 Major milk market actors and other infrastructure in the dairy value chain

In Table 4.10.16, the number of milk market actors involved in the dairy value chain of the selected project clusters of Nagaon district is presented. These market actors are linked to the major town or market point of the cluster. The number of milk traders is in the range of three in Juria to 30 each in Lumding, Batadrawa and Bajiagaon. Batadrawa cluster has the highest number of cottage industry owners with scope of conducting one training programmefor cottage processors in this cluster. The rest of the clusters having cottage industry are in the range of one to four and it is suggested that if the number of participants goes below 20 in Batadrawa, few interested cottage industry owners can be mobilized to make a full training session. The number of sweet shops in Lumding, Dholpukhuri and Udali are highest with 30 each and lowest is two sweet shops in Fakimari.

Table 4.10.16: Number of milk market actors at cluster level (based on KII and FGD)

Dairy cluster	No. of milk traders	No. of cottage industry owners	No. of sweet shop owners
Paschim Kaliabor	5	0	8
Lumding	30	0	20
Roha	10	3	12
Dholpukhuri (Hojai)	20	0	22
Udali (Lanka)	15	0	30
Juria	3	0	6
Batadrawa (Dhing)	30	20	30
Bajiagaon	30	0	3
Barhampur	9	4	3
Laokhowa	22	0	17
Khagorijan	0	0	0
Fakimari	0	0	2
Dalanghat	10	0	8
Kathiatali	12	4	10
Koliabor	15	1	20
Rupahihat	15	0	10
Jogijan(Hojai)	20	0	22
Binakandi (Doboka)	20	0	15
Nagaon town	70	7	40

The major linked markets where milk and milk products are traded are shown in Table 4.10.17. Farmers were asked if they accessed bank credit during the 12 months preceding the survey and to name the banks. Dairy farmers in some of the clusters reported that they received credit from formal financial sources such as AGVB Amsoi, UBI Lanka, Canara Bankand Indian Bank- Nagao branch. Some of the unorganized commercial farms of the clusters namely Roha, Khagorijan, Dalanghat and Kaliabor reported the access to insurance services from the government supported insurance scheme under NLM Guwahati. The percentage of villages having blacktop approach roads, gravel roads and earthen roads are respectively 50.56%, 18.33% and 30.56% in the project district as a whole.

Table 4.10.17: Markets and other infrastructure at cluster level

Dairy cluster	Markets with trading of milk and milk products*	Bank and other financing institutions	Insurance for livestock	Approach road quality (% of total cluster villages)		
				Blacktop	Gravel	Earthen
Paschim Kaliabor	Ambagan market (weekly)	0	0	40	20	40
Lumding	Lumding (daily)	0	0	30	20	50
Roha	Nagaon (daily), Chaporimukh, Roha town (weekly)	AGVB-Amsoi	New India Assurance/ Oriental Insurance	20	0	80
Dholpukhuri (Hojai)	Hojai (daily)	0	0	100	0	0
Udali (Lanka)	Lanka, Nakhuti	UBI-Lanka Branch	0	60	30	10

Dairy cluster	Markets with trading of milk and milk products*	Bank and other financing institutions	Insurance for livestock	Approach road quality (% of total cluster villages)		
				Blacktop	Gravel	Earthen
Juria	Nagaon Town (daily), Bahguri Bazaar, Singari	Canara Bank		40	20	40
Batadrawa (Dhing)	Dhing, Dhupagurimarket,Besamari	0	0	20	0	80
Bajiagaon	Amoni, Samaguri	0	0	20	30	50
Barhampur	Barhampur (weekly), Nagaon town (Daily)	0	0	50	50	
Laokhowa	Ambagan Market, Laokhowa Market	0	New India Assurance/ Oriental Insurance	60	20	20
Khagorijan	Nagaon town (daily)	Indian Bank, Nagaon Branch	New India Assurance/ Oriental Insurance	100	0	0
Fakimara	Pakhimoria			60	20	20
Dalanghat	Nagaon town (daily)	0	New India Assurance/ Oriental Insurance	20	0	80
Kathiatoli	Kampur town (daily),Kathiatoli	0	0	60	40	0
Kaliabor	Jakhalbondha market (daily)	0	New India Assurance/ Oriental Insurance	40	20	30
Rupahihat	Rupahihat Market (weekly)	0	0	20	60	20
Jogijan (Hojai)	Hojai			70	0	30
Binakandi (Doboka)	Sarupathar block 48, Nagaon town, Doboka Hotel, Sarupathar block 49	0	0	100	0	0
Nagaon Town	Nagaon town (daily)	Indian Bank-Nagaon, SBI	New India Assurance/ Oriental Insurance	40	35	25

Note: Market frequency is in parentheses (daily, biweekly or weekly).

4.10.18 Progressive farmers at cluster level

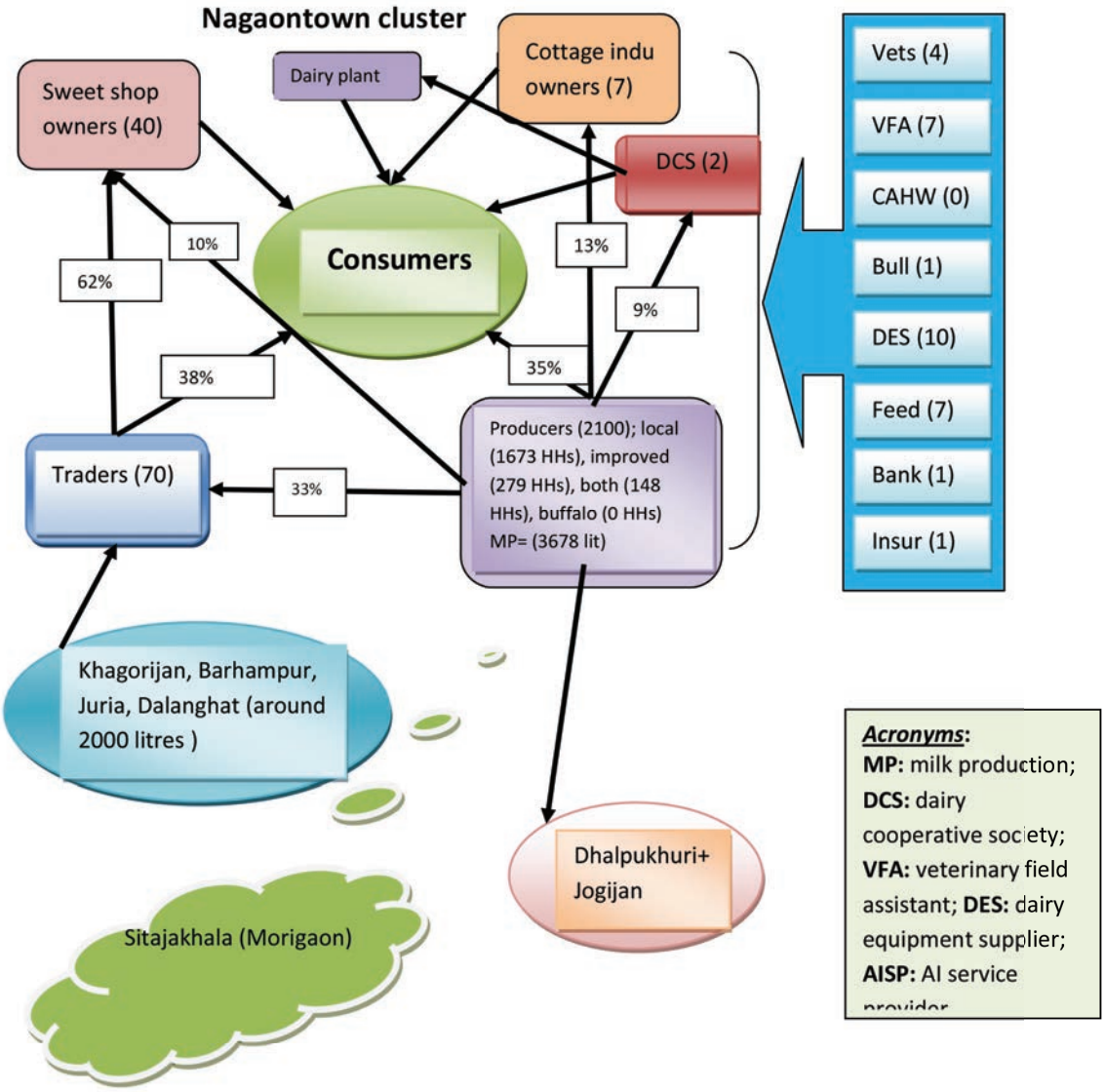
Table 4.10.18 indicates the number of progressive dairy farmers.During the survey, a few such progressive farmers were identified in Nagaon district as a whole.

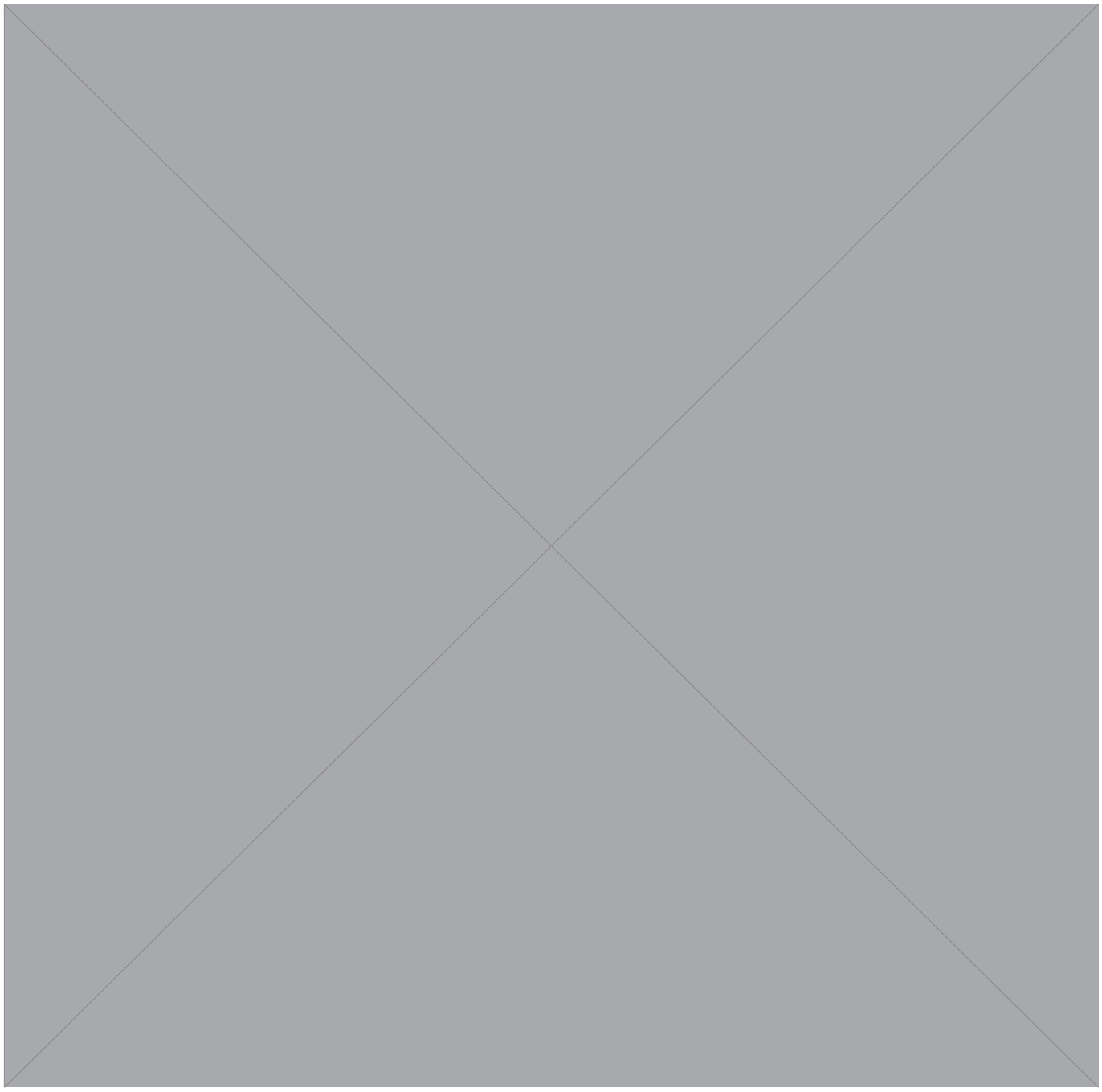
Table 4.10.18: Names and contacts of promising progressive entrepreneurs in dairy

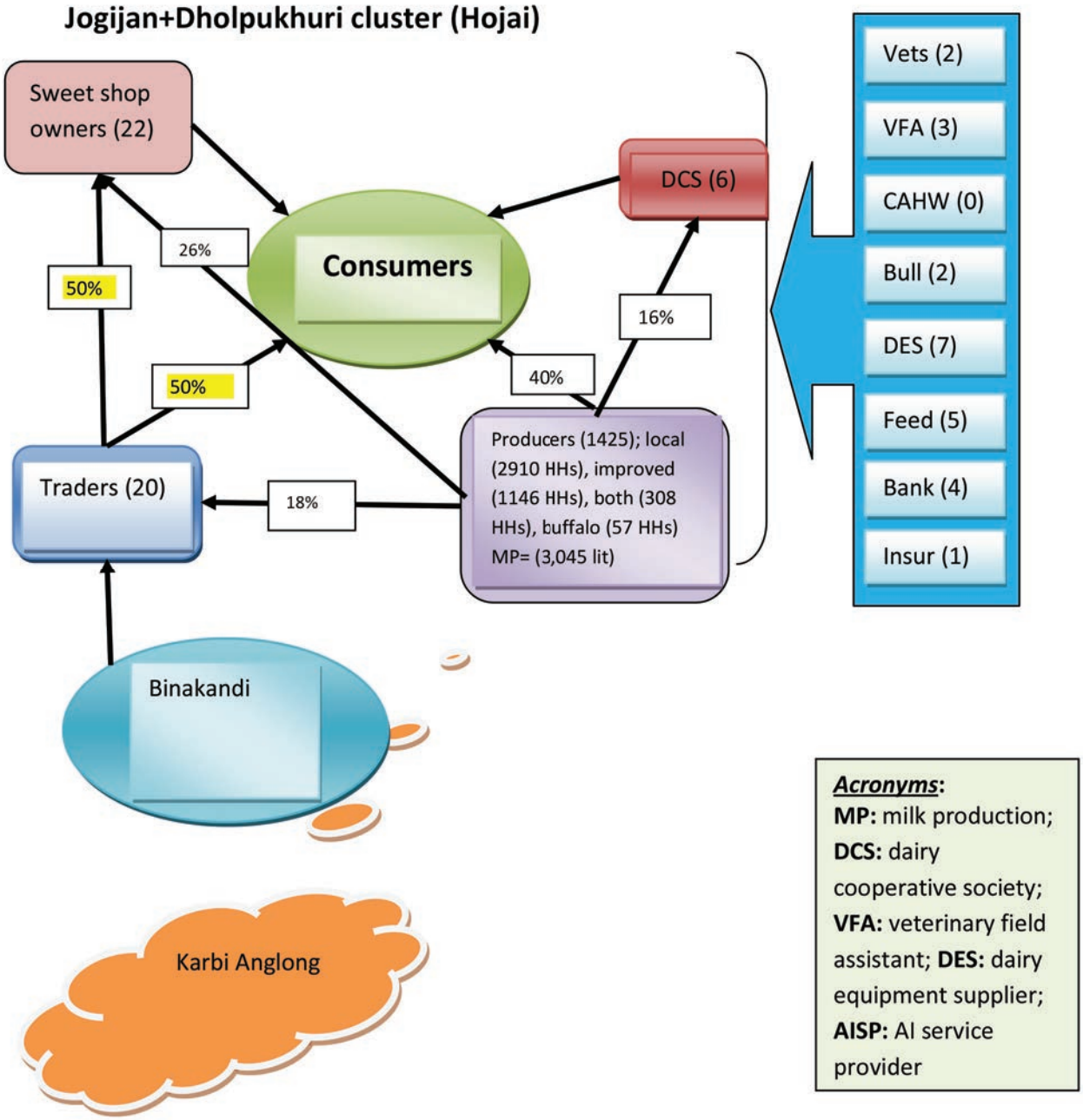
Dairy cluster	No. of entrepreneurs
Paschim Kaliabor	0
Lumding	3
Roha	0
Dholpukhuri (Hojai)	2
Udali (Lanka)	0
Juria	0
Batadrawa (Dhing)	0

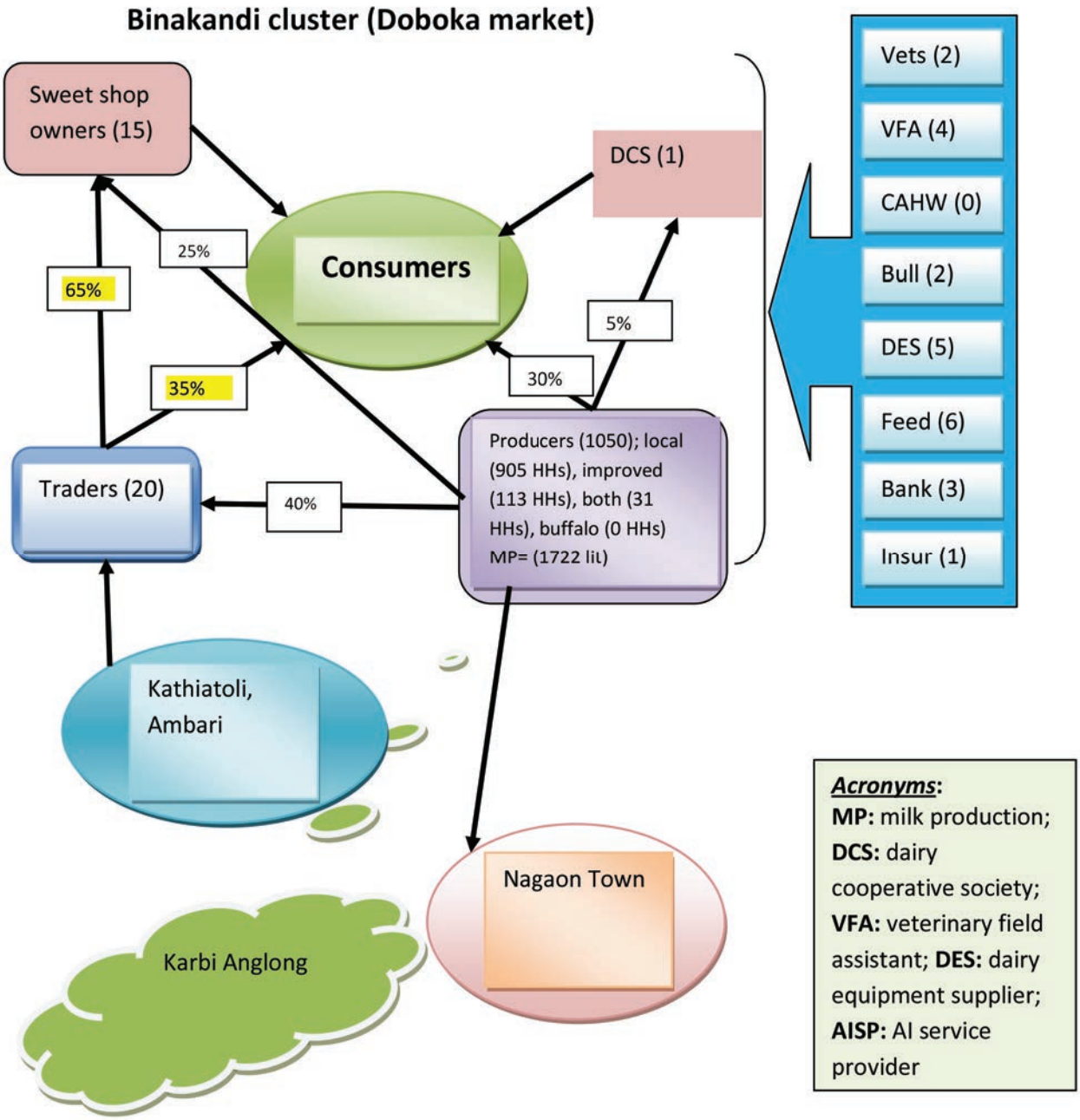
Dairy cluster	No. of entrepreneurs
Bajiagaon	8
Barhampur	0
Laokhowa	0
Khagorijan	3
Fakimara	0
Dalanghat	0
Kathiatoli	2
Kaliabor	2
Rupahihat	0
Jogijan(Hojai)	1
Binakandi (Doboka)	0
Nagaon town	0

Figure 4.10.1: Schematic representation of the value chain actors of the major recommended clusters.






Jogijan+Dholpukhuri cluster (Hojai)
Sweet shop owners (22)
DCS (6)
Consumers
26%
50%
50%
16%
40%
Producers (1425); local (2910 HHs), improved (1146 HHs), both (308 HHs), buffalo (57 HHs) MP= (3,045 lit)
Traders (20)
18%
Binakandi
Karbi Anglong
Vets (2)
VFA (3)
CAHW (0)
Bull (2)
DES (7)
Feed (5)
Bank (4)
Insur (1)
Acronyms:
MP: milk production;
DCS: dairy cooperative society;
VFA: veterinary field assistant; DES: dairy equipment supplier;
AISP: AI service provider



4.10.15 Quick observations and recommendations

Major clusters with presence of informal market actors are Nagaon town, Lumding, Jogijan and Dholpukhuri linked to Hojai market and Binakandi. Nagaon shows active co-existence of formal and informal markets for milk. In Nagaon town, the DDD dairy plant is working at sub-optimal use of its capacity. However, marketing of milk is informally carried out. More than 2,500 litres of milk is supplied daily to the Hojaimarket from Dholpukhuri cluster. There is a private processor at Bhimarali named ***Kopili*** dairy that collects a sizable amount of milk (2,000 litres) daily. Milikbasti, Dhariabasti, Rampur, Amtala, Singaribasti, Mainapathar and Kumarkata are major milk producing villages in the cluster.The demand of milk for the entire market is higher than itssupply in the cluster; therefore, milk is also supplied from Karbi Anglong and Nagaon town cluster. There are almost 30 sweet shops at Hojai market and around 20 milk traders supplying milk to the market. Milk from Lumding cluster is supplied to

Lumding market. Milk is also supplied to Lanka town. More than 50% of milk is covered by Purabi Dairy. There are two DCSs in the cluster which are actively working with both formal and informal sectors. In Batadrawa cluster, a relatively higher number of cottage processors are present. To cover the prominent market actors in the training interventions, the following order in terms of potentiality have been identified:

Table 4.10.19: Cluster level planning for conducting training in Nagaon district

Rank of importance	Name of the cluster	Possible no. of trainingsessions organized				Recommendations
		Prod (94)	SM (19)	CP (1)	MT (10)	
Most potential	Nagaon town	13	7.5	0.35	2.5	1. Market actors such as SMs and milk traders are from Nagaon town and thus Khagorijan and Pakhimoria clusters can be merged with Nagaon town. 2. Dholpukhuri and Jogijan can be considered as one cluster linked to Hojai town market.
	Khagorijan	1	0.0	0	0.0	
	Pakhimoria	9	0.1	0	0.0	
	Dholpukhuri	2	1.5	0	0.25	
	Jogijan	2	1.1	0	0.45	
	Lumding	8	1	0	1.5	
	Udali	19	1.5	0	0.75	
Medium potential	Binakandi	3	0.75	0	1.00	1. Pachim Kaliabor and Kaliabor can be considered as one cluster. 2. SMs and milk traders of Laokhowa can participate in the training with Bajiagaon cluster because of geographic nearness. 3. Batadrawa is an independent cluster linked to Dhing market with presence of informal market actors. Sweets from cottage processors concentrated in villages go to Nagaon town and are supplied elsewhere on order basis.
	Paschim Kaliabor	3	0.4	0	0.25	
	Kaliabor	1	1.0	0.05	0.75	
	Bajiagaon	3	0.15	0	1.5	
	Laokhowa	3	0.85	0	1.1	
	Batadrawa	2	1.5	1	1.5	
	Raha	5	0.6	0.15	0.5	
	Dolonghat	3	0.4	0	0.5	
Less Potential	Juria	12	0.3	0	0.15	
	Rupahihat	5	0.75	0	0.15	
	Barhampur	1	0.15	0.2	0.45	

Note: When considered for producer's training, only commercial farms were considered with ownership of high yielding improved animal stock plus the *khuti* system of rearing farms; **Prod:** Dairy producers, **MT:** Milk traders; Figures within brackets indicate number of respective market actors.

4.11 Dhubri district

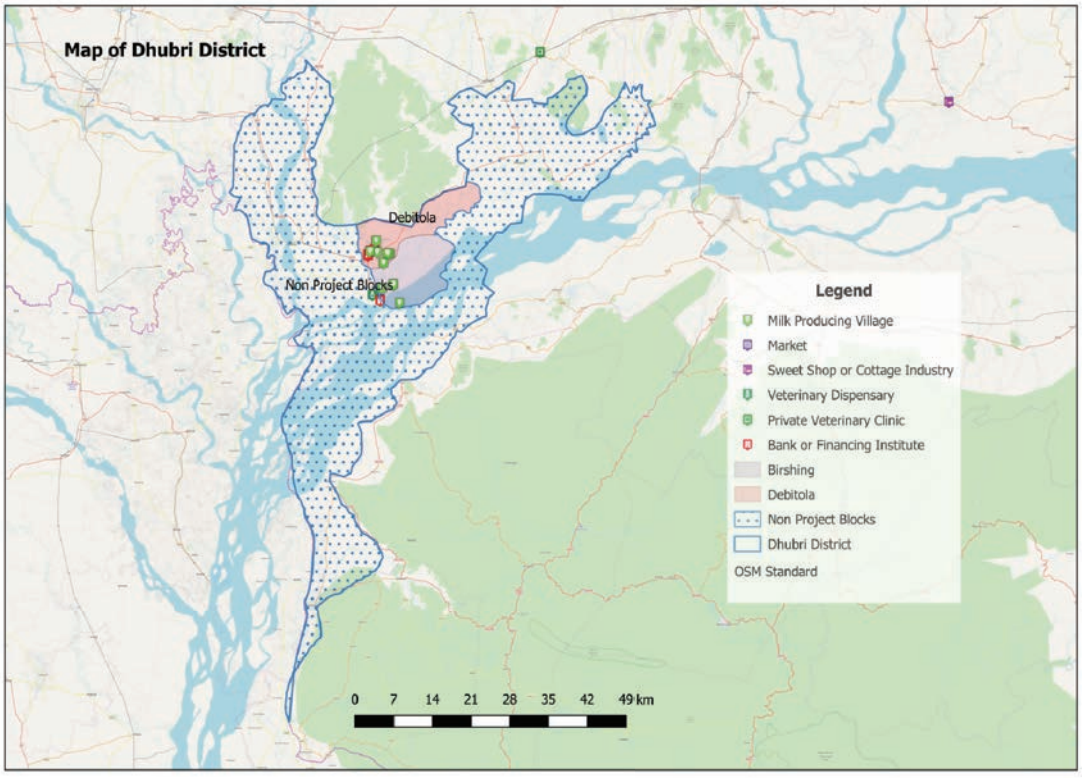
4.11.1 Cluster villages identification based on field visit

The project identified three clusters in Dhubri district for the implementation of the world bank aided APART . The selected clusters covering the potential villages for the intervention of the informal dairy value chain are Debitola, Birshing and Dharamsala. After an initial overview and discussion with some of the informed sources such as DVO, VOs/BVOs of the respective clusters, the ILRI enumerators finalized the villages as listed by the DDD as potential clusters where the village specific information was drawn. The names of villages are shown in Table 4.11.1.

Table 4.11.1: Cluster villages in Dhubri district

Dairy cluster	Names of the DDD- listed villages	Names of the ILRI- listed villages	Potential villages incorporated	Potential villages dropped
Debitola	Madaikhali, Asharikandi, Chalakura, SouthGeramari, South Charjogipara Geramari, Chalakura, Dangircahr, S/ Geramari, Sajuarkuti, Silairpar,S/ Geramari , Pt-V1, Jhaskal	Madaikhali, Asharikandi, Chalakura, South Geramari, South Charjogipara Geramari, Chalakura, Asharikandi, Madhaikhali, S/Geramari, Sajuarkuti, Silairpar,S/ Geramari , Pt-V1	0	Dangir Cjhar, Jhaska
Birshing (Dhubri town)	Kuntircahr, Falimari, River Block-Majerchar	River Block –Majerchar,Birsing Char, Chalakura	0	Kuntircahr, Falimari
Dharamsala	Gauripur,No. 1, 2 and 3 Gauripur, No. 2 Tiamati	Gauripur, Gauripur pt1 and 3, Pt-2, Tiamati, and Pt-2	0	0

Figure 4.11: The map of the surveyed clusters in Dhubri district.



4.11.2 FGD participants' profile

Table 4.11.2 shows the number of participants segregated by gender and social status. The average number of participants across the project clusters is 8.4 in Dhubri district of which number of male and female participants respectively constitute 5.85 and 2.61 representing in percentage terms 46.15% and 15.69%. Among the participants across the project clusters, representation of the participants from the 'general' category is the highest (86%) followed by the OBC category (14%). No participantswere from the SC or ST categories.

Table 4.11.2: Distribution of participants by gender and social status

Dairy clusters	Average no. of participants			% social status of participants			
	Male (%)	Female (%)	Total	General	SC	ST	OBC
Debitola	4.22 (57.65)	3.10 (42.35)	7.32	79	0	0	21
Birshing (Dhubri town)	6.21 (73.67)	2.22 (26.33)	8.43	88	0	0	12
Dharamsala	7.12 (74.01)	2.50 (25.99)	9.62	91	0	0	9

4.11.3 Farming system by type of bovine stock

The dairy farming system based on type of bovine stock in the selected project clusters show that the district as whole has 4,420 HH who have atleast one dairy cattle or buffalo, representing 58% of HH among the total HH across project clusters. According to breed of cattle for the selected clusters as a whole, proportion of farming households having local breed, improved breed and both local and improved are 61.92%, 20.41% and 5.78% respectively. Proportions of farming HH with buffalo stock constitute 11.89% of the total HH (Table 4.11.3). Proportion of farmers having improved breed of cattle is the highest in Birshing cluster (24%) followed by Debitola (23%) in Dhubri district.

Table 4.11.3: Distribution of farm HH by type of bovine stock

Dairy cluster	Total HH	Dairy farming HH (%)	% HH keeping cattle from local breeds	% HH keeping cattle from improved breeds	% HH keeping cattle from both local and improved breeds	% HH keeping buffaloes
Debitola	2,350	1,255 (53.40)	67.80	23.00	4.00	5.20
Birshing	3,370	2,022 (76.92)	42.67	24.00	8.33	25.00
Dharamsala	1,895	1,143 (60.32)	75.30	14.22	5.00	5.48

Note: Figures in parentheses are the percentage of dairy farming households in total HH.

4.11.4 Farming system by rearing practicesin Dhubri district

Table 4.11.4 shows that almost 21% farm HH rear cattle in a fully stallfed condition, while proportion of farmers rearing cattle in a partly stallfed condition constitute almost 65% and there is 14% *khuti* system of rearing. The farming system based on rearing system is closely related to the type of bovine stock as in Table (4.14.3). The fully stall-fed rearing condition increases with the increase of the number of improved cattle stock because grade cattle/crossbred animals are reared mostly in fully stallfed condition (see Tables 4.11.3 and 4.11.4).

Table 4.11.4: Distribution of farm HH by rearing practices

Dairy cluster	% fully stall fed	% partly stall fed	% *khuti* (forage herd) system
Debitola	29.00	63.00	08.00
Birshing	16.67	53.33	30.00
Dharamsala	19.00	78.00	03.00

4.11.5 Gendered participation in production and income control in dairying

In the project clusters Dhubri, it has been seen that of the total farming activities carried out, women's' role is lower compared to their male counterparts across the project clusters (34%). On the other hand, women's role on the control of income is measured as 23.58% for all the selected project clusters of Dhubri district (Table 4.11.5).

Table 4.11.5: Women's role in dairy production and income control

Dairy cluster	No. of farming HH	% women have role in milk production	% women have control of income from milk production
Debitola	1,255	24.00	18.40
Birshing (Dhubri town)	4,900	40.00	28.33
Dharamsala	1,143	38.00	24.00

4.11.6 Average herd size (adult animals) of farm HH according to type of bovine stock

The average herd size of the cattle stock equivalent to adult animal unit according to the type of bovine stock is reported in Table 4.11.6. It indicates that the number of adult indigenous cattle per HH is two across the project clusters with the highest being in Debitola cluster and the lowest in Dharamsala. Similarly, the average improved cattle holding in each HH across selected project clusters is almost 3.7. Similarly, the average buffaloes holding in each HH across the selected project clusters are 1.71.

Table 4.11.6: Average herd size (adult animals) by the bovine stock in the project clusters

Dairy cluster	No. of local cows	No. of improved cows	No. of buffaloes
Debitola	2.2	4.4	0.60
Birshing (Dhubri town)	2.0	3.0	3.33
Dharamsala	1.8	3.6	1.20

Source: Field Survey, 2018

4.11.7 Milk productivity and production of the bovine stock at cluster level

The daily milk yield of the bovine stock is not uniform in the entire lactation length and bears an inverted U shape in milk yield trend. Immediately after the calf born the yield remains relatively less and gradually it reaches the peak yield and after getting pregnant the yield again comes down. While doing the interview the farmers were asked about their response on the average daily milk yield during the lean and peak period of the cattle in milk. In the selected project clusters of Dhubri the daily milk productivity of local cows during the lean period is 0.95 litres for the clusters as a whole with Birsingh having 1.50 litres as the highest and 0.60 in the Debitola cluster. During the peak lactation days of the indigenous cow it gives an average productivity of 2.24 litres. In the same way the average lean and peak productivity of improved cattle stock is 3.62 and 7.71 litres and of buffaloes is 1.28 and 3.59 litres respectively. The average milk yield is the highest in Birshing across the stages of lactation (7.25 litres).

Table 4.11.7: Lowest and highest levels of average daily milk production per cow in the clusters

Dairy cluster	Milk production of local cows litres		Milk production of improved cows litres		Milk production of buffaloes litres	
	Low	High	Low	High	Low	High
Debitola	0.60	1.70	3.40	7.80	1.33	3.33
Birshing (Dhubri town)	1.50	2.80	4.33	8.00	1.00	4.00
Dharamsala	0.75	2.22	3.12	7.32	1.50	3.44

Tables 4.11.8 to 4.11.10 presents the average milk production of local, improved and buffalo stock of the district. Based on local cattle stock, the total milk production across the clusters is 4,081 litres with highest milk production recorded as 1,855 litres in Birshing followed by Dharamsala. Based on improved cattle stock, the total milk production of the improved cattle in the selected project clusters is 9,571 litres, with the highest milk production reported as 4,488 litres in Birshing from 24% of crossbred cattle. The three clusters reporting the presence of buffalo stock shows that total milk production based on buffalo population is 2,243 litres across the clusters. Looking at the proportionate share of total milk production by all three categories of bovine stock of the selected project district, the local cows, improved cows and buffaloes share 25.68, 60.21 and 14.11% respectively. Since buffalo stock constitute an important source of milk in Dhubri district, especially in Birshing cluster policy priority should be more on the buffalo rearing farmers in the district, as in the remaining project districts buffalo's role is always found to be lesser in the whole milk production.

Table 4.11.8: Estimated total milk production based on total local cattle stock

Dairy cluster	Estimated no. of HH with local cattle	Average herd size (adult lactating animals)	Average milk production per local cow litre	Total milk production with local cattle stock* litre
Debitola	850.89	1.1	1.15	1,076
Birshing	862.79	1.0	2.15	1,855
Dharamsala	860.68	0.9	1.49	1,150

*In estimating total milk production of local cows only the lactating animals were considered assuming 50% of the total adult local cattle as lactating.

Table 4.11.9: Estimated total milk production based on improved cattle stock

Dairy cluster	Estimated no. of HH with improved cattle	Average herd size (adult lactating animals)	Average milk production per improved cow litre	Total milk production with improved cattle stock* litre
Debitola	065.26	2.2	5.60	3,556
Birshing (Dhubri town)	505.50	1.5	6.17	4,488
Dharamsala	062.64	1.8	5.22	1,527

*In estimating total milk production of improved cattle only lactating animals are considered assuming 50% of the total adult improved cattle as lactating.

Table 4.11.10: Estimated total milk production based on buffalo stock

Dairy cluster	Estimated no. of HH with buffaloes	Average herd size (adult lactating animals)	Average milk production per improved cow litre	Total milk production with buffaloes* litre	Total milk production across bovine stock# litre
Debitola	065.26	0.3	2.33	0045.62	**4,678**
Birshing (Dhubri town)	505.50	1.7	2.50	2,104.14	**8,447**
Dharamsala	062.64	0.6	2.47	0092.83	**2,770**

*In estimating total milk production of buffaloes only lactating animals were considered assuming 50% of the total adult buffaloes as lactating; # Total milk production is the summation of milk production across bovine stock in Tables 4.11.8, 4.11.9 and4.11.10.

4.11.8 Marketing behaviour of farmers at cluster level

Table 4.11.11 shows that farm HH with local cattle across project clusters sell 61% of the total milk production, while farm HH with improved cattle stock sell almost 88% of their total household milk production. HH with buffaloes sell almost 74.11% of their total milk production with buffalo stock.

Table 4.11.11: Bovine stock percentage of milk sold per HH

Dairy cluster	% with local cows	% with improved cows	% with buffaloes
Debitola	58.00	91.00	74.00
Birshing (Dhubri town)	70.00	88.33	80.33
Dharamsala	55.00	84.00	68.00

Table 4.11.12 presents the sources of milk sale in the project clusters. It is evident from the table that selling milk in the neighbourhood or selling self in the local market is predominant in majority of the clusters of Dhubri. These are smallholder dairy farmers rearing dairy animals of indigenous breed to cater the local raw milk consumers in their neighbourhood. Considering the district as whole based on the selected clusters 61.26% farmers sell milk locally, followed by selling to traders (21.11%). None of the farmers are found to sell milk to DCS in any of the project clusters; while 17.63% farmers sell milk to private processors directly.[3]The informal market actors such as milk traders and private processors together procure milk of almost 38.74% of the producers establishing an informal value chain between producers to traders and producers to SMs/CPs or producers to consumers to SMs.

Price offered to producers by various marketing sources are the highest when farmers sell milk locally (Rs. 45/ litre) and when sourced to private processor. The price offered by private processor is relatively lower with Rs. 38.56/litre (Table 4.11.12). The differentiated price across marketing channels may not lead the proportionate milk sale as various factors may play toward the use of different marketing channels. Farmers' better network with the processing agents may encourage them to sell milk to them even though they forgo a price when sold locally along with maintenance of milk quality because this may provide them an assured sale of milk.

Table 4.11.12: Percentage of milk sale by sources and their respective farm gate prices

Dairy cluster	Neighbours or local sale		To traders		To cooperatives		To private processors	
	%	Price/litre	%	Price/litre	%	Price/litre	%	Price/litre
Debitola	50.00	45.00	39.00	36.67	0	-	11.00	45.00
Birshing (Dhubri town)	63.33	45.00	13.33	40.00	0	-	23.34	45.00
Dharamsala	70.44	45.00	11.00	39.00	0	-	18.56	45.00

4.11.9 Access to veterinary services

Table 4.11.13: Access to veterinary services at the selected project clusters of the district

Dairy cluster	No. of local veterinarian*		Distance from the FGD location/ village km	No. of VFA		Distance from the FGD location/ village km	No. of CAHW		Distance from the FGD location/ village km
	Male	Female		Male	Female		Male	Female	
Debitola	1	0	3.3	2	0	0.50	0	0	0
Birshing (Dhubri town)	1	0	1	2	0	4.66	0	0	0
Dharamsala	0	0	0	0	0	0	0	0	0

* Local veterinarian includes both private and govt. employed veterinarian

4.11.10 Availability of producers/traders organizations and input supplying institutions at cluster level

In Gauripur and Gauripurpt 1,2,3 under Dharamsala cluster, there are few registered dairy cooperative societies but these societies at present exist for name sake only with the sole intention of availing subsidized benefits under certain government schemes. If the previously formed societies failed to avail the marketing benefits of DCS, the purpose for forming and sustaining new DCSs in these areas may again fail.

Table 4.11.14: Availability of producers/traders organizations at cluster level

Dairy cluster	No. of milk traders organizations	No. of DCS	No. of SHG-dairy
Debitola	0	1(Madaikhali)	1(Sajuarkuti)
Birshing (Dhubri town)	0	0	0
Dharamsala	0	0	0

Note: In parentheses are the major linked villages.

Table 4.11.15: Availability of input supplying institutions at cluster level

Dairy cluster	No. of Dairy plant, chilling plant, BMC	No. of DDL	No. of feed testing laboratory	No. of feed mills	No. of private veterinary clinic
Debitola	0	1 (Block Vety Disp.Gauripur)	0	0	0
Birshing (Dhubri town)	0	0	0	0	0
Dharamsala	0	0	0	0	0

Note: There is no BMC/Chilling plant in the listed clusters but at Bilachipara, Chapor and Mancachar such BMC/ chilling centres are present.

4.11.11 Major milk market actors and other infrastructure in the dairy value chain

The farmers in the river blocks namely Birsing, Salakura, Majer Char etc. do not have markets inside where milk and milk products are traded. The dairy farmers in these production areas mainly sell milk to the dhubri town with four main *ghats*on the other side of the river Brahmaputra to connect with the town market. There is a retail milk market inside Dhubri town from where majority of the SMs in town procure milk apart from some contact milk sellers. Some of the vendors sell left over milk door to door after being unable to sell milk in the retail market. The retail market price of milk in Dhubri town is Rs. 60, while the farmers fetch a price of Rs 50 when they sell door to door. The majority of the milk sellers met in the town sourcing milk from these river blocks are milk producers themselves and mainly sell their own milk (producer cum vendor). When these farmers were asked about how do they sell when they have production of 1-2 litres of milk only? Was it a cost-effective way of selling with such a meager amount of production? The farmers responded that the 10-12 farmers producing milk of 1-2 litres forms a group and one group member collects milk from other members including his own and takes to market. The responsibility of selling milk through collection is done by the group members on rotation basis. This shows farmers' ability to sell milk of their own adopting alternate practices in the absence of DCS. If DCS fails to provide price higher or equivalent to the wet market price, the membership decision by farmers may not be taken. In Table 4.11.16, the number of milk market actors involved in the dairy value chain of the selected project clusters of Dhubri district is presented.

Table 4.11.16: Number of milk market actors at cluster level (based on KII and FGD)

Dairy cluster	No. of milk traders	No. of cottage industry owners	No. of sweet shop owners
Debitola	25	0	16
Birshing (Dhubri town)	15	1	12
Dharamsala	10	2	10

Table 4.11.17: Markets and other infrastructure at cluster level

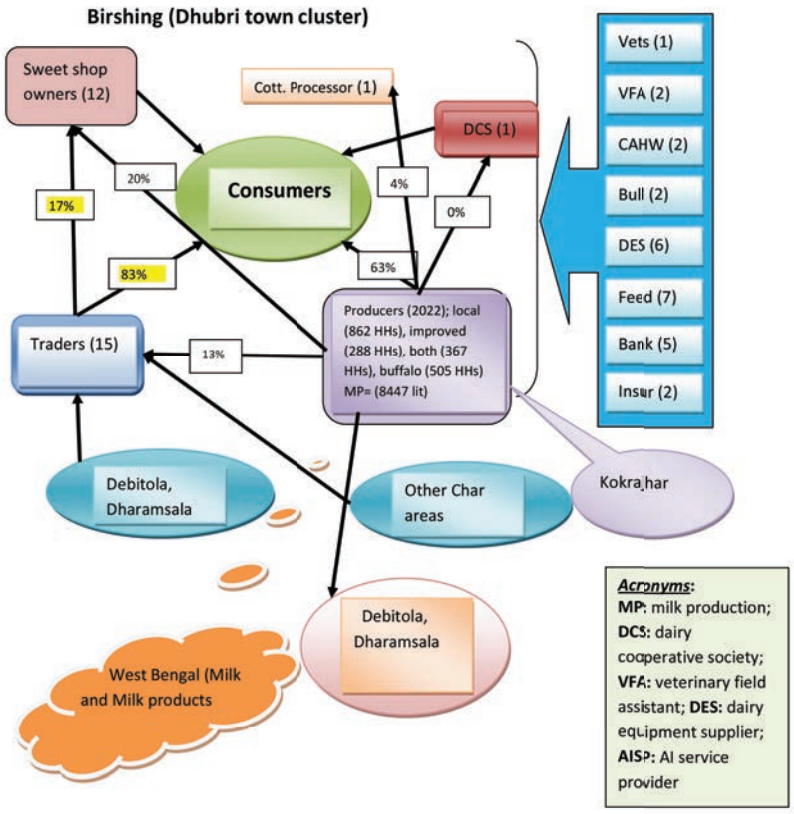
Dairy cluster	Markets with trading of milk and milk products*	Bank and other financing institutions$	Insurance for livestock	Approach road quality (% of total cluster villages)		
				Blacktop	Gravel	Earthen
Debitola	Dhubri town (daily), Gauripur market	UCO, UBI-Gauripur, NABARD, AGVB	New India Assurance/Oriental Insurance	20	0	80
Birshing (Dhubri town)	Gauripur market (weekly), Dhubri town (daily)	Allahabad Bank, Bandhan Bank, Canara Bank, CBI, PNB, SBI	0	0	0	100
Dharamsala	0	Allahabad Bank	0	40	10	50

*Frequency of market is in parentheses (daily, biweekly or weekly).

4.11.13 Entrepreneurs at cluster level

There are no entrepreneurs identified in any of the APART clusters of this district.

Figure 4.11.1: Schematic representation of the value chain actors of the major recommended clusters.



4.11.15 Quick observations and recommendations

Birshing is the most important cluster linked to Dhubri town. The major source is the river blocks (*Chars*) such as Majer char, Chalakura, Birshing, Kuntir char, Dangir Char etc. where buffalo-based farms and improved cattle stock constitute the main farming system. As milk production areas are mainly located in the river blocks with informal milk trading to the district town, i.e., Dhubri, these production areas are associated with severe communication constraints. Being the production areas located in the river blocks with an expanded area, the farmers use small ferry services. Being cut off from main land areas by the river, the access to veterinary services is relatively poor as per the information from the interviewed farmers at Birsing, Chalakura and Majer Char. Only a few VFAs are found to render veterinary services in these areas. Under the Debitola cluster Madaikhali, Asharikandi, S/Geramari, Sajuarkuti etc.are important production villages from where milk goes to both Dhubri town and Gauripur market. For convenience of covering market actors to train following sequence may be followed and effort should made to track outside suppliers for quality check of the milk.

Table 4.11.18: Clusterlevel planning for conducting training in Dhubri district

Rank of importance	Name of the cluster	Possible no. of training sessions				Recommendations
		Prod (20)	SM (2)	CP (0)	MT (3)	
Most potential	Birshing	10	0.8	0	1.25	Dhubri town is linked to Birshing Cluster and mainly milk comes from the farms and *khutis* of *Chapari* areas (e.g. Chalakura, Majer Char, Kuntir Char, Birshing). Training of producers should be imparted in these *khutis* and *Chapori* areas. As some milk and curd comes from Siliguri (WB), vendors supplying these processed products should be traced and trained.
Medium potential	Debitola	7	0.6	0.05	0.75	Debitola and Dharmasala both are independent clusters with different markets.
	Dharmasala	3	0.6	0.05	0.75	
Less Potential	Nil					

Note: When considered for producer's training, only commercial farms were considered with ownership of high yielding improved animal stock plus the *khuti* system of rearing farms; **Prod:** Dairy producers, **MT:** Milk traders; Figures within brackets indicate number of respective market actors.

4.12 Kamrup district

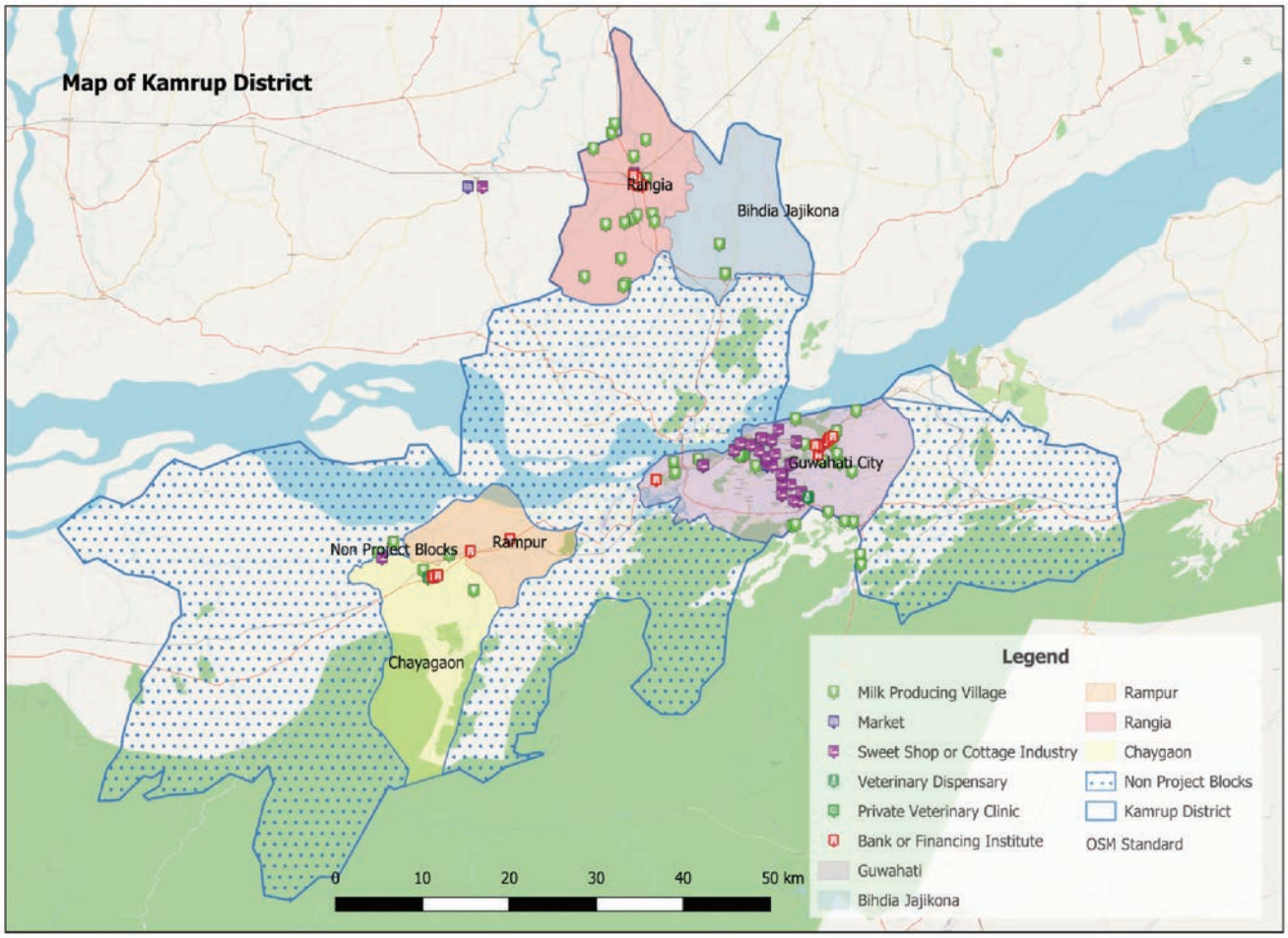
4.12.1. Cluster villages identification based on field visit

The project identified five clusters in Kamrup district for the implementation of ensuing APART project. The selected clusters covering the potential villages for the intervention of the informal dairy value chain are Rangia, Rampur, Chayagaon, Bihdia Jajikona and Guwahati. Making an initial overview and discussion with some of the informed sources such as District Dairy Officers (DDO), DVO, VOs/BVOs of the respective clusters, the ILRI enumerators finalized the villages as was listed by the DDD as potential villages from where the village specific information were drawn. The lists of villages are the pre-existent villages only as shown in Table 4.21.1.

Table: 4.12.1: Cluster village identification in Kamrup district

Dairy cluster	Names of the DDD listed-villages	Names of the ILRI listed-villages	Potential villages incorporated	Potential villages dropped
Rangia	Balikuchi, Sundhia, Dohora, PachimparBahghbari, Mohkali, Hariandan, Batakuchi, Balisatra, Dhuhi, Barahghati, Kanikuchi, Bormura, Bichenella, Gurkuchi, Bongaon, Dimu, Surakhundi, Tulsibari, Lasibishnupur, Koniha - cluster/society has 68 villages	Balikuchi, Sundhia, Dohora, Pachimpar Bahghbari, Mohkali, Hariandan, Batakuchi, Balisatra, Dhuhi, Barahghati, Kanikuchi, Bormura, Bichenella, Gurkuchi, Bongaon, Dimu, Surakhundi, Tulsibari, Lasibishnupur, Koniha - cluster/society has 68 villages	0	0
Rampur	Satpokhili	Satpokhili	0	0
Chayagaon	Alekjhari, Tupjani, Balasidhi, Paschimduli, Milanpur, Tokradia, Bhatipara, Borpith, Ghoramara, UttarBanakata, DakhinBanakata, Banakata, Balagaon, Jamuguri, Kalardia,	Alekjhari, Tupjani, Balasidhi, Paschimduli, Milanpur, Tokradia, Bhatipara, Borpith, Ghoramara, UttarBanakata, DakhinBanakata, Banakata, Balagaon, Jamuguri, Kalardia,	0	0
Bihdia Jajikona	Saychi, Baregaon, Dagaon, Barhata	Saychi, Baregaon, Dagaon, Barhata	0	0
Guwahati		8th mile, 9th mile, 10th mile, 11th mile, Jorabat, Panikhaiti (Belguri), Bonda, Amgaon (Bonda), Narengi (Mathgaria), Basistha, Maligaon, Goshala	8th mile, 9th mile, 10th mile, 11th mile, Jorabat, Panikhaiti (Belguri), Bonda, Amgaon (Bonda), Narengi (Mathgaria), Basistha, Maligaon, Goshala	0

Figure 4.12: The map of the surveyed clusters in Kamrup district.



4.12.2 FGD participants' profile

Table 4.12.2 shows the number of participants segregated by gender and social status. The average number of participants across the project clusters is 8.37 in Kamrup district of which male and female participants respectively constitute 5.90 and 2.47 numbers representing in percentage terms 70.49 and 29.51%. Among the participants across the project clusters, representation of the participants from general category is the highest (78.54%) followed by the OBC category (15.39%). Participant from SC category was found to be only 5,01%, while ST people's representation was the lowest (1.05%) among the total participants in the district of Kamrup. In Guwahati majority of the participants (95.28%)are from General category with the community profile as Nepali and Bihari rearing improved cattle breeds in commercial system of farming.

Table 4.12.2: Distribution of participants by gender and social status

Dairy cluster	Average number of participants			% social status of participants			
	Male	Female	Total	General	SC	ST	OBC
Rangia	5.26	2.85	8.11	64.14	10.25	0.00	25.61
Rampur	6.21	1.75	7.96	79.28	05.22	5.25	10.25
Chayagaon	5.40	3.60	9.00	85.26	00.00	0.00	14.74
BihdiaJajikona	4.38	3.77	8.15	68.75	09.60	0.00	21.65
Guwahati	8.25	0.39	8.64	95.28	00.00	0.00	04.72

4.12.3 Farming system by type of bovine stock

The dairy farming system based on type of bovine stock in the selected project clusters show that the district as whole has 5,586 HH who have atleast one dairy cattle or buffalo, representing 46.15% HH among the total HH across project clusters. According to breed of cattle for the selected clusters as a whole, proportion of farming HH having local breed, improved breed and both local and improved are 66.09%, 24.65% and 8.40% respectively Proportions of farming HH with buffalo stock constitute only 0.86% of the total HH (Table 4.12.3). Proportion of farmers having improved breed of cattle is the highest in Guwahti cluster (almost 95%) which is also found to be the highest among all the clusters across districts of the study. Being Guwahati as the main market for the urban milk consumers to buy milk, the peri-urban milk producers have grown to supply milk.These are mainly the farmers from Nepali community specialized in milk business and few farmers from Bihari community as well.

Table 4.12.3: Distribution of farm HH by type of bovine stock

Dairy cluster	Total HH	Total farming HH	% HH keeping cattle from local breeds	% HH keeping cattle from improved breeds	% HH keeping cattle from both local and improved breeds	% HH keeping buffaloes
Rangia	3,890	2,500	74.16	16.67	9.17	0.00
Rampur	319	135	84.46	6.22	9.32	0.00
Chayagaon	2,655	1,605	82.73	7.20	5.78	4.29
Bihdia Jajikona	848	373	85.54	8.18	6.28	0.00
Guwahati	-	1380	3.62	94.93	1.45	0.00

4.12.4 Farming system by rearing practices

Table 4.12.4 shows that almost 72.25% of farm HH rear cattle in a fully stall-fed condition across project clusters while the proportion of farmers rearing cattle in a partly stallfed condition constitute 72.25%. There is not any *khuti* system of rearing except in Chayagaon cluster as 8.24% of the total farm HH in this cluster keep local cattle or buffalo. The farming system based on rearing practice is closely related to the type of bovine stock as in Table 4.1.3. The fully stall-fed rearing condition increases with the increase of the number of improved cattle stock because grade cattle/crossbred animals are reared mostly in fully stallfed condition (see Tables 4.12.3 and 4.12.4).

Table 4.12.4: Distribution of farm HH by rearing practices

Dairy cluster	% fully stall fed	% partly stall fed	% *khuti* (forage herd) system
Rangia	15.28	84.72	0.00
Rampur	10.21	89.79	0.00
Chayagaon	06.65	85.11	8.24
BihdiaJajikona	07.65	92.35	0.00
Guwahati	92.22	07.78	0.00

4.12.5 Gendered participation in production and income control in dairying

To have an understanding of the prevailing status of women in the rearing activities of dairy animal and control over income accrued through milk and milk product sale, the participant farmers were asked on the same. While asking, female participants were separately asked for their response. During the field visit it was understood that women's roles in performing the rearing activities were relatively more compared to their role in the control of income vis-à-vis their male counterpart. Again, while understanding the role of women in conducting farm activities it depends on the nature of farm and type of farm activities. The fully commercial farms based on improved cattle stock require more back breaking hard work of male labourers of the family, while subsistence farming is mostly conducted in women's hands. Moreover, activities such as selling of milk in the market, grass collection, taking animals for grazing etc. are carried out mostly by the male members of the family. While, cleaning of cattle shed, feeding the cattle at home etc. are done mostly by the female members of the family. In regards

to income control, many a times farmers reported that their decision to spend income gained through the sale of milk and milk products is carried out jointly by discussing each other. In the project clusters undivided Kamrup, it has been seen that of the total farming activities carried out, women's' role is relatively higher compared to their male counterparts across the project clusters (72.17%). On the other hand, women's role on the control of income is measured as 47.20% for all the selected project clusters of Kamrup district (Table 4.12.5).

Table 4.12.5: Women's role in dairy production and income control

Dairy cluster	No. of total HH	% women have role in milk production	% women have control in income from milk production
Rangia	2,500	78.21	61.59
Rampur	135	69.25	48.25
Chayagaon	1,605	72.66	38.97
BihdiaJajikona	373	82.49	45.91
Guwahati	973	58.22	41.29

4.12.6 Average herd size (adult animals) of the farm HH according to type of bovine stock

The average herd size of the cattle stock equivalent to adult animal unit according to the type of bovine stock in Kamrup district is reported in Table 4.12.6. It indicates that the number of adult indigenous cattle per HH is 2.02 adult cattle heads across the project clusters with the highest being in Rangia cluster and the lowest in Rampur. Similarly, the average improved cattle holding in each HH across selected project clusters is 3.98. The relatively high average improved cattle holding across clusters are led by the high average number of improved cattle in the commercial farms of Guwahati city cluster (8.71). The farmers except Chayagaon reported that none of the farmers in these clusters owned buffaloes during the time the survey was conducted. The average size of buffaloes held by the farmers of Chayagaon cluster is 2.57 (Table 4.12.6).

Table 4.12.6: Average herd size (adult animals) by the bovine stock in the project clusters

Dairy cluster	No. of local cows	No. of improved cows	No. of buffaloes
Rangia	2.25	3.00	0.00
Rampur	1.88	2.89	0.00
Chayagaon	2.00	2.20	2.57
BihdiaJajikona	1.98	3.10	0.00
Guwahati	2.00	8.71	0.00

Source: Field Survey, 2018

4.12.7 Milk productivity and production of the bovine stock at cluster level

The daily milk yield of the bovine stock is not uniform in the entire lactation length. Immediately after the calf born the yield remains relatively less and gradually it reaches the peak yield and after getting pregnant the yield again comes down. While doing the interview the farmers were asked about their response on the average daily milk yield during the lean and peak period of the cattle in milk. In the selected project clusters of Kamrup the daily milk productivity of local cows during the lean period is 0.56 litres for the clusters as a whole with Guwahati having 0.75 litres as the highest and 0.43 as lowest in the Rampur cluster. During the peak lactation days of the indigenous cow it gives an average productivity of 1.88 litres. In the same way the average lean and peak productivity of improved cattle stock is 2.45 and 9.73 litres and of buffaloes (in the only cluster of Chayagaon) is 0.84 and 4.21 litres respectively. The average milk yield improved cattle is the highest in Guwahati city cluster across the stages of lactation (8.43litres) which may be for the reason that commercial farmers mostly keep high yielding crossbreds and pure breed exotic cattle in this cluster supported by their improved management practices.

Table 4.12.7: Lowest and highest levels of average daily milk production per cow in the clusters

Dairy cluster	Milk production for local cows litres		Milk production of improved cows litres		Milk production of buffaloes litres	
	Low	High	Low	High	Low	High
Rangia	0.52	1.85	2.17	08.17	0.00	0.00
Rampur	0.43	1.88	2.10	09.11	0.00	0.00
Chayagaon	0.62	1.60	2.25	10.25	0.84	4.21
BihdiaJajikona	0.49	1.97	2.00	08.00	0.00	0.00
Guwahati	0.75	2.12	3.71	13.14	0.00	0.00

Tables 4.12.8 to 4.12.10 show the average milk production of local, improved and buffalo stock of the district. Based on local cattle stock, the total milk production across the clusters is 1, 02,284 litres with highest milk production recorded as 93,272 litres in Guwahati followed by Rangia cluster (5,703litres). Based on improved cattle stock, Table 4.12.9 points out that the total milk production of the improved cattle in the selected project clusters are almost 97,597 litres, with the highest milk production reported in Guwahati city cluster followed by Rangia (3232 litres). The only cluster reporting the presence of buffalo stock shows that total milk production based on buffalo population is 223 litres. Looking at the proportionate share of total milk production by all three categories of bovine stock of the selected project districts, the local cows, improved cows and buffaloes share 4.36, 95.42 and 0.22 respectively. Table 4.12.9 indicates more 99% of the milk in Guwahati is from improved cattle. Since the productivity of improved cattle stock is relatively better in the project district, proportion of farming HH rearing improved cattle stock, i.e.24.65% contributes almost 95% of the total milk production, while as high as 66% of the total farming HH rearing indigenous breed contributes only 5% of total milk production across bovines in the district. The low milk productivity of the indigenous cattle and the bovine stock predominantly of indigenous cattle based indicate that the project clusters need to emphasize on cattle crossbreding to transform a large part of the farms from subsistence to commercial.

Table 4.12.8: Estimated total milk production based on total local cattle stock

Dairy cluster	Estimated no. of HH with local cattle	Average herd size (adult lactating animals)	Average milk production per local cow litre	Total milk production with local cattle stock* litre
Rangia	1,854.00	1.13	1.19	2,472
Rampur	0114.02	0.94	1.16	0124
Chayagaon	1,327.82	1.00	1.11	1,474
Bihdia Jajikona	0319.06	0.99	1.23	0389
Guwahati	3.62	1.00	1.44	5

*In estimating total milk production of local cows only the lactating animals were considered assuming 50% of the total adult local cattle as lactating.

Table 4.12.9: Estimated total milk production based on improved cattle stock

Dairy cluster	Estimated no. of HH with improved cattle	Average herd size (adult lactating animals)	Average milk production per improved cow litre	Total milk production with improved cattle stock* litre
Rangia	0416.75	1.50	5.17	3,232
Rampur	0008.40	1.45	5.61	68
Chayagaon	0115.56	1.10	6.25	794
Bihdia Jajikona	0030.51	1.55	5.00	236
Guwahati	1,310.00	7.56	9.43	93,267

*In estimating total milk production of improved cattle only lactating animals are considered assuming 50% of the total adult improved cattle as lactating.

Table 4.12.10: Estimated total milk production based on buffalo stock

Dairy cluster	Estimated no. of HH with buffaloes	Average herd size (adult lactating animals)	Average milk production per buffalo litre	Total milk production with buffaloes* litre	Total milk production across bovine stock#lite
Rangia	00.00	0.00	0.00	000.00	**5,704**
Rampur	00.00	0.00	0.00	000.00	**192**
Chayagaon	68.85	1.29	2.53	223.41	**2,492**
BihdiaJajikona	00.00	0.00	0.00	000.00	**625**
Guwahati	00.00	0.00	0.00	000.00	**93,272**

*In estimating total milk production of buffaloes only lactating animals were considered assuming 50% of the total adult buffaloes as lactating; # Total milk production is the summation of milk production across bovine stock in Tables4.12.8, 4.12.9 and4.12.10.

4.12.8 Marketing behaviour of farmers at cluster level

All types of farms are found to sell their surplus milk. Farmers with local cattle stock keep a part of their milk produced for home consumption and offered to relatives/kith and keen and the remaining part is marketed to earn cash. Farmers with improved cattle stock produce primarily for market to earn profit, while some portion of the produce is kept for HH consumption. Since, total milk production is more in commercial farms with crossbred/ improved cattle proportion of milk marketed is also high. In subsistence farms with one or two litres of milk production based on local cattle, almost 50% of milk produced is consumed at home. Table 4.12.11 shows that farm HH of Kamrup with local cattle across project clusters sell 52.04% of the total milk production, while farm HH with improved cattle stock sell 83.24% of their total HH milk production. The only project cluster with presence of buffaloes sell 79.65% of their total milk production with buffalo stock.

Table 4.12.11: Percentage of milk sold per type of stock

Dairy cluster	% with local cows	% with improved cows	% with buffaloes
Rangia	40.66	85.12	00.00
Rampur	43.38	80.00	00.00
Chayagaon	58.25	80.00	79.65
BihdiaJajikona	49.65	78.25	00.00
Guwahati	68.25	92.85	00.00

Table 4.12.12 presents the sources of milk sale in the project clusters. It is evident from the table that unlike the other districts, selling milk to traders is predominant in majority of the clusters of Kamrup. An average of 49.43% of the total milk producers sells milk to traders. Farmers practicing local sale of milk constitute 31.54% of the total producers across clusters. These are smallholder dairy farmers rearing dairy animals of indigenous breed to cater the local raw milk consumers in their neighbourhood. Considering the district as whole based on the selected clusters 7.73% farmers sell milk to DCS, while 10.30% sell to private processors. The informal market actors such as milk traders and private processors together procure milk of almost 60% of the producers establishing an informal value chain between producers to traders and producers to SMs/CPs or producers to consumers to SMs.

Prices offered to producers by various marketing sources is the highest when farmers sell milk locally (INR 45/ litre) followed by INR 40/ litres when sourced to private processor. In the study sites of Kamrup price fetched for the milk sale to DCS is INR 38.80/litres across clusters which is relatively a better price received by farmers sourcing milk to DCS compared to some other districts.

Table 4.12.12: Percentage of milk sale by sources and their respective farm gate prices

Dairy cluster	Neighbours or local sale		To traders		To cooperatives		To private processors	
	%	Price/litre	%	Price/litre	%	Price/litre	%	Price/litre
Rangia	38.19	50.00	34.90	40.00	10.72	40.00	16.19	45.00
Rampur	28.63	40.00	53.44	37.00	09.15	36.00	15.66	40.00
Chayagaon	43.28	40.00	28.37	35.00	06.77	38.00	21.58	40.00
BihdiaJajikona	35.29	45.00	54.73	35.00	14.15	35.00	05.29	40.00
Guwahati	10.00	50.00	75.69	45.00	02.86	45.00	11.43	38.33

4.12.9 Access to veterinary services

Adequate access to and availability of veterinary services plays an important for enhancing bovine milk production and productivity. Across clusters average of 1.4 numbers of local veterinarians operate, while the average distance from the farm villages is 4.33 km. At cluster level, it is evident from the table that farm villages of Rangia cluster has to take 3.83 km to come for visiting local veterinarian, while farm villages of Chayagaon and Guwahati take lesser distance to physically meet a veterinarian. In the same way, accessing a VFA at his duty station/residence takes 1.8km across clusters ranging from 0.5 km in Rangia cluster to almost 2 km in Chayagaon, Bihdia Jajikona and Guwahati clusters. Table 4.12.13 shows that none of the farmers in Golaghat reports to have community animal health worker accessing the veterinary services. There is one AI practitioner each in cluster Rangia, Chayagaon and Guwahati.

Table 4.12.13: Access to veterinary services at the selected project clusters of the district

Dairy cluster	No. of local veterinarian*		Distance from the FGD location/ village km	No. of VFA		Distance from the FGD location/ village km	No. of CAHW		Distance from the FGD location/ village km
	Male	Female		Male	Female		Male	Female	
Rangia	1	0	3.83	8	0	0.5	0	0	0
Rampur	1	0	2.8	1	0	2.5	0	0	0
Chayagaon	3	0	1.5	4	0	2.0	0	0	0
Bihdia Jajikona	1	0	2.0	2	0	2.0	0	0	0
Guwahati	1	0	1.5	1	0	2.0	0	0	0

*Local veterinarian includes both private and government.

4.12.10 Access to other services (input and breeding)

Discussion with the farmers about their access to dairy equipment, which was essentially indicated their accessibility of utensils for storage of milk, they reported the number of such shops in the nearest main market from where these stuffs are available. Access to such equipment specifically designed for milk storage and transportation points out that it range from 1 in Rampur and Bihdia Jajikona to 30 in Guwahati. However, the average distance to such supplier shops of the selected villages of the clusters is almost 3 km. Pure feed shops are mostly found in the vicinity of commercial dairy farms of peri urban parts in Guwahati city and are almost nil in most of the remaining clusters as feeds are primarily sold in the grocery shops only The grocery shop from where the concentrate feeds are bought, are available within the project clusters with average distance of such shops from the study villages ranging from 2 to 3.5 km (see Appendix Table A2). Farm villages reporting to provide natural services to the fellow farmers are in the range of 1 in Bihdia Jajikona to 4 in Guwahati. There is no such service available in Rampur cluster.

4.12.11 Availability of producers'/traders' organization and input supplying institutions at cluster level

In regards to availability of active producers'/traders' organization, farmers report that there is not any registered milk traders' organization in the selected clusters except in Guwahati. Discussion with farmers in Guwhati indicated there is one such trader organization with membership of almost 400 vendors. Similarly, there are cooperative societies in selected dairy concentrated location in the peri urban parts of Guwahati city. Farmers in Chayagaon also report to have such DCS in the cluster. Asking the farmers about having any SHG related to dairy farming practices and active milk producers' institutions, farmers report that there is one DCS and MPI in Chayagaon and Guwahati cluster respectively (see Table 4.12.14)

Table4.12.14: Availability of producers/traders organizations at cluster level)

Dairy cluster	No. of milk traders organizations	No. of DCS
Rangia	0	0
Rampur	0	0
Chayagaon	0	1
Bihdia Jajikona	0	0
Guwahati	1	3(8th Mile,11th Mile,Jorabat)

The availability of input supplying institutions in the selected project clusters such as dairy plant/chilling plant/ bulk milk cooler, DDL, feed testing laboratory, feed mill and private veterinary clinic, farmers report that there are two generally known dairy plants in Guwahati cluster with one of DDD, Govt. of Assam and one of Purabi dairy while none of the respondents in the FGD of all the remaining project clusters reported the availability of such institutions. In regards to DDL, feed testing laboratory, farmers of Guwhati cluster report the availability of 3 such diagnostic centres such as NERDDL, laboratory of College of Veterinary Science, Khanapara and laboratory of Kamrup district veterinary office. Regarding the availability of feed testing laboratory, none of the clusters reported availability of such institutions. Table 4.12.15 indicates that there are 11 feed mills to the best of the knowledge of interviewed farmers, located at various parts in and outside the Guwahati city (see Annexe Table A3). In majority of the clusters of Kamrup distrct there is availability of private veterinary clinics from where medicines for animal health care/consultation with the veterinary doctors are available.

Table 4.12.15: Availability of input supplying institutions at cluster level

Dairy cluster	No. of dairy plant, chilling plant, BMC	No. of DDL	No. of feed testing laboratory	No. of feed mill	No. of private veterinary clinic
Rangia	0	0	0	0	2
Rampur	1 BMC/chilling plant (Rampur)	0	0	0	1
Chayagaon	0	0	0	0	1 (Petent vet.)
Bihdia Jajikona	0	0	0	0	0
Guwahati	4 (central dairy, Purabi Dairy, GR Dairy, AMUL)	3	0	10	8

4.12.12 Major milk market actors and other infrastructure in the dairy value chain

In Table 4.12.16, the number of milk market actors involved in the dairy value chain of the selected project clusters is presented. These market actors are linked to the major town or market point of the cluster. The number of milk traders is in the range of two in Rampur cluster to 400 in Guwahati city cluster. As the table points out, there is no cottage industry owner in Rampur and Bihdia Jajikona, but based on the information from farmers, there are five cottage processors in Rangia and Chayagaon each and eight in Guwahati City. The number of sweet shops in Guwahati city is the highest (250) not only among the clusters in Kamrup district but among all the clusters in the state as a whole; while lowest are only one sweet shop in Rampur cluster.

Table 4.12.16: Number of milk market actors at cluster level (based on KII and FGD)

Dairy cluster	No. of milk traders	No. of cottage industry owners	No. of sweet shop owners
Rangia	30	5	15
Rampur	2	0	1
Chayagaon	30	5	20
BihdiaJajikona	4	0	2
Guwahati	400	8	250

The major linked markets where milk and milk products are traded are shown in Table 4.12.17. On being asked the farmers, if any of them in the village accessed bank credit during 12 months preceding the survey and to name the banks, dairy farmers reported that none of them availed credit from formal financial sources. Few farmers in Podumoni cluster reported that they availed bank loans from SBI, AGVB, Allahabad Bank, and PNB. Some of the unorganized commercial farms reported the access to insurance services from the government supported insurance scheme under the National livestock Mission (NLM) Guwahati done through New India Assurance/Oriental Insurance. Such clusters are Rangia, Chayagaon, and Guwahati. Farmers in Guwahati cluster also found to access services from some other commercial insurance company. Among the selected clusters, 78% of the cluster villages across the project district are found to having favourable road infrastructure with black top approach roads; while 10% and 12% villages are having gravel road and earthen road respectively.

Table 4.12.17: Markets and other infrastructure at cluster level

Dairy cluster	Markets with trading of milk and milk products*	Bank and other financing institutions	Insurance for livestock	Approach road quality (% of total cluster villages)		
				Blacktop	Gravel	Earthen
Rangia	Rangia (weekly)	SBI, UCO, PNB, Bandhan Bank	New India Assurance/ Oriental Insurance	40	30	30
Rampur	Rampur (weekly)	SBI	0	100	0	0
Chayagaon	Chaygaon, Kukurmara	SBI,AGVB-Kukurmara, Allahabad Bank	New India Assurance/ Oriental Insurance	80	0	20
Bihdia Jajikona	Baihata (weekly), Goreswar Weekly)	SBI	0	70	20	10
Guwahati	8th mile, Narengi, 9th mile, Panikhaiti, different parts within Guwahati city (daily)	SBI-JorabatBranch,SBI-Narengi,PNB, UCO, Allahabad Bank, Canara Bank, UBI	New India Assurance/ Oriental Insurance	100	0	0

*Market frequency isin parentheses (daily, biweekly or weekly).

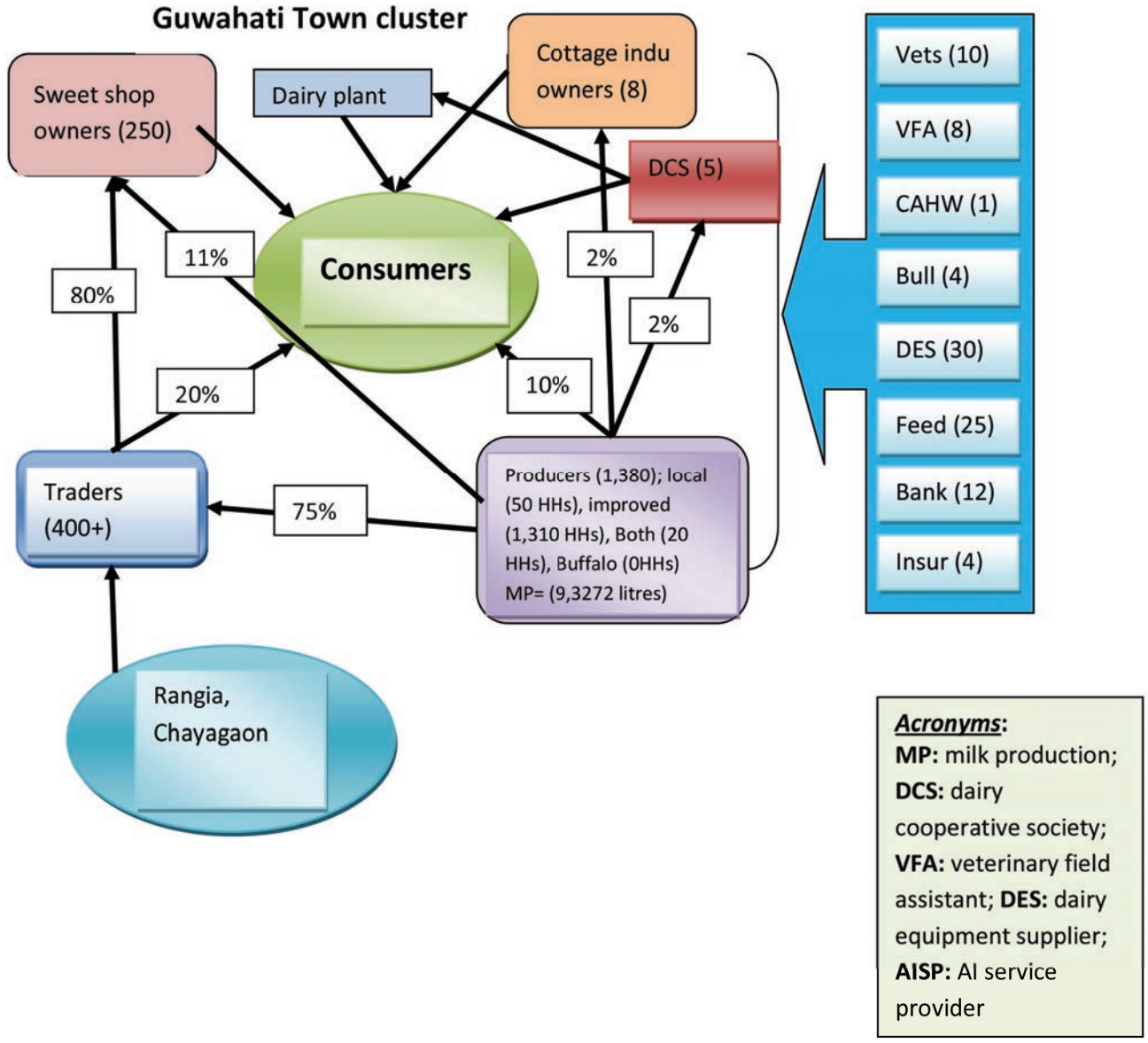
4.12.13 Progressive farmers at cluster level

Table 4.12.18 indicates the number of progressive dairy farmers/milk traders/cottage industry owners. It shows that there are 4 such entrepreneurs identified in Rangia and one in Chayagaoncluster.

Table 4.12.18: Names and contacts of promising progressive entrepreneurs in dairy

Dairy cluster	No. of progressive farmers
Rangia	4
Rampur	0
Chayagaon	1
Bihdia Jajikona	0
Guwahati	552 (40% commercial farms with more than 10 crossbred animals)

Figure 4.12.1: Schematic representation of the value chain actors of the major recommended clusters.



4.12.15 Quick observations and recommendations

Guwahati city is the capital city of the state and the largest market for dairy value chain actors. There are some higher milk producing potential villages nearby to the city those are- 8th, 9th, 10th, 11th mile, Jorabat, Panikhaiti etc.from where maximum amount of milk is being supplied to the markets .Besides some portion of milk is also

being supplied from other clusters of the district Rangia and Chayagaon and some portion of milk completely formally by some private dairy plants. Purabi ,Amul collect milk from other districts and Sitajakhala from Morigaon district. Almost 90% farmers are commercial farmers in the areas nearby to the Guwahati city. There are almost 250 sweet shops in the city and more than 400 milk traders. There is milk traders association but the member-traders completely do marketing of milk and milk products informally. Chayagaon cluster can be clubbed with the Guwahati city. The cluster level planning to conduct training programme can be carried out as shown below.

Table 4.12.19: Cluster level planning for conducting training in Kamrup district

Rank of importance	Name of the cluster	Possible no. of training sessions				Recommendations
		Producers (52)	SM (24)	CP (1)	MT (20)	
Most potential	Guwahati City	33	12.5	0.50	17.50	1. Guwahati is the dominant cluster with highest number of informal market actors (SM and MT) and commercial dairy producers. Training should focus on these market actors on a priority basis. 2. Bihdia Jajikona can be merged with Rangia Cluster because of geographical nearness.
	Rangia	13	0.75	0.10	1.25	
	Bihdia Jajikona	1	0.15	0.00	0.50	
Medium potential	Chaygaon	4	0.40	0.25	0.60	Rampur can be merged with Chaygaon cluster because of geographical nearness.
	Rampur	1	0.25	0.10	0.70	
Less Potential	Nil					

Note: When considered for producer's training, only commercial farms were considered with ownership of high yielding improved animal stock plus the *khuti* system of rearing farms; **Prod:** Dairy producers, **SM:MT:** Milk traders; Figures within brackets indicate number of respective market actors.

4.13 Cachar district

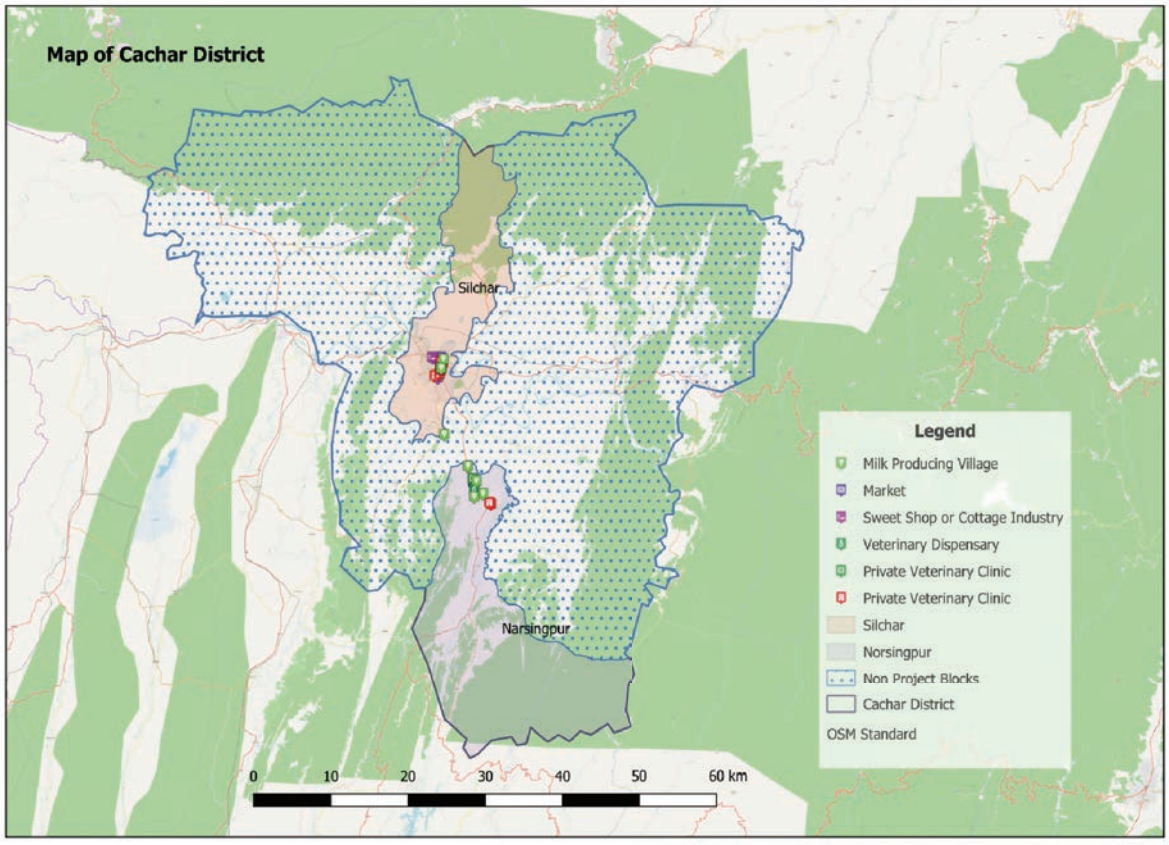
4.13.1 Cluster villages identification based on field visit

There are two clusters in Cachar district for the implementation of the ongoing APART project. The selected clusters covering the potential villages for the intervention of the informal dairy value chain are Norsingpur and Silchar town. Making an initial overview and discussion with some of the informed sources such as DVO, VOs/ BVOs of the respective clusters, the ILRI enumerators finalized the villages as was listed by the DDD as potential villages from where the village specific information were drawn. The lists of villages are shown in Table 4.13.1

Table 4.13.1: Cluster villages identification based on field visit

Dairy cluster	Names of the DDD-listed villages	Names of the ILRI listed-villages	Potential villages incorporated	Non-Potential villages dropped
Norsingpur	Clever House pt. 4, Norsingpurpt. 2, Boaljharpt, Norsingpur pt. 1	Clever House pt. 4, orsingpurpt. 2, Boaljharpt, Norsingpur pt. 1, Kazidhar Part-3	Kazidhar Part-3	0
Tapang	Rosekandi TE	NIL	0	
Silchar town		Duarbandha, Jamigang Mahabir Marg, Borakhai TE, Bor Jalen Ghat, Iranmara, Madhutila and Awartila, Silkhuri, Palangghat, Ukilpatty, Claver House part-4	Duarbandha, Jamigang Mahabir Marg, Borakhai TE, Bor Jalen Ghat, Iranmara, Madhutila and Awartila, Silkhuri, Palangghat, Ukilpatty, Claver house part-4	0L

Figure 4.13: Map of the surveyed clusters in Cachar district.



4.13.2 FGD participants' profile

Table 4.13.2 shows the number of participants segregated by gender and social status. The average number of participants across the project clusters is 9 in Cachar district of which male and female participants respectively constitute 7.25 and 1.75 numbers representing in percentage terms 80.55% and 19.44%. The caste profile shows that among the participants across the project clusters, representation of the participants from OBC category is the highest (54%) followed by the General category (37.5%). Only 8.5% of the total participants belonged to ST community and no participant from SC category was found.

Table 4.13.2: Distribution of participants by gender and social status

Dairy cluster	Average no. of participants			% social status of participants			
	Male (%)	Female (%)	Total	General	SC	ST	OBC
Norsingpur	6 (75)	2 (25)	8 (100)	35	0	5	60
Silchar town	8.5 (85)	1.5 (15)	10 (100)	40	0	12	48

4.13.3 Farming system by type of bovine stock

The dairy farming system based on type of bovine stock in the selected project clusters show that the district as whole has 3,592 HH who have atleast one dairy cattle or buffalo, representing 50.70% HH among the total HH across project clusters. According to breed of cattle for the selected clusters as a whole, proportion of farming HH having local breed, improved breed and both local and improved are 66.67%, 22.29% and 5.49% respectively. Proportions of farming HH with buffalo stock constitute only 5.56% of the total HH(Table 4.16.3). Proportion of farmers having improved breed of cattle in Norsingpur cluster is 26.25% and in Silchar town cluster is 18.33% out. of the total farming HH.

Table 4.13.3: Distribution of farm HH by type of bovine stock

Dairy cluster	Total HH	No.of farming HH (%)	% HH keeping cattle from local breeds	% HH keeping cattle from improved breeds	% HH keeping cattle from both local and improved breeds	% HH keeping buffaloes
Norsingpur	1,950	955 (48.97)	65.00	26.25	8.75	0
Silchar town	5,030	2,637 (52.42)	68.33	18.33	2.22	11.11

4.13.4 Farming system by rearing practices

Table 4.13.4 shows that almost 25.76% of farm HH rear cattle in a fully stall-fed condition, while proportion of farmers rearing cattle in a partly stallfed condition constitute 74.24%. There is not any *khuti* system of rearing. The farming system based on rearing system is closely related to the type of bovine stock as in Table 4.13.3. The fully stall-fed rearing condition increases with the increase of the number of improved cattle stock because grade cattle/crossbred animals are reared mostly in fully stallfed condition (see Tables 4.13.3 and 4.13.4).

Table 4.13.4: Distribution of farm HH by rearing practices

Dairy cluster	% fully stall fed	% partly stall fed	*% khuti* (forage herd) system
Norsingpur	28.75	71.25	0
Silchar town	22.78	77.22	0

4.13.5 Women's participation in dairy production and income control

To have an understanding of the prevailing status of women in the rearing activities of dairy animal and control over income accrued through milk and milk product sale, the participant farmers were asked on the same. While asking, female participants were separately asked for their response. It was gleaned that women's roles

in performing the rearing activities were low compared to their role in the control of income vis-à-vis their male counterpart. Again, while understanding the role of women in conducting farm activities it depends on the nature of farm and type of farm activities. The fully commercial farms based on improved cattle stock require more back breaking hard work of male labourers of the family, while subsistence farming is mostly conducted in women's hands. Moreover, activities such as selling of milk in the market, grass collection, taking animals for grazing etc. are carried out mostly by the male members of the family. While, cleaning of cattle shed, feeding the cattle at home etc. are done mostly by the female members of the family. In regards to income control, many a times farmers reported that their decision to spend income gained through the sale of milk and milk products is carried out jointly by discussing each other. In the project clusters Cachar, it has been seen that of the total farming activities carried out, women's' role is relatively lower compared to their male counterparts across the project clusters (23.13%). On the other hand, women's role on the control of income is measured as 40.63% for all the selected project clusters of Cachar district (see Table 4.13.5).

Table 4.13.5: Women's participation in dairy production and income control

Dairy cluster	No. of total farming HHs	% women have role in milk production	% women have control in income from milk production
Norsingpur	0955	22.50	42.50
Silchar town	2,637	23.75	38.75

4.13.6. Average herd size (adult animals) of the farm HH according to type of bovine stock

The average herd size of the cattle stock equivalent to adult animal unit according to the type of bovine stock is reported in Table 4.13.6. It indicates that the number of adult indigenous cattle per HH is 2.25 across the project clusters. Similarly, the average improved cattle holding in each HH across selected project clusters is 2.12. The farmers in Norsingpur reported that none of the farmers in these clusters owned buffaloes during the time the survey was conducted. The average size of buffaloes held by the farmers of the remaining cluster, Silchar town is three.

Table 4.13.6: Average herd size (adult animals) by bovine stock in the project clusters

Dairy cluster	No. of local cows (%)	No. of improved cows (%)	Buffaloes (%)
Norsingpur	02.24 (49.89)	02.25 (50.11)	-
Silchar town	02.25 (31.03)	2 (27.59)	3 (41.38)

4.13.7 Milk productivity and production of the bovine stock at cluster level

The daily milk yield of the bovine stock is not uniform in the entire lactation length. Immediately after the calf born the yield remains relatively less and gradually it reaches the peak yield and after getting pregnant the yield again comes down. While doing the interview the farmers were asked about their response on the average daily milk yield during the lean and peak period of the cattle in milk. In the selected project clusters of Cachar the daily milk productivity of local cows during the lean period is 0.47 litres for the clusters as a whole. During the peak lactation days of the indigenous cow it gives an average productivity of 2 litres for both the clusters. In the same way the average lean and peak productivity of improved cattle stock is 2.57 and 7.73 litres and of buffaloes is 1.50 and 3.75 litres in Silchar town (Table 4.13.7).

Table 4.13.7: Lowest and highest levels of average daily milk production per cow in the clusters

Dairy cluster	Milk production of local cows litres		Milk production of improved cows litres		Milk production of buffaloes litres	
	Low	High	Low	High	Low	High
Norsingpur	0.45	2	2.40	7.25	-	-
Silchar town	0.50	2	2.75	8.20	1.50	3.75

Tables 4.13.8, 4.13.9 and 4.13.10 show the average milk production of local, improved and buffalo stock of Cachar district. Based on local cattle stock, the total milk production across the clusters is 3,385 litres with highest milk production recorded as almost 2534 litres in Silchar town followed by Norsingpur cluster. Based on improved cattle stock, the total milk production of the improved cattle in both the selected project clusters is 4,007 litres. The cluster Silchar town reporting the presence of buffalo stock shows that total milk production based on buffalo population is 1,153 litres. Looking at the proportionate share of total milk production by all three category of bovine stock of the selected project districts, the local cows, improved cows and buffaloes share 39.61, 46.89 and 13.50% of total milk production respectively.

Table 4.13.8: Estimated total milk production based on total local cattle stock

Dairy cluster	Estimated no. of HH with local cattle	Average herd size (adult animals)	Average milk production per local cow litres	Total milk production with local cattle stock* litres
Norsingpur	0620.75	1.1	1.23	0852
Silchar town	1,801.86	1.1	1.25	2,534

*In estimating total milk production of local cows only the lactating animals were considered assuming 50% of the total adult local cattle as lactating.

Table 4.13.9: Estimated total milk production based on improved cattle stock

Dairy cluster	Estimated no. of HH with improved cattle stock	Average herd size (adult animals)	Average milk production per improved cow litre	Total milk production with improved cattle stock* litre
Norsingpur	250.69	1.1	4.83	1,361
Silchar town	483.36	1.0	5.48	2,646

*In estimating total milk production of improved cattle only lactating animals are considered assuming 50% of the total adult improved cattle as lactating.

Table 4.13.10: Estimated total milk production based on buffalo stock

Dairy cluster	Estimated no. of HH with buffalo	Average herd size (adult animals)	Average milk production per buffalo litre	Total milk production with buffalo stock* litre	Total milk production across bovine stock#litre
Norsingpur	000.00	-	0.00	0000.00	**2,212**
Silchar town	292.97	1.5	2.63	1,153.57	**6,334**

*In estimating total milk production of buffaloes only lactating animals were considered assuming 50% of the total adult buffaloes as lactating.

#Total milk production is the summation of milk production across bovine stock in Tables 4.13.8, 4.13.9 and 4.13.10.

4.13.8 Marketing behaviour of farmers at cluster level

All types of farms are found to sell their surplus milk. Farmers with local cattle stock keep a part of their milk produced for home consumption and the remaining part is marketed to earn cash. Farmers with improved cattle stock produce primarily for market to earn profit, while some portion of the produce is kept for HH consumption. Since, total milk production is more in commercial farms with crossbred/improved cattle and buffaloes proportion of milk marketed is also high. In subsistence farms with one or two litres of milk production based on local cattle, more than 50% of milk produced is consumed at home. Table 4.13.11 shows that farm HH with local cattle across project clusters sell 47.25% of the total milk production, while farm HH with improved cattle stock sell 81.63% of their total HH milk production. The project cluster with buffaloes, Silchar town, sells 82.50% of their total milk production.

Table 4.13.11: Bovine stock percentage of milk sold per HH

Dairy cluster	% with local cows	% with improved cows	% with buffaloes (%)
Norsingpur	42.00	81.25	-
Silchar town	52.50	82.00	82.50

Table 4.13.12 presents the sources of milk sale in the project clusters. It is evident from the table that selling milk in the neighbourhood or selling self in the local market is an important source of sale in both the clusters of Cachar district. These are smallholder dairy farmers rearing dairy animals of indigenous breed to cater the local raw milk consumers in their neighbourhood. Considering the district as whole based on the selected clusters 52.50% of the total producers sell milk to traders followed by selling to neighbours or in the local market (41.87%). Selling milk to the DCS in all the project clusters is only 1.25% pointing out that almost 99% of the total farmers in the selected cluster use informal channel to dispose milk. The informal market actors such as milk traders and private processors together procure milk of almost 56.87% of the producers establishing an informal value chain between producers to traders and producers to SMs/CPs or producers to consumers to SMs.

Prices offered to producers by various marketing sources are the highest when farmers sell milk to private processors (INR 60/litre) followed by INR 45/ litres when farmers resort to local sale. As shown by empirical studies in Assam and rest of India that cooperatives are weak in offering better prices to consumers, similar finding is also reported in the study sites of Cachar where cooperatives offer only Rs 35/litres across clusters. However, price received from DCS is also same with the price received when sourced to traders indicating that the number of traders and demand raised by traders are relatively less compared to the supply of milk in both the clusters (Table 4.13.12)

Table 4.13.12: Percentage of milk sale by sources and their respective farm gate prices (in INR)

Dairy cluster	Neighbours or local sale		To traders		To cooperatives		To private processors	
	%	Price/litre	%	Price/litre	%	Price/litre	%	Price/litre
Norsingpur	40.00	40.00	60.00	35.00	0	-	0	-
Silchar town	43.75	50.00	45.00	35.00	2.50	35.00	8.75	60.00

4.13.9 Access to veterinary services

For the consumers' safety and milk quality, adequate access to veterinary services is important. Table 4.16.13 presents the number of veterinary service providers which include local veterinarians, veterinary field assistants (VFA), community animal health workers and AI practitioners providing services to the farmers. Across clusters Norsingpur cluster has one local veterinarian operating in the project villages, while Silchar town has four local veterinarians. Average distance from the farm villages is 3.11 km. At cluster level, it is evident from Table 4.13.13 that farm villages of two clusters are relatively closely located to a doctor's residence/duty station. In the same way, accessing a VFA at his duty station/residence takes 2.56 km across clusters. The table also shows that none of the farmers in Cachar reports to have community animal health worker accessing the veterinary services while in Sichar town cluster farmers report the presence of 3 AI practitioners providing breeding services to the farmers of remote locations.

Table 4.16.13: Access to veterinary services at the selected project clusters of the district

Dairy cluster	No. of local veterinarian*		Distance from the FGD location/ village km	No. of VFA		Distance from the FGD location/village km	No. of CAHW		Distance from the FGD location/ village km
	Male	Female		Male	Female		Male	Female	
Norsingpur	1	0	02.62	5	0	02.62	0	0	0
Silchar town	4	0	03.60	13	0	02.50	0	0	0

*Local veterinarian includes both private and government employed.

4.13.10 Access to other services (input and breeding)

In this section major inputs that a farmer access for their milk storage and transportation, feeding of cattle and natural mating of their animal. On being asked the farmers about their access to dairy equipment, which was essentially indicated their accessibility of utensils for storage of milk, they reported the number of such shops in the nearest main market from where these stuffs are available. Farmers of Silchar town cluster reported the availability of four such shops from where they can buy milk cans or other such equipment specifically designed for milk storage and transportation.However, the average distance to such supplier shops of the selected villages is almost 5.1 km. Pure feed shops are very few in both the clusters as feeds are primarily sold in the grocery shops only. Quality segregation of a particular type of feed is mostly not found in these shops and thus farmers buy the available stock only. Farmers are much far from having knowledge on the quality of feeds except few educated and curious commercial farmers. The grocery shop from where the concentrate feeds are bought, are available within the clusters with average distance of such shops from the study villages ranging from 3.5 to 4.1 km (see Appendix Table A2). In all the selected clusters, no farmer is found providing natural mating services on commercial basis. However, farmers report an average of 1.5 numbers of breeding bulls across project clusters with an average distance of farmers from this bull owner is 1.6 km.

In regards to availability of active producers'/traders' organization, farmers report that there is not any registered milk traders' organization in the selected clusters. Similarly, there is also not having any SHG related to dairy farming practices and active milk producers' organization.There is no active dairy cooperative society in the selected clusters as well (see Table 4.13.14)

4.13.11 Availability of producers/traders organizations and input supplying institutions at cluster level

There are two DCS in Silchar town. Producers and milk traders organizations are absent from all clusters.

Table 4.13.14: Availability of producers/traders organizations at cluster level

Dairy cluster	Milk traders organizations	DCS
Norsingpur	0	0
Silchar town	0	2

The availability of input supplying institutions in the selected project clusters such as dairy plant/chilling plant/ bulk milk cooler, DDL, feed testing laboratory, feed mill and private veterinary clinic, farmers report that there is not any dairy plant (although 1 at Silchar town, current status is not functional) in both clusters, while farmers report the presence of one DDL under AHVD in the town doing only few tests on disease diagnosis. There is one feed mill in Silchar town out of the two clusters. Table 4.13.15 indicates that there are three private veterinary clinics in Norsingpur and four in Silchar town from where medicines for animal health care/consultation with the veterinary doctors is available.

Table 4.13.15: Availability of input supplying institutions at cluster level

Dairy cluster	No. of dairy plant, chilling plant, BMC*	No. of DDL	No. of feed testing laboratory	No. of feed mills	No. of private veterinary clinics
Norsingpur	0	0	0	0	3 (Govindo Medicos, Dev Medicos)
Silchar town	1 (dairy plantnon -functional)	1	0	1	4 (at Silchar town)

*Two BMC/chilling centresare present in Kalain and Harinagar which are unlikely to be connected with the listed clusters.

4.13.12 Major milk market actors and other infrastructure in the dairy value chain

In Table 4.13.16 the number of milk market actors involved in the dairy value chain of the selected project clusters is presented. These market actors are linked to the major town or market point of the cluster. Silchar Town has 50 numbers of milk traders and Norsingpur has 10. As the table points out, there is no cottage industry owner in both the clusters as some of the cottage industry products such as ghee, curd or cream are available in the sweet shops only. The number of sweet shops in Silchar town is 60; while only 4 sweet shops in Norsingpur

Table 4.13.16: Number of milk market actors at cluster level (based on KII and FGD)

Dairy cluster	No. of milk traders	No. of cottage industry owners	No. of sweet shop owners
Norsingpur	10	0	4
Cachar town	50	0	60

The major linked markets where milk and milk products are traded are shown in Table 4.13.17. The major markets linked to these clusters are Natun Bazaar and Silchar town. On being asked the farmers, if any of them in the village accessed bank credit during 12 months preceding the survey and to name the banks, dairy farmers of Silchar Town cluster reportedly availed credit from formal financial sources such as UBI Silchar and Federal Bank Silchar. Some of the unorganized commercial farms reported the access to insurance services from the government supported insurance scheme under the National livestock Mission (NLM) Guwahati.

Table 4.13.17: Markets and other infrastructure at cluster level

Dairy cluster	Markets with trading of milk and milk products*	Bank and other financing institutions	Insurance for livestock	Approach road quality (% of cluster villages)		
				Blacktop	Gravel	Earthen
Norsingpur	Natun Bazaar (weekly)	0	Oriental Insurance/ New India Assurance	75	25	0
Silchar town	Silchar town (daily)	UBI-Silchar,Federal Bank(Silchar)	Oriental Insurance/ New India Assurance	60	30	10

*Market frequency is in parentheses (daily, biweekly or weekly).

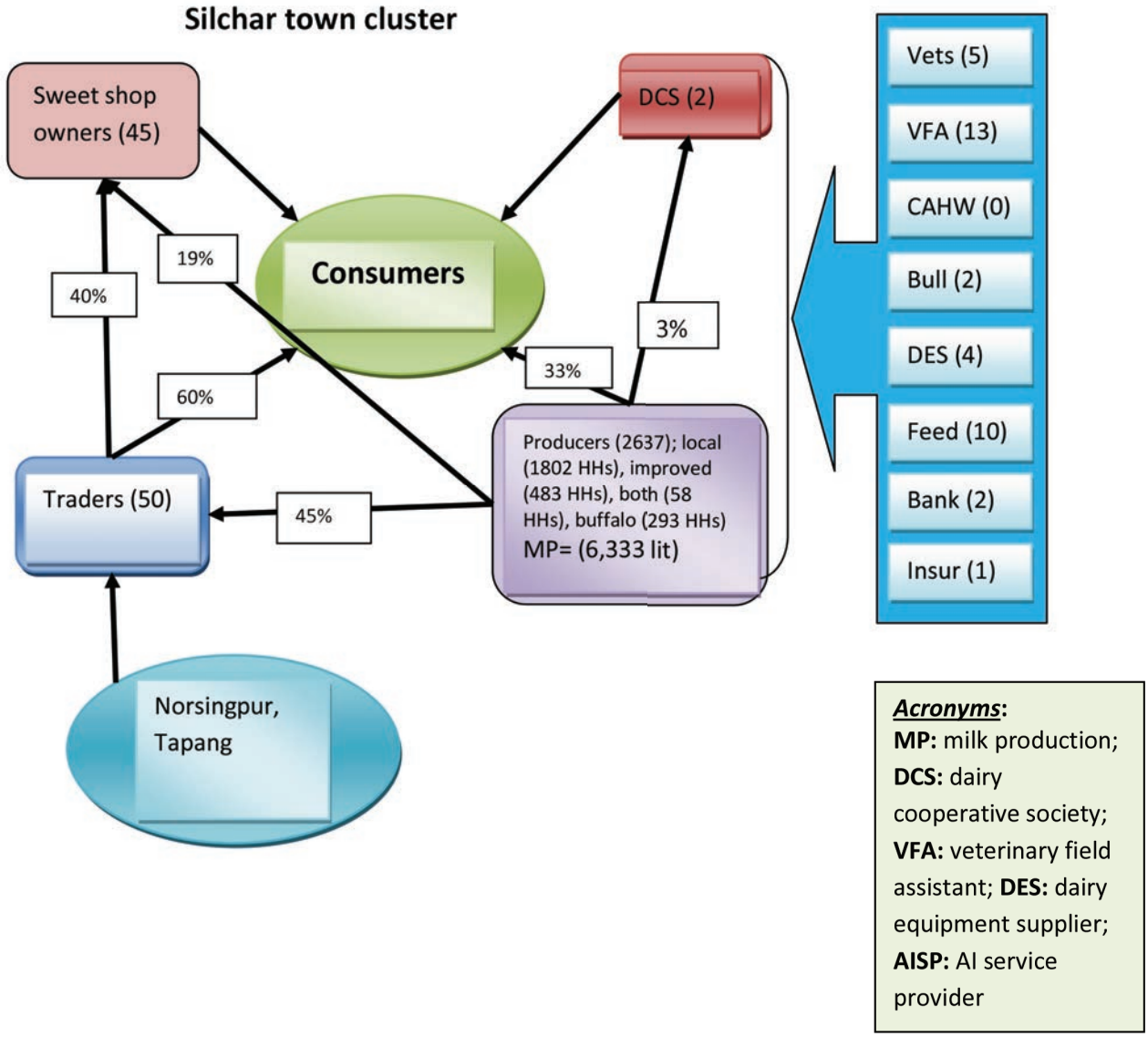
4.13.13 Progressive farmers at cluster level

Table 4.13.18 indicates the number of progressive dairy farmers. It shows that there are three such progressive farmersinNorsingpurcluster. There are no entrepreneurs in Silchar town.

Table 4.13.18: Names and contacts of promising progressive entrepreneurs in dairy

Dairy cluster	No. of entrepreneurs
Norsingpur	3
Cachar town	0

Figure 4.13.1: Schematic representation of the value chain actors of the major recommended clusters.



4.13.15. Summary and recommendations

Milk is mainly being supplied from Jamigang Mahabir Marg, Borakhai TE, Bor Jalen Ghat, Iranmara, Madhutila, Awartila, Silkhuri, Palangghat, Ukilpatty etc. and some portion of milk from Narsingpur cluster. Milk from Cachar district doesn't go-out and doesn't come- in from outside of the district. There are 4-5 DCSs registered under DDD but maximum milk is being supplied through informal marketing value chain. Norsingpur cluster can be clubbed with Silchar town cluster for convenience of conducting training as shown below.

Table 4.13.19: Cluster level planning for conducting training in Cachar district

Rank of importance	Name of the cluster	Possible no. of training sessions				Recommendations
		Producers (16)	SM (3)	CP (0)	MT (3)	
Most potential	Silchar town	12	2.5	0	2.5	1. Sichar town is the dominant cluster of Cachar district to where the milk comes various informal village milk producers where Tapang is one such cluster included in it. 2. While training the informal market actors of Narshingpur they may be clubbed with the Silchar town to form a full batch training.
Medium Potential	Narsingpur	4	0.25	0	0.5	
Less Potential	Nil					

Note: When considered for producer's training, only commercial farms were considered with ownership of high yielding improved animal stock plus the *khuti* system of rearing farms; **Prod:** Dairy producers, **MT:** Milk traders; Figures within brackets indicate number of respective market actors.

4.14 Morigaon district

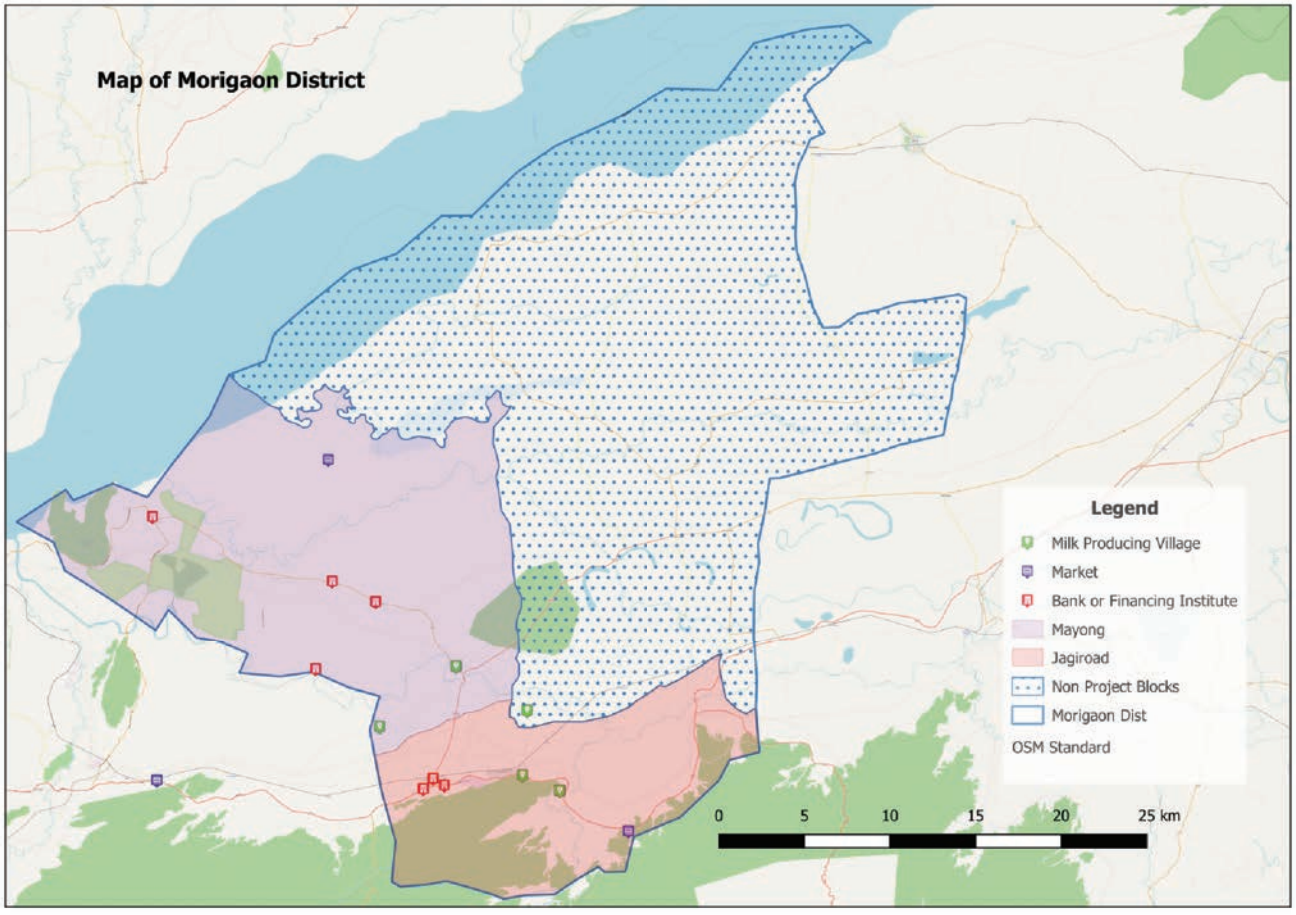
4.14.1 Cluster village identifications based on field visit

In Morigaon district two clusters have been identified for the implementation of ongoing APART project. The selected clusters covering the potential villages for the intervention of the informal dairy value chain are Mayong/ Kapilii and Jagiraod town. The lists of villages are shown in Table 4.14.1.

Table 4.14.1: Cluster villages in Morigaon district

Dairy cluster	Names of the DDD listed-villages	Names of the ILRI- listed villages	Potential villages incorporated	Non-potential villages dropped
Mayong	Satabari, Khanajan, BohaBorjhari, Howlabheti, Dungabori, Manah, Amlighat, Babungaon, Rowmari, Kilingvelly, Deoshal	JagiBhakat ,Satabari, Khanajan, BohaBorjhari, Howlabheti, Hatia Mukh, Dungabori, Manah, Udmari, Amlighat, Babungaon, Rowmari, Kilingvelly, Deoshal	0	0
Jagirod town	JagiBhakat, HatiaMukh, Udmari, Patidoya, Ouguri, Khatabori	JagiBhakat, HatiaMukh, Udmari, Patidoya, Ouguri, Khatabori	0	0

Figure 4.14: The map of the surveyed clusters in Morigaon district.



4.14.2 FGD participants' profile

The number of participants segregated by gender and social status is presented in Table 4.14.2. The average number of participants across the project clusters is 7.55 in Morigaon district of which male and female participants respectively constitute 6.17 and 1.38 numbers representing in percentage terms 81.72 and 18.28%. Among the participants across the project clusters, the participants are predominantly from general category (79.64%) followed by the participants from ST category (12.44%). Participant from SC and OBC is only 2.60% and 5.32% respectively among the total participants.

Table 4.14.2: Distribution of participants by gender and social status

Dairy clusters	Average no. of participants			% social status of participants			
	Male	Female	Total	General	SC	ST	OBC
Mayong	4.53	2.76	7.29	73.65	0.00	17.53	8.82
Jagiroad town (6)	7.81	0.00	7.81	85.62	5.21	07.35	1.82

4.14.3 Farming system by type of bovine stock

The dairy farming system characterized by type of bovine stock in the selected project clusters show that the district as whole has 1,446 HH who have atleast one dairy cattle or buffalo, representing 52.43% HH among the total HH across project clusters. According to breed of cattle for the selected clusters as a whole, proportion of farming HH having local breed, improved breed and both local and improved are 81.68%, 10.44% and 5.70% respectively. Proportions of farming HH with buffalo stock constitute a meager proportion of 2.18% of the total HH (Table 4.14.3). Proportion of farmers having improved breed of cattle is relatively higher in Mayong/Kapili cluster (12.23%) compared Jagoroad town cluster (8.65%).

Table 4.14.3: Distribution of farm HH by type of bovine stock

Dairy cluster	Total HH	Total farming HH (%)	% HH keeping cattle from local breeds	% HH keeping cattle from improved breeds	%HH keeping cattle from both local and improved breeds	% HH keeping buffaloes
Mayong (9)	1,620	912 (56.30)	79.23	12.23	6.19	2.35
Jagiroad town (6)	1,138	534 (46.92)	84.14	08.65	5.21	2.00

4.14.4. Farming system by rearing practices

Table 4.14.4 presents that 12.73% farm HH rear cattle in a fully stall-fed condition across project clusters, while proportion of farmers rearing cattle in a partly stallfed condition constitute 87.27%. There is not any *khuti* system of rearing except in both the clusters. The farming system based on rearing practice is proportionately related to the type of bovine stock owned by the farming HH of the project clusters as in Table 4.14.3. The fully stall fed rearing condition increases with the increase of the number of improved cattle stock because grade cattle/ crossbred animals are reared mostly in fully stallfed condition (see Tables 4.14.3 and 4.14.4).

Table 4.14.4: Distribution of farm HHs by rearing practices

Dairy cluster	% fully stall fed	% partly stall fed	% *Khuti* (forage herd) system
Mayong	14.65	85.35	0.00
Jagiroad town	10.82	89.18	0.00

4.14.5 Women's participation in dairy production and income control

In the project clusters of Morigaon district, it has been seen that of the total farming activities carried out, women's' role is relatively higher compared to their male counterparts across the project clusters (63.86%).

On the other hand, women's role on the control of income is measured as 40.07% for both the selected project clusters of Morigaon district (Table 4.14.5).

Table 4.14.5: Women's participation in dairy production and income control

Dairy cluster	No. of total HH	% women have role in milk production	% women have control of income from milk production
Mayong	912	68.32	38.21
Jagiroad town	534	59.39	41.93

4.14.6. Average herd size (adult animals) of the farm HH according to type of bovine stock

The average herd size of the cattle stock equivalent to adult animal unit of Morigaon district according to the type of bovine stock has been shown in Table 4.14.6. It indicates that the number of adult indigenous cattle per HH is 1.28 across the project clusters. Similarly, the average improved cattle holding in each HH across selected project clusters is 2.94. The average herd size of buffalo stock in the selected clusters in 1.40 across the two clusters.

Table 4.14.6: Average herd size (adult animals) by the bovine stock in the project clusters

Dairy cluster	No. of local cows	No. of improved cows	No. of buffaloes
Mayong	1.30	2.32	1.66
Jagiroad town	1.25	3.56	1.13

Source: Field Survey, 2018

4.14.7 Milk productivity and production of the bovine stock at cluster level

The daily milk yield varies in the entire lactation length showing an inverted U shaped trend. Immediately after the calf born the yield remains relatively less and gradually it reaches the peak yield and after getting pregnant the yield again comes down. During the execution of FGD with the farmers, they were asked about their response on the average daily milk yield during the lean and peak period of the cattle in milk. In the selected project clusters of Nalbari the daily milk productivity of local cows during the lean period is 0.52 litres for the clusters as a whole. During the peak lactation days of the indigenous cow it gives an average productivity of 2.16 litres. In the same way the average lean and peak productivity of improved cattle stock is 1.81 and 9.11 litres and of buffaloes is 0.98 and 3.92 litres/day respectively.

Table 4.14.7: Lowest and highest levels of average daily milk production per cow in the clusters

Dairy cluster	Milk production of local cows litres		Milk production of improved cows litres		Milk production of buffaloes litres	
	Low	High	Low	High	Low	High
Mayong	0.53	2.00	1.50	8.34	1.11	4.18
Jagiroad town	0.50	2.32	2.12	9.87	0.86	3.65

Tables 4.14.8, 4.14.9 and4.14.10 show the average milk production of local, improved and buffalo stock of the district. Based on local cattle stock, the total milk production across the clusters is approximately 990.09. The total milk production of the improved cattle in the selected two project clusters is almost 1129 litres. The total milk production based on buffalo population is only 60.66 litres across the two clusters. The proportionate share of total milk production by all three categories of bovine stock of the selected project districts indicates that the local cows, improved cows and buffaloes share 45.41%, 51.81% and 2.78% respectively.

Table 4.14.8: Estimated total milk production based on total local cattle stock

Dairy cluster	Estimated no. of HH with local cattle	Average herd size (adult lactating animals)	Average milk production per local cow litre	Total milk production with local cattle stock* litre
Mayong	722.58	0.65	1.27	594
Jagiroad town	449.31	0.63	1.41	396

*In estimating total milk production of local cows only the lactating animals were considered assuming 50% of the total adult local cattle as lactating.

Table 4.14.9: Estimated total milk production based on improved cattle stock

Dairy cluster	Estimated no. of HH with improved cattle	Average herd size (adult lactating animals)	Average milk production per improved cow litre	Total milk production with improved cattle stock* litre
Mayong	111.54	1.16	4.92	637
Jagiroad town	046.19	1.78	6.00	493

*In estimating total milk production of improved cattle only lactating animals are considered assuming 50% of the total adult improved cattle as lactating.

Table 4.14.10: Estimated total milk production based on buffalo stock

Dairy cluster	Estimated no. of HH with buffaloes	Average herd size (adult lactating animals)	Average milk production per buffalo	Total milk production with buffaloes* litre	Total milk production across bovine stock#litre
Mayong	21.43	0.83	2.65	47.05	**1,278**
Jagiroad town	10.68	0.57	2.26	13.61	**0902**

*In estimating total milk production of buffaloes only lactating animals were considered assuming 50% of the total adult buffaloes as lactating.

#Total milk production is the summation of milk production across bovine stock in Tables 4.14.8, 4.14.9 and4.14.10.

4.14.8 Marketing behaviour of farmers at cluster level

The marketed surplus of milk according to bovine stock is presented in Table 4.14.11. Marketed surplus is left over milk after keeping for HH consumption and offering to relatives. Farmers with improved cattle stock produce primarily for market to earn profit, while some portion of the produce is kept for HH consumption. On the other hand, farmers with local cattle keep most of their produce for home consumption and if production is a little higher, they resort to dispose the surplus through local sale. Since, total milk production is more in commercial farms with crossbred/improved cattle proportion of milk marketed is also high. In subsistence farms with one or two litres of milk production based on local cattle, close to 50% of milk produced is generally consumed at home. Table 4.14.11 shows that farm HH with local cattle across the two project clusters sell 45.98% of the total milk production, while farm HH with improved cattle stock sell 80.93% of their total HH milk production. Farm HH with buffalo stock sell 59.51% of their total milk production.

Table 4.14.11: Bovine stock percentage of milk sold per HH

Dairy cluster	% with local cows	% with improved cows	% with buffaloes
Mayong	48.15	82.39	65.32
Jagiroad town	43.80	79.48	53.71

Table 4.14.12 presents the major marketing channels of in the project clusters. It is evident from the table that unlike the districts discussed before that selling milk in the neighbourhood or selling self in the local market is relatively high (43.35%) and milk sold by farmers directly to processors in Morigaon district constitute only 6.20% of producers. Across the project clusters, selling milk to traders and private processors together constitute 17.52% of the total milk producers. Cooperatives being dominant in the district with penetration of Purabi Dairy and Local presence of Sitajakhala DUSS, a large segment of the farmers sell milk directly to DCS, while selling milk to traders is only 11.32%. The average prices offered to producers by various marketing sources is the highest when farmers sell milk locally (Rs. 45/litre) followed by Rs. 40/ litre when sourced to private processors. As obvious from empirical findings across India that cooperatives are weak in offering better prices to consumers, the price in the study sites of Morigaon is also found to offer Rs 36.50/litre. The price offered by milk trader is slightly higher over the price paid by DCS. Active presence of DCS and farmers finding this source as vibrant to get an assured sale of milk, almost 40% of the milk producers supply milk to DCS.

Table 4.14.12: Percentage of milk sale by sources and their respective farm gate prices

Dairy cluster	Neighbours or local sale		To traders		To cooperatives		To private processors	
	%	Price/litre	%	Price/litre	%	Price/litre	%	Price/litre
Mayong	42.35	45.00	13.19	38.00	36.87	36.00	7.59	40.00
Jagiroad town	44.35	45.00	09.45	38.00	41.39	37.00	4.81	40.00

4.14.9 Access to veterinary services

Table 4.14.13 presents the number of veterinary service providers which include local veterinarians, veterinary field assistants, community animal health workers, AI practitioners providing services to the farmers. Across clusters the average 1.5 number of local veterinarians operate, while the average distance from the farm villages is 5.5 km. In the same way, accessing a VFA at his duty station/residence also takes 5.5 km across the two clusters. Table 4.14.13 shows that none of the farmers in Morigaon reports to have community animal health worker accessing the veterinary services. There is one AI practitioner (Gopal Mitra) in Jagoroad operating in his Jurisdiction with an average distance of 3 km.

Table 4.14.13: Access to veterinary services at the selected project clusters of the district

Dairy cluster	No. of local veterinarians*		Distance from the FGD location/ village km	No. of VFA		Distance from the FGD location/village km	No.of CAHW		Distance from the FGD location/ village km
	Male	Female		Male	Female		Male	Female	
Mayong	1	0	6	2	0	6	0	0	0
Jagiroad	2	0	5	2	0	5	0	0	0

*Local veterinarian includes both private and governmentEmployed.

4.14.10 Access to other services (input and breeding)

In this section major inputs that a farmer access for their milk storage and transportation, feeding of cattle and natural mating of their animal. On being asked the farmers about their access to dairy equipment, which was essentially indicated their accessibility of utensils for storage of milk; they reported the number of such shops in the nearest main market from where these stuffs are available. Farmers reported the availability of 5-7 such shop from where they can buy milk cans or other such equipment specifically designed for milk storage and transportation with average distance of 5.5 km. Pure feed shops are very less in most of the clusters as feeds are primarily sold in the grocery shops only. The average number of grocery shops from where the concentrate feeds are bought and are available within the clusters is in the average distance of 4 km from cluster villages (see Table 4.4.14). In all the selected clusters, no farmer is found providing natural mating services of purebred exotic bulls or local bull on a commercial basis.

Table 4.14.14: Access to input and breeding (natural) services at cluster level

Dairy cluster	Dairy equipment supplier		Feed supplier/grocery shop selling feed		Breeding bull service provider/community bull	
	No.	Distance from the FGD location/village km	No.	Distance from the FGD location/village km	No.	Distance from the FGD location/village km
Mayong	5*	6	10	3	0	0
Jagirad town	7	5	10	5	0	0

4.14.11 Availability of producers/trader' organizations and input supplying institutions at cluster level

In regards to availability of active producers'/traders' organization, farmers report that there is not any registered milk traders' organization in the selected two clusters. Similarly, there is also not having any SHG related to dairy farming practices and active milk producers' Institutions. However, the clusters show sufficient numbers of active dairy cooperative society in the selected clusters ranging from 8 in Jagiroad cluster to 17 in Mayong (see Table 4.14.15)

Table 4.14.15: Availability of producers/traders organizations at cluster level

Dairy cluster	Milk traders organization	DCS
Mayong	0	17 (Jagi Bhakatgaon, Boha Borjhari, Satarbari, Khandajan)
Jagirad town	0	8 (Udmari, Howlabheti, Amlighat)

Notes: Figures in parentheses are the major linked villages

Farmers report that there is one dairy plan, chilling and BMC under Stajakhala DUSS in Amlighat under Jagiroad cluster; while none of the respondents in the FGD of all the project clusters reported the availability of DDL, feed testing laboratory. There is a feed millJagirod. Table 4.14.16 indicates that there are 2-3 private veterinary clinics in both the clusters of Morigaon from where medicines for animal health care/consultation with the veterinary doctors are available.

Table 4.14.16: Availability of input supplying institutions at cluster level

Dairy cluster	No.of dairy plant, chilling plant, BMC	No. of DDL	No. of feed testing laboratory	Feed mill	Private veterinary clinic
Mayong	1 BMC	0	0	1	2
Jagirod town	2 (1 of Sitajakhala; 1 under TMSS-non-functional)	0	0	0	3

4.14.12 Major milk market actors and other infrastructure in the dairy value chain

In Table 4.14.17, the number of milk market actors involved in the dairy value chain of the selected project clusters of Morigaon district is presented. There are not informal milk traders in the district as milk marketing channels is mostly in dominated by formal sector procurement through DCS collection centres. The number of milk traders is only 5-8 in both the clusters. Similarly, number of sweet shops is also less (8) in Mayong and together with Morigaon town and Jagiroad town the number of sweet shops is 17. For the convenience of imparting training for SMs and milk traders located in Morigaon, Jagiroad and Mayong can be clubbed to give one training to each set of market actors (milk trader and SMs). As the table points out, there are four and five cottage industry owners respectively in Mayong and Jagiroad clusters.

Table 4.14.17: Number of milk market actors at cluster level (based on KII and FGD)

Dairy cluster	No. of milk traders	No. of cottage industry owners	No. of sweet shop owners
Mayong	5	4	8
Jagirad town	15	5	15

The major linked markets where milk and milk products are traded are shown in table 4.14.18. The major markets linked to these clusters are Mayong, Morigaon town and Jagiroad. On being asked the farmers, if any of them in the village accessed bank credit during 12 months preceding the survey and to name the banks, dairy farmers of only Mayong cluster reported that one or two farmers availed credit from formal financial sources such as Union Bank JagiBhakat. Some of the unorganized commercial farms of all the clusters reported the access to insurance services from the government supported insurance scheme under the National livestock Mission (NLM) Guwahati done through New India Assurance/Oriental Insurance. The percentage of villages having blacktop approach roads, gravel roads and earthen roads are respectively 80%, 10% and 10% in the project district as a whole.

Table 4.14.18: Markets and other infrastructure at cluster level

Dairy cluster	Markets with trading of milk and milk products*	Bank and other financing institutions	Insurance for livestock	Approach road quality (% of cluster villages)		
				Blacktop	Gravel	Earthen
Mayong	Mayong, Jagiroad, Morigaon town	1 (Union Bank, Jagibhakat Branch)	New India Assurance/ Oriental Insurance	100	0	0
Jagirad town	Jagiroad, Morigaon town	0	New India Assurance/ Oriental Insurance	60	20	20

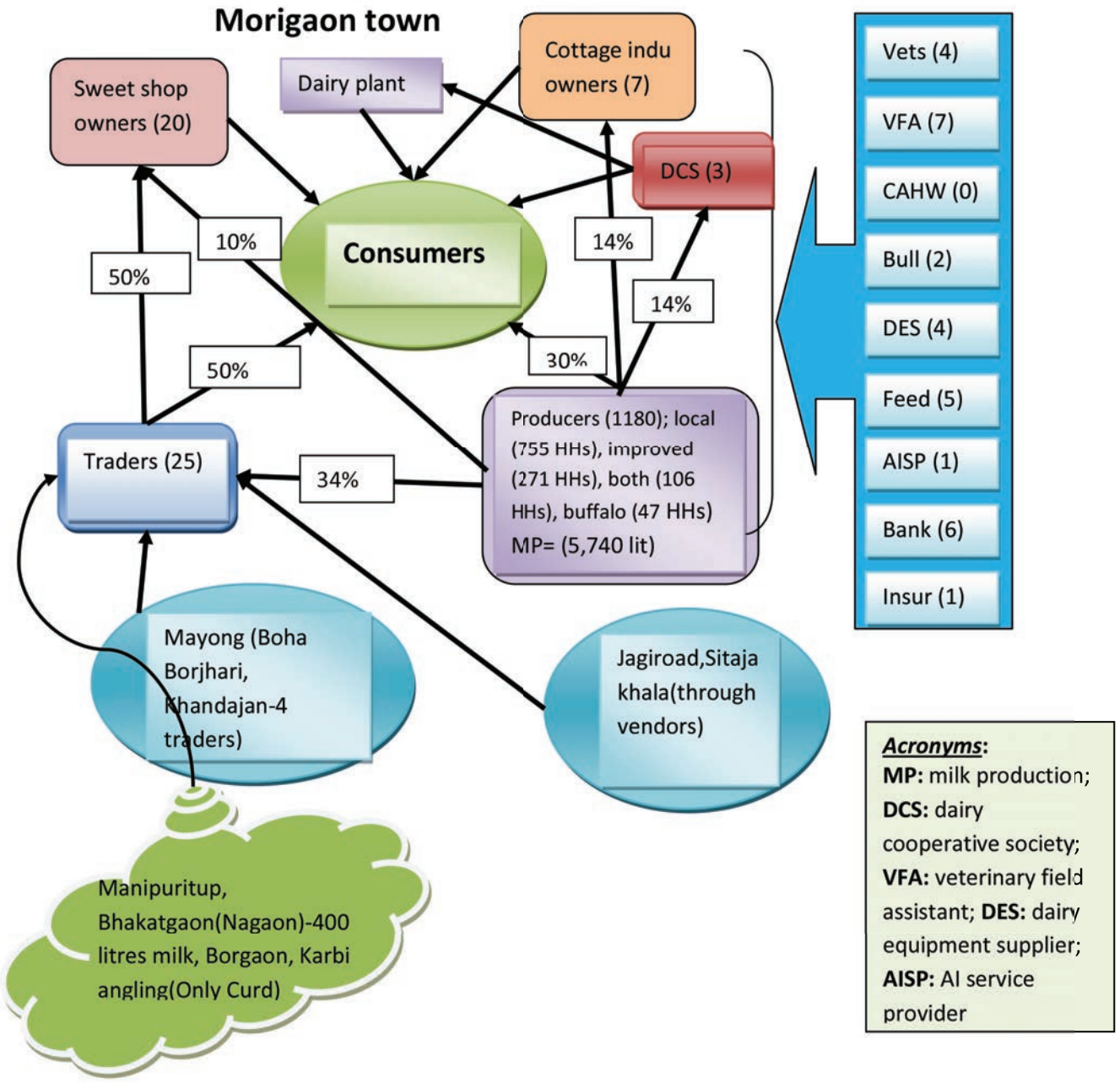
4.14.13 Progressive farmers at cluster level

Table 4.14.18 indicates the number of progressive dairy farmers. It shows that during the survey, in all the clusters of Morigaon district few such progressive farmers were identified as shown in the table with their contact information.

Table 4.14.19: Names and contacts of promising progressive entrepreneurs in dairy

Dairy cluster	No. of entrepreneurs
Mayong	2
Jagirad town	5

Figure 4.14.1: Schematic representation of the value chain actors of the major recommended clusters.



4.14.15 Quick observations and recommendations

Maximum number of milk producing villages in the Mayong cluster supplying milk to a private milk processor named Sitajakhala. Almost 70% of milk is supplied to Purabi Dairy from some production villages like Jagibhakat, Satarbari, Kandhajan and Boha Borjhari, and the rest of 30% milk is supplied by 5-6 traders from Khandajan and Boha Borjhari villages to the sweet shops at Morigaon town and Jagiroad market. Besides, some portion of milk is also being supplied to Morigaon town from nearby areas like Bhurbandha, Gasarguri, Manipur and some portion of milk from Bhoragaon where buffaloes are mostly found and some from the *khutis* of some Chapari areas near Darang District. Milk from Amlighat, Howlabheti, Hatiamukh, Dungabori, Manaha, Udmari, Rowmari, Deoshal etc. (80–90%) is supplied to the private processor atSitajakhala situated at Amlighat. Some portion of

milk is also being supplied to Purabi (Ghy). At Morigaon town there have almost 10 Sweet shops (around 10-15 traders supplying milk) and at Jagiroad market there have 7-8 major sweet shops but there have 3 milk outlets of Sitajakhala to supply milk to the sweet shops and retail sale. 10–12 milk traders individually sell milk door to door by purchasing milk from Sitajakhala and 2-3 milk traders collect milk from the nearest producing villages of Jagiroad market (mainly indigenous cattle's milk) make home delivery nearby to the market.

Table 4.14.20: Cluster-level planning for conducting training in Morigaon district

Rank of importance	Name of the cluster	Possible no. of training sessions				Recommendations
		Prod (16)	SM (2)	CP (1)	MT (2)	
Most potential	Morigaon town	10	1.00	0.35	1.25	1. One full batch training can be organized for the SMs and milk traders of Jagiroad and Mayong clusters. 2. One cottage processor's training can be organized for actors all across the clusters.
	Jagiroad town	4	0.40	0.20	0.25	
Medium potential	Mayong	2	0.75	0.25	0.75	
Less Potential	Nil					

Note: When considered for producer's training, only commercial farms were considered with ownership of high yielding improved animal stock plus the *khuti* system of rearing farms.

Prod: Dairy producers, **MT:** Milk traders; Figures within brackets indicate number of respective market actors.

4.15 Karbi Anglong District

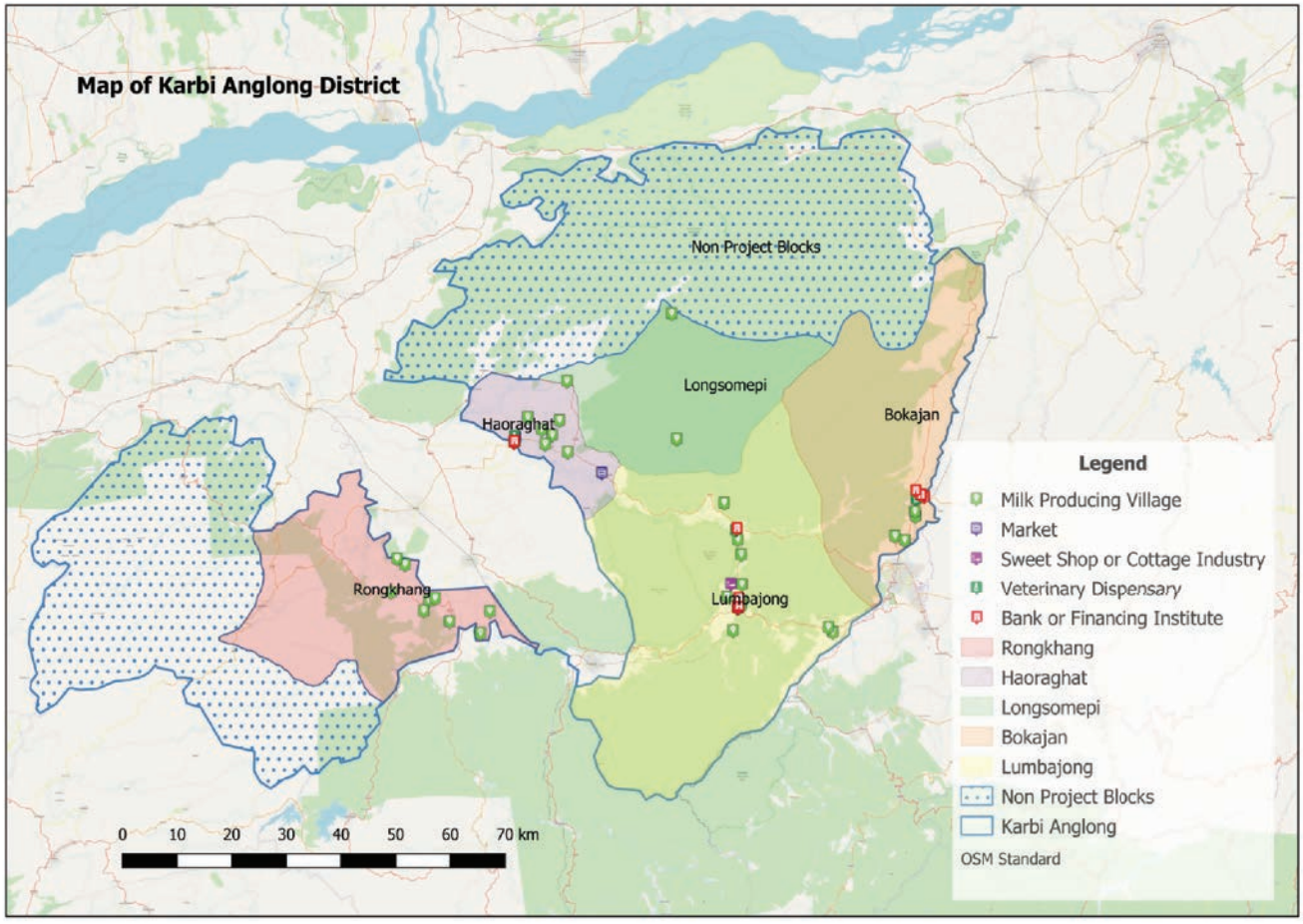
4.15.1 Cluster villages identification based on field visit

The project identified five clusters in Karbi Anglong district. The selected clusters covering the potential villages for the intervention of the informal dairy value chain are Bokajan, Lumbajong 1, Lumbajong -2, Longsomepi, Howraghat and Rongkhang. Making an initial overview and discussion with some of the informed sources such as key veterinarians knowledgeable about the villages of the respective clusters, the ILRI enumerators finalized the villages as was listed by the DDD as potential villages from where the village specific information were drawn. The lists of villages are shown in Table 4.15.1.

Table 4.15.1: Cluster villages in Karbi Anglong district

Dairy cluster	Names of the DDD-listed villages	Names of the ILRI-listed villages	Potential villages incorporated	Non-Potential villages dropped
Bokajan	GautomBasti, Tila basti, Sukanjan, Nowkata, Phulbari, Amarjan, Sariojan, Kathalguri, Neparpat, Ekoroni, Khatkhati, Matipal Alubari12	GautomBasti, Tila basti, Sukanjan, Nowkata, Phulbari, Amarjan, Sariojan, Kathalguri, Neparpat, Ekoroni, Khatkhati, Matipal Alubari12	0	0
Lumbajong (1) (Dhansiri)	Dhansiri Nepali Basti, Adarsh Basti, Faramdara, Kherbari, Khankridisa, Rangapahar, Daldoli, Dhansiri	Dhansiri Nepali Basti, Adarsh Basti, Faramdara, Kherbari, Khankridisa, Rangapahar, Daldoli, Dhansiri	0	0
Lumbajong (2) (Diphu town)	Habjan Nepali Basti,Harilal Basti, Taralangso, Dewan Basti, Mantila, Gita Ashram, 5 Kilo, Birla Lurlangso, Nepali Saraswasti Mandir, Manjailai, Longnit, Chutianala	Habjan NepaliBasti, HarilalBasti, Taralangso, Dewan Basti, Mantila, Gita Ashram, 5 Kilo, Birla Lurlangso, Nepali Saraswasti Mandir, Manjailai, Longnit, Chutianala, 7th Mile	7th Mile	0L
Longsomepi (3)	Langhin, Manikpur, Dentaghat	Langhin, Manikpur, Dentaghat	0	0
Hawraghat (11)	Howraghat ward2, GhonoBasti, Kalibari, Samoguri, Era Digholpani, Baloguri, Chauhan Basti, Harijon Basti, Udhajan, Rangkut 1 2 4, Ganeshpur13	Howraghat ward2, GhonoBasti, Kalibari, Samoguri, Era Digholpani, Baloguri, Chauhan Basti, Harijon Basti, Udhajan, Rangkut 1 2 4, Ganeshpur13	0	0
Rongkhang (13)	Kheroni, Khroni Das Basti, Kheroni Purana Basti, Kheroni Mas Basti, Baksa Dubi, Sildubi, Hawaipur, Jenkha, Lambapathar, Kheroninepali Basti, Mailoo, Doinmukh, Nabaibil 3	Kheroni,Khroni Das Basti,Kheroni Purana Basti,Kheroni Mas Basti, Baksa Dubi, Sildubi, Hawaipur, Jenkha, Lambapathar, KheroninepaliBasti, Mailoo, Doinmukh, Nabaibil3	0	0

Figure 4.15: The map of the surveyed clusters of Karbi Anglong district.



4.15.2 FGD participants' profile

Table 4.15.2 shows the number of participants segregated by gender and social status. The average number of participants across the project clusters is 7.51 in Karbi Anglong district of which male and female participants respectively constitute 6.44 and 1.07 numbers representing in percentage terms 85.75 and 14.25%. Among the participants across the project clusters, representation of the participants from ST category is the highest (61.46%) followed by the general category (28.37%). Participant from SC category is found to be very insignificant, while OBC people represented 8.46% among the total participants.

Table 4.15.2: Distribution of participants by gender and social status

Dairy cluster	Average number of participants			% social status of participants			
	Male	Female	Total	General	SC	ST	OBC
Bokajan	4.22	1.69	5.91	32.15	0	60.21	7.64
Lumbajong (Dhansiri)	5.31	2.55	7.86	26.22	0	45.21	28.57
Lumbajong (Diphu town)	6.52	1.33	7.85	14.22	0	70.21	15.57
Longsomepi	7.21	0	7.21	28.25	0	71.75	0
Hawraghat	8.25	0	8.25	41.15	0	58.85	0
Rongkhang	7.15	0.84	7.99	28.25	10.26	61.49	0

4.15.3 Farming system by type of bovine stock

The dairy farming system based on type of bovine stock in the selected project clusters show that the district as whole has 2,996 HH who have atleast one dairy cattle or buffalo, representing 46.15% HH among the total HH across project clusters. According to breed of cattle for the selected clusters as a whole, proportion of farming HH having local breed, improved breed and both local and improved are 80.52%, 10.39% and 8.60% respectively Proportions of farming HH with buffalo stock constitute only 0.99% of the total HH. (Table 4.15.3). Proportion of farmers having improved breed of cattle is the highest in Howraghat cluster (18.25%) followed by Lumbajong (13.21%).

Table 4.15.3: Distribution of farm HH by type of bovine stock

Dairy cluster	Total HH	Total farming HH	% HH keeping cattle from local breeds	% HH keeping cattle from improved breeds	% HH keeping cattle from both local and improved breeds	% HH keeping buffaloes
Bokajan	1,460	790	82.00	10.50	07.00	2.50
Lumbajong (Dhansiri)	1,040	480	87.56	08.25	04.19	0.00
Lumbajong (Diphu town)	1,680	369	75.45	13.21	12.34	0.00
Longsomepi	0425	119	84.34	05.01	10.65	0.00
Hawraghat	1,012	650	69.31	18.25	11.23	1.21
Rongkhang	1,963	588	84.44	07.15	06.19	2.22

4.15.4 Farming system by rearing practices

Table 4.15.4 shows that almost 11.46% of farm HH rear cattle in a fully stall-fed condition across project clusters, while proportion of farmers rearing cattle in a partly stallfed condition constitute 88.54%. There is not any *khuti* system of rearing in any of the clusters. The farming system based on rearing system is closely related to the type of bovine stock as in Table 4.15.3. The fully stall fed rearing condition is proportional to the number of improved cattle stock because grade cattle/crossbred animals are reared mostly in fully stallfed condition (see Tables 4.15.3 and 4.15.4).

Table 4.15.4: Distribution of farm HH by rearing practices

Dairy cluster	% fully stall fed	% partly stall fed	% *khuti*(forage herd) system
Bokajan	11.28	88.72	0
Lumbajong (Dhansiri)	07.22	92.78	0
Lumbajong (Diphu town)	14.28	85.72	0
Longsomepi	07.41	92.59	0
Hawraghat	20.22	79.78	0
Rongkhang	08.34	91.66	0

4.15.5 Women's participation in dairy production and income control

To have an understanding of the prevailing status of women in the rearing activities of dairy animal and control over income accrued through milk and milk product sale, the participant farmers were asked on the same. While asking, female participants were separately asked for their response. It was gleaned that women's roles in performing the rearing activities were relatively more compared to their role in the control of income vis-à-vis their male counterpart. Again, while understanding the role of women in conducting farm activities it depends on the nature of farm and type of farm activities. The fully commercial farms based on improved cattle stock require

more back breaking hard work of male labourers of the family, while subsistence farming is mostly conducted in women's hands. Moreover, activities such as selling of milk in the market, grass collection, taking animals for grazing etc. are carried out mostly by the male members of the family. While, cleaning of cattle shed, feeding the cattle at home etc. are done mostly by the female members of the family. In regards to income control, many a times farmers reported that their decision to spend income gained through the sale of milk and milk products is carried out jointly by discussing each other. In the project clusters of Karbi Anglong, it has been seen that of the total farming activities carried out, women's' role is relatively higher compared to their male counterparts across the project clusters (65.24%). On the other hand, women's role on the control of income is measured as 47.91% for all the selected project clusters of KarbiAnglong district (Table 4.15.5).

Table 4.15.5: Women's participation in dairy production and income control

Dairy cluster	No. of total HH	% women have role in milk production	% women have control of income from milk production
Bokajan	790	60.28	38.22
Lumbajong (Dhansiri)	480	68.34	48.64
Lumbajong (Diphu town)	369	71.22	36.83
Longsomepi	119	58.33	36.83
Hawraghat	650	72.87	69.29
Rongkhang	588	60.42	57.64

4.15.6 Average herd size (adult animals) of the farm HH according to type of bovine stock

The average herd size of the cattle stock equivalent to adult animal unit according to the type of bovine stock is reported in Table 4.15.6. It indicates that the number of adult indigenous cattle per HH is 2.41 across the project clusters with the highest being in Howraghat cluster and the lowest in Longsomepi. Similarly, the average improved cattle holding in each HH across selected project clusters is 3.02. The farmers in Lumbajong 1 and 2 and Longsomepi reported that none of the farmers in these clusters owned buffaloes during the time the survey was conducted. The average size of buffaloes held by the farmers of the remaining clusters is 2.31.

Table 4.15.6: Average herd size (adult animals) by the bovine stock in the project clusters

Dairy cluster	No. of local cows	No. of improved cows	No. of buffaloes
Bokajan	2.12	3.50	2.15
Lumbajong (Dhansiri)	2.33	3.00	0.00
Lumbajong (Diphu town)	2.33	3.00	0.00
Longsomepi	1.84	2.15	0.00
Hawraghat	3.18	3.67	2.00
Rongkhang	2.68	2.78	2.79

4.15.7 Milk productivity and production of the bovine stock at cluster level

The daily milk yield of the bovine stock is not uniform in the entire lactation length. Immediately after the calf born the yield remains relatively less and gradually it reaches the peak yield and after getting pregnant the yield again comes down. While doing the interview the farmers were asked about their response on the average daily milk yield during the lean and peak period of the cattle in milk. In the selected project clusters of Karbi Anglong the daily milk productivity of local cows during the lean period is 0.51litres for the clusters as a whole with Howraghat having 0.78 litres as the highest and 0.33 as lowest in the Longsomepi cluster. During the peak lactation days of the indigenous cow it gives an average productivity of 2.18 litres. In the same way the average lean and peak productivity of improved cattle stock is 2.08 and 8.83 litres and of buffaloes is 1.02 and 3.71 litres respectively. The average milk yield of improved cattle is the highest in Longsomepi across the stages of lactation (7.07 litres) and the lowest in Howraghat and Rongkhang cluster (4.58litres).

Table 4.15.7: Lowest and highest levels of average daily milk production per cow in the clusters

Dairy cluster	Milk production of local cows litres		Milk production of improved cowslitres		Milk production of buffaloes litres	
	Low	High	Low	High	Low	High
Bokajan	0.45	2.20	2.00	8.00	1.00	3.64
Lumbajong (Dhansiri)	0.50	1.98	2.50	10.00	0.00	0.00
Lumbajong (Diphu town)	0.55	2.25	2.50	10.00	0.00	0.00
Longsomepi	0.33	2.05	2.15	12.00	0.00	0.00
Hawraghat	0.78	2.66	1.83	7.33	1.20	4.00
Rongkhang	0.43	1.96	1.50	7.66	0.85	3.48

Tables 4.15.8, 4.15.9 and 4.15.10 show the average milk production of local, improved and buffalo stock of the district. Based on local cattle stock, the total milk production across the clusters is 4,108 litres with highest milk production recorded as 1,232 litres in Howraghat followed by almost 910 litres Bokajan cluster. Based on improved cattle stock, Table 4.1.9 points out that the total milk production of the improved cattle in the selected project clusters is 2,646 litres. The three clusters reporting the presence of buffalo stock shows that total milk production based on buffalo population is only 109 litres across the clusters. Looking at the proportionate share of total milk production by all three categories of bovine stock of the selected project districts, the local cows, improved cows and buffaloes share 59.85, 38.56 and 1.59 respectively. Since the productivity of improved cattle stock is relatively better in the project district, a meager proportion of farming HH rearing improved cattle stock, 13.40% contributes almost 59.18% of the total milk production, while as high as 78% of the total farming HH rearing indigenous breed contributes 40.43% of total milk production across bovines.

Table 4.15.8: Estimated total milk production based on total local cattle stock

Dairy cluster	Estimated no. of HH with local cattle	Average no. of HH with adult local cattle	Average milk production per local cow litre	Total milk production with local cattle stock* litre
Bokajan	647.80	1.06	1.33	910
Lumbajong (Dhansiri)	420.29	1.17	1.24	607
Lumbajong (Diphu town)	278.41	1.17	1.40	454
Longsomepi	100.36	0.92	1.19	110
Hawraghat	450.52	1.59	1.72	1232
Rongkhang	496.51	1.34	1.20	795

*In estimating total milk production of local cows only the lactating animals were considered assuming 50% of the total adult local cattle as lactating.

Table 4.15.9: Estimated total milk production based on improved cattle stock

Dairy cluster	Estimated no. of HH with improved cattle stock	Average no. of HH with adult improved cattle	Average milk production per improved cow litre	Total milk production with improved cattle stock* litre
Bokajan	82.95	1.75	5.00	726
Lumbajong (Dhansiri)	39.60	1.50	6.25	371
Lumbajong (Diphu town)	48.74	1.50	6.25	457
Longsomepi	5.96	1.08	7.08	45
Hawraghat	118.63	1.84	3.58	779
Rongkhang	42.04	1.39	4.58	268

*In estimating total milk production of improved cattle only lactating animals are considered assuming 50% of the total adult improved cattle as lactating.

Table 4.15.10: Estimated total milk production based on buffalo stock

Dairy cluster	Estimated no. of HH with buffaloes	Average no. of HH with lactating buffaloes	Average milk production per buffalo litre	Total milk production with buffaloes* litre	Total milk production across bovine stock#lite
Bokajan	19.75	1.08	2.32	49.26	**1,685**
Lumbajong (Dhansiri)	0.00	0.00	0.00	0.00	**978**
Lumbajong (Diphu town)	0.00	0.00	0.00	0.00	**911**
Longsomepi	0.00	0.00	0.00	0.00	**155**
Hawraghat	7.87	1.00	2.60	20.45	**2,032**
Rongkhang	13.05	1.40	2.17	39.42	**1,102**

*In estimating total milk production of buffaloes only lactating animals were considered assuming 50% of the total adult buffaloes as lactating.

Total milk production is the summation of milk production across bovine stock in Tables 4.15.8, 4.15.9 and 4.15.10.

4.15.8 Marketing behaviour of farmers at cluster level

All types of farms are found to sell their surplus milk. Farmers with local cattle stock keep a part of their milk produced for home consumption and offered to relatives/kith and keen and the remaining part is marketed to earn cash. Farmers with improved cattle stock produce primarily for market to earn profit, while some portion of the produce is kept for HH consumption. Since, total milk production is more in commercial farms with crossbred/ improved cattle proportion of milk marketed is also high. In subsistence farms with one or two litres of milk production based on local cattle, more than 50% of milk produced is consumed at home. Table 4.15.11 shows that farm HH with local cattle across project clusters sell 46.28% of the total milk production, while farm HH with improved cattle stock sell 85.89% of their total HH milk production. Project clusters with presence of buffaloes sell 67.38% of their total daily milk production with buffalo stock.

Table 4.15.11: Bovine stock percentage of milk sold per HH

Dairy cluster	% with local cows	% with improved cows	% with buffaloes
Bokajan	40.00	80.62	60.21
Lumbajong (Dhansiri)	50.12	90.13	68.00
Lumbajong (Diphu town)	45.62	90.00	0.00
Longsomepi	50.00	78.25	0.00
Hawraghat	48.21	91.67	68.73
Rongkhang	43.72	84.66	72.58

Table 4.15.12 presents the sources of milk sale in the project clusters. It is evident from the table that selling milk in the neighbourhood or selling self in the local market constitutes 32.50% of the producers across clusters of Karbi Anglong. These are smallholder dairy farmers rearing dairy animals of indigenous breed to cater the local raw milk consumers in their neighbourhood. Considering the district as whole based on the selected clusters 37.62% farmers sell milk traders, and almost 22% of the farmers sell milk to DCS. Selling milk to the private processors in all the project clusters is only 9.47%. The sale patter points out that almost 78.26% of the total farmers in the selected cluster use informal channel to dispose milk. The informal market actors such as milk

traders and private processors together procure milk of almost 47.09% of the producers establishing an informal value chain between producers to traders and producers to SMs/CPs or producers to consumers to SMs.

Prices offered to producers by various marketing sources is the highest when farmers sell milk locally (INR 45/ litre) followed by INR 40/ litres when sourced to private processor. As shown by empirical studies in Assam and rest of India that cooperatives are weak in offering better prices to consumers (Kamuar et al. 2013; Kumar and Staal, 2010; Bayan, 2018), similar finding is also reported in the study sites of Karbi Anglong where cooperatives offer only Rs 36/litres across clusters.

Table 4.15.12: Percentage of milk sale by sources and their respective farm gate prices

Dairy cluster	Neighbours or local sale		To traders		To cooperatives		To private processors	
	%	Price/litre	%	Price/litre	%	Price/litre	%	Price/litre
Bokajan	52.00	45.00	48.00	35.00	00.00	-	8.00	40.00
Lumbajong (Dhansiri)	25.23	40.00	33.99	40.00	32.00	35.00	8.78	40.00
Lumbajong (Diphu town)	38.67	40.00	32.05	40.00	25.00	35.00	4.28	40.00
Longsomepi	28.25	40.00	32.88	35.00	26.19	35.00	12.68	38.00
Hawraghat	12.68	50.00	35.27	40.00	35.14	40.00	16.91	40.00
Rongkhang	38.15	50.00	43.55	35.00	12.11	35.00	6.19	40.00

4.15.9 Access to veterinary services

Table 4.15.13 indicates the number of veterinary service providers. Across clusters the average 1.16 numbers of local veterinarians operate, while the average distance from the farm villages is 5.33 km. At cluster level, it is evident from the table that farm villages of Bokajan cluster has to take on average 4–5 km to come for visiting a local veterinarian or vice versa. In the same way, accessing a veterinary field assistant (VFA) at his duty station/ residence takes 5.08 km across clusters ranging from 4 km to almost 8 km. Table 4.15.13 shows that none of the farmers in the clusters of Karbi Anglong have accessed the services of community animal health worker due to non-availability of the same. There is one and two AI practitioners (Gopal Mitra) in Howraghat and Bokajan cluster respectively in Karbi Anglong.

Table 4.15.13: Access to veterinary services at the selected project clusters of the district

Dairy cluster	No. of local veterinarians*		Distance from the FGD location/ villagekm	No. of VFA		Distance from the FGD location/ village km	No. of CAHW		Distance from the FGD location/ village km
	Male	Female		Male	Female		Male	Female	
Bokajan	1	0	9.5	1	0	8	0	0	-
Lumbajong (Dhansiri)	1	0	4	2	0	4	0	0	-
Lumbajong (Diphu town)	1	0	5	2	0	5.5	0	0	-
Longsomepi	1	0	5	1	0	4	0	0	-
Hawraghat	1	0	4.5	2	0	5	0	0	-
Rongkhang	2	0	4	4	0	4	0	0	-

*Local veterinarian includes both private and governmentemployed.

4.15.10 Access to other services (input and breeding)

Table 4.15.14 in the appendix indicates that farmers in all the project clusters (except Longsomepi) of Karbi Anglong reported the availability of shops from where they can buy milk cans or other such equipment specifically designed for milk storage and transportation. Farmers in Longsomepi indicated that there is no such shop in their

local or village market from where they can buy feeds for dairy animal. However, the average distance to such supplier shops of the selected villages of the remaining clusters is almost 7.8 km. Pure feed shops are almost nil in most of the clusters as feeds are primarily sold in the grocery shops only. The grocery shop from where the concentrate feeds are bought, are available in all the clusters, either within the clusters or in major linked villages with average distance of such shops from the study villages ranging from 3 to 10 km (see Appendix Table A2). In all the project clusters farmers reported that there is no breeding bull service providers providing natural mating services on payment basis. However, farmers in all the clusters inform the presence of nondescript indigenous community bulls (scrub) by which the nondescript animal stock comes to mating unless otherwise controlled through AI.

4.15.11 Availability of producers/traders organizations and input supplying institutions at cluster level

In regards to availability of active producers'/traders' organization, farmers report that there is not any registered milk traders' organization in the selected clusters. Similarly, there is also not having any SHG related to dairy farming practices and active milk producers' institutions (MPI). Except Lumbajong 1 and Rongkhang cluster of Karbi Anglong there is no active dairy cooperative society in the selected clusters (see Table 4.15.14)

Table 4.15.14: Availability of producers/traders organization at cluster level

Dairy cluster	No. of milk traders organizations	No. of DCS
Bokajan	0	0
Lumbajong (Dhansiri)	0	5 (DhansiriNepalibasti and some other villages)
Lumbajong (Diphu town)	0	0
Longsomepi	0	0
Hawraghat	0	0
Rongkhang	0	5 (at Kheroni)

Note: In parentheses are the major linked villages.

The availability of institutions in the selected project clusters such as dairy plant/chilling plant/bulk milk cooler, DDL, feed testing laboratory, feed mill and private veterinary clinic, farmers report that there are 3 dairy plants; one in Bokajan (Surabhi Dairy), one in Lumbajong (KAMUL) and 1 (DDD dairy plant) in Howraghat. The table also shows presence of BMC/Chilling plant in the listed clusters. The FGD of all the project clusters reported the non-availability of DDL and feed testing laboratory and feed mill in any of the listed clusters. Table 4.15.15 indicates that except Longsomepi all the clusters have private veterinary clinics from where medicines for animal health care/consultation with the veterinary doctors are available.

Table 4.15.15: Availability of input supplying institutions at cluster level

Dairy cluster	No. of dairy plant, chilling plant, BMC	No. of DDL	No. of feed testing laboratory	No. of feed mills	No. of private veterinary clinics
Bokajan	2 (1-SURABHI; 1-TMSS-non-functional); 1 BMC/chilling centre	0	0	0	3
Lumbajong (Dhansiri)	2 (1-KAMUL; 1-TMSS-not commissioned)	0	0	0	5
Lumbajong (Diphu town)	1 BMC/chilling centre	0	0	0	5
Longsomepi	0	0	0	0	0
Hawraghat	0	0	0	0	2
Rongkhang	1 BMC/chilling centre	0	0	0	2

4.15.12 Major milk market actors and other infrastructure in the dairy value chain

Table 4.15.16 display the number of milk market actors involved in the dairy value chain of the selected project clusters. These market actors are linked to the major town or market point of the cluster. Bokajan and Rongkhang have the number of milk traders 20 each and Lumbajong 1 and Hawraghat has 12 each. Longsomepi cluster has only two milk traders. As the table points out, except Longsomepi and Hawraghat all the clusters have cottage industry owner in Bokajan, Rongkhang and Lumbajong as some of the cottage industry products such as ghee, curd or cream are available in the sweet shops also. Based on FGD in the remaining clusters, there are few cottage industry owners ranging from 2 to 5. The number of sweet shops in Lumbajong is the highest; while Hawraghat has only 3 sweet shops.

Table 4.15.16: Number of milk market actors at cluster level (based on KII and FGD)

Dairy cluster	No. of milk traders	No. of cottage industry owners	No. of sweet shop owners
Bokajan	20	2	12
Lumbajong 1	17	3	20
Lumbajong 2	8	5	3
Longsomepi	2	0	3
Howraghat	12	0	10
Rongkhang	20	5	10

Table 4.15.17: Markets and other infrastructure at cluster level

Dairy cluster	Markets with trading of milk and milk products*	Bank and other financing institutions	Insurance for livestock	Approach road quality (% of total cluster villages)		
				Blacktop	Gravel	Earthen
Bokajan	Khatkhati (daily), Sukanjan, Bokajan	0	New India Assurance/ Oriental Insurance	40	30	30
Lumbajong	Diphu (daily), Rongkhelang	IDBI (Diphu Branch)	New India Assurance/ Oriental Insurance	70	20	10
Lumbajong	Manja (weekly), Birla	SBI, LDGB, Manja)	New India Assurance/ Oriental Insurance	20	60	20
Longsomepi	Longsomepi, Phuloni	0	0	100	0	0
Hawraghat	Howraghat, Bokolia, Phuloni	0	New India Assurance/ Oriental Insurance	20	65	15
Rongkhang	Kheroni, Forest Bazaar, Chariali	0	New India Assurance/ Oriental Insurance			

*Market frequency is in parentheses (daily, biweekly or weekly).

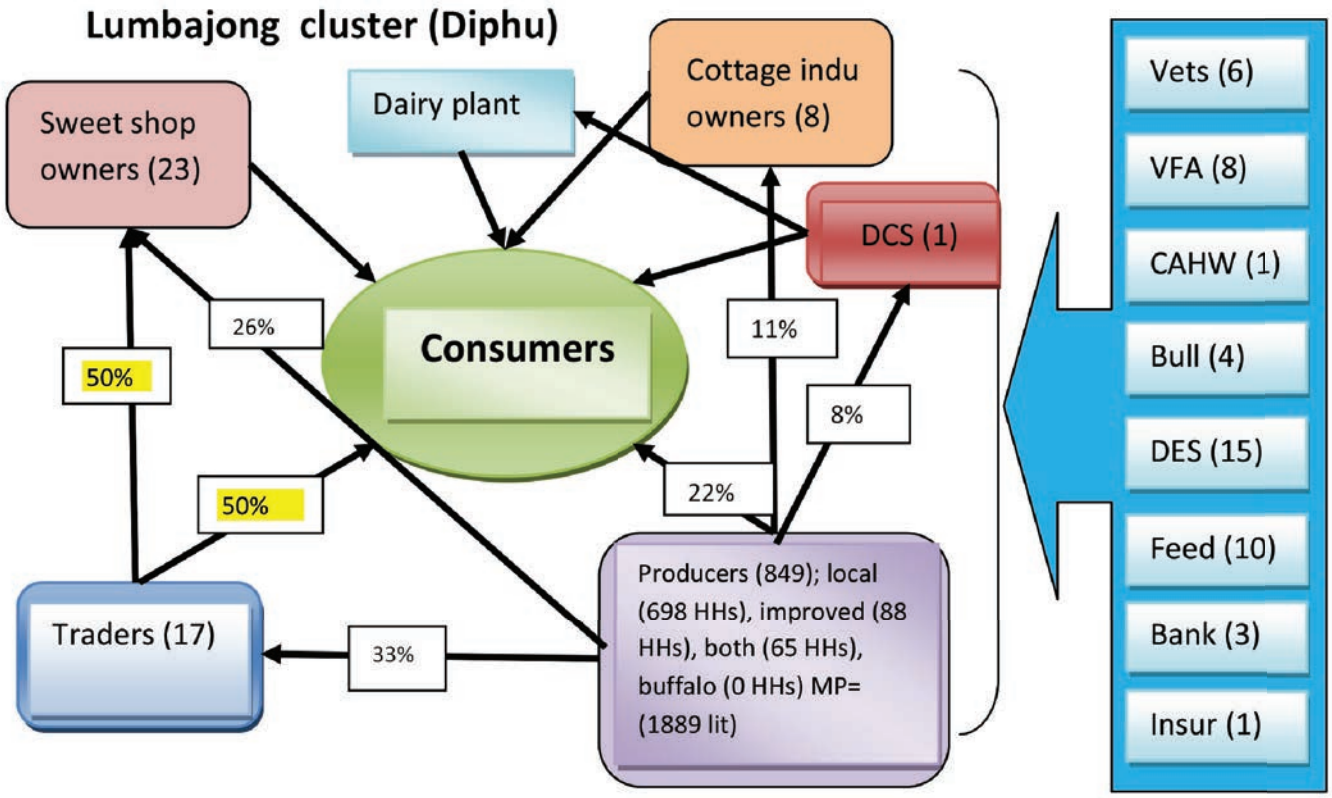
4.15.13 Progressive farmers at cluster level

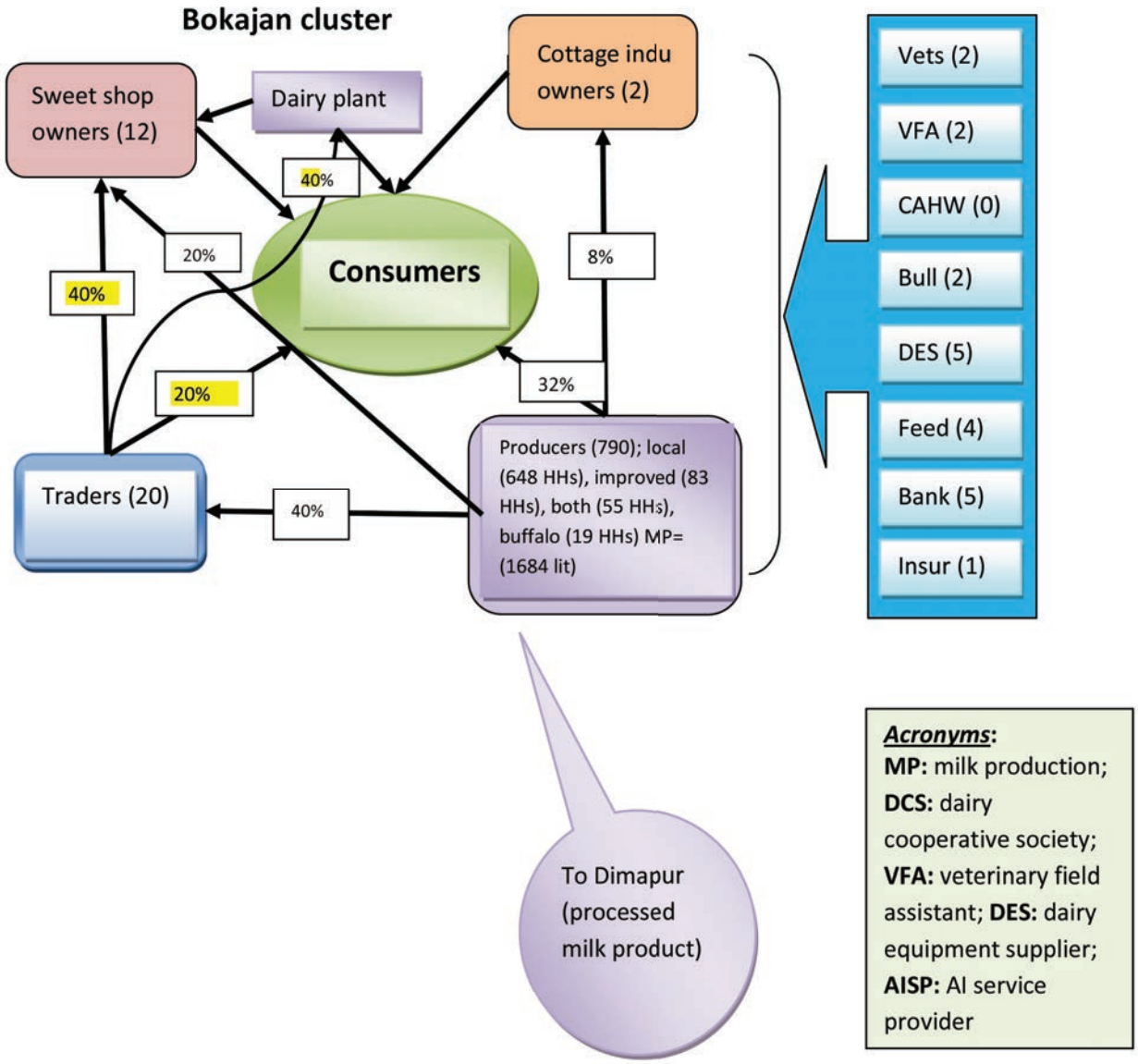
Table 4.15.18 indicates the number of progressive dairy farmers/milk traders/cottage industry owners. It shows that there are two such progressive farmers in Howraghat cluster.

Table 4.15.18: Names and contacts of promising progressive entrepreneurs in dairy

Dairy cluster	No. of progressive farmers
Bokajan	0
Lumbajong	0
Lumbajong	0
Longsomepi	0
Hawraghat	2
Rongkhang	0

Figure 4.15.1: Schematic representation of the value chain actors of the major recommended clusters.





4.15.14 Quick observations and recommendations

In the Karbi Anglong district, most important informal clusters are Lumbajong and Bokajan. In Lumbajong cluster milk is mainly supplied from the producing villages within the cluster to the Diphu town and other markets and as well as door to door vending. There is not found to be any inter-cluster flow of milk relating to the Lumbajong cluster. Maximum amount of milk is covered by KAMUL. There is a DCS registered under DDD named Tulsi Dugdha Utpadak Samabai Samiti and which is actively working in the cluster.

In the Bokajan cluster potential villages for dairy production are Sukanjan, Gautambasti, Tilabasti, Khatkhati, Saraijan, Neparpat, Pulbari, 7th Mile etc. Maximum amount of milk (50% of total production) is supplied to Nagaland (Dimapur). A dairy plant name Surabhi dairy collects milk from the producers and some milk traders of around 500 litres which they process daily and 350–400 litres milk is regularly supplied to Dimapur. Around 150 litres milk from these villages are supplied to the sweet shops in markets at Bokajan. There are almost 12 sweet shops in Bokajan, Sukanjan and Sikarigate market and around 20 milk traders. Some traders make paneer at home and sell at the market and deliver directly to consumers. Proportion of farmers having improved breed cattle is relatively high in villages at Bokajan cluster.

For convenience of covering market actors to train following sequence may be followed and effort should be laid to track outside suppliers for quality check of the milk.

Table 4.15.19: Cluster level planning for conducting training in Karbi Anglong district

Rank of importance	Name of the cluster	Possible no. of trainingsessions				Recommendations
		Producers (10)	SM (3)	CP (0)	MT (4)	
Most potential	Lumbajong 1	1	0.55	0	1	1. Lumbajong 1 and Lumbajong 2 can be clubbed as one cluster. 2. Bokajan is an independent cluster. Traders and Surabhi dairy supply milk to Dimapur from Bokajan, so these traders along with others trading within the clusters should be trained.
	Lumbajong 2	1	0.3	0	0.8	
	Bokajan	3	0.5	0	0.6	
Medium potential	Howraghat	4	0.6	0	0.75	Rongkhang is an independent cluster and since number of MT and SM is less to conform to one full batch, these traders may be clubbed with market actors of Hojai town (Jogijan and Dholpukhuri cluster of Nagaon)
	Rongkhang	2	0.7	0	0.4	
Less potential	Longsomepi	0	0.1	0	0.4	Market actors' training of Longsomepi cluster may be clubbed with that of Howraghat.

Note: When considered for producer's training, only commercial farms were considered with ownership of high yielding improved animal stock plus the *khuti* system of rearing farms

Prod: Dairy producers, **MT:** Milk traders; Figures within brackets indicate number of respective market actors.

4.16 Sivasagar district

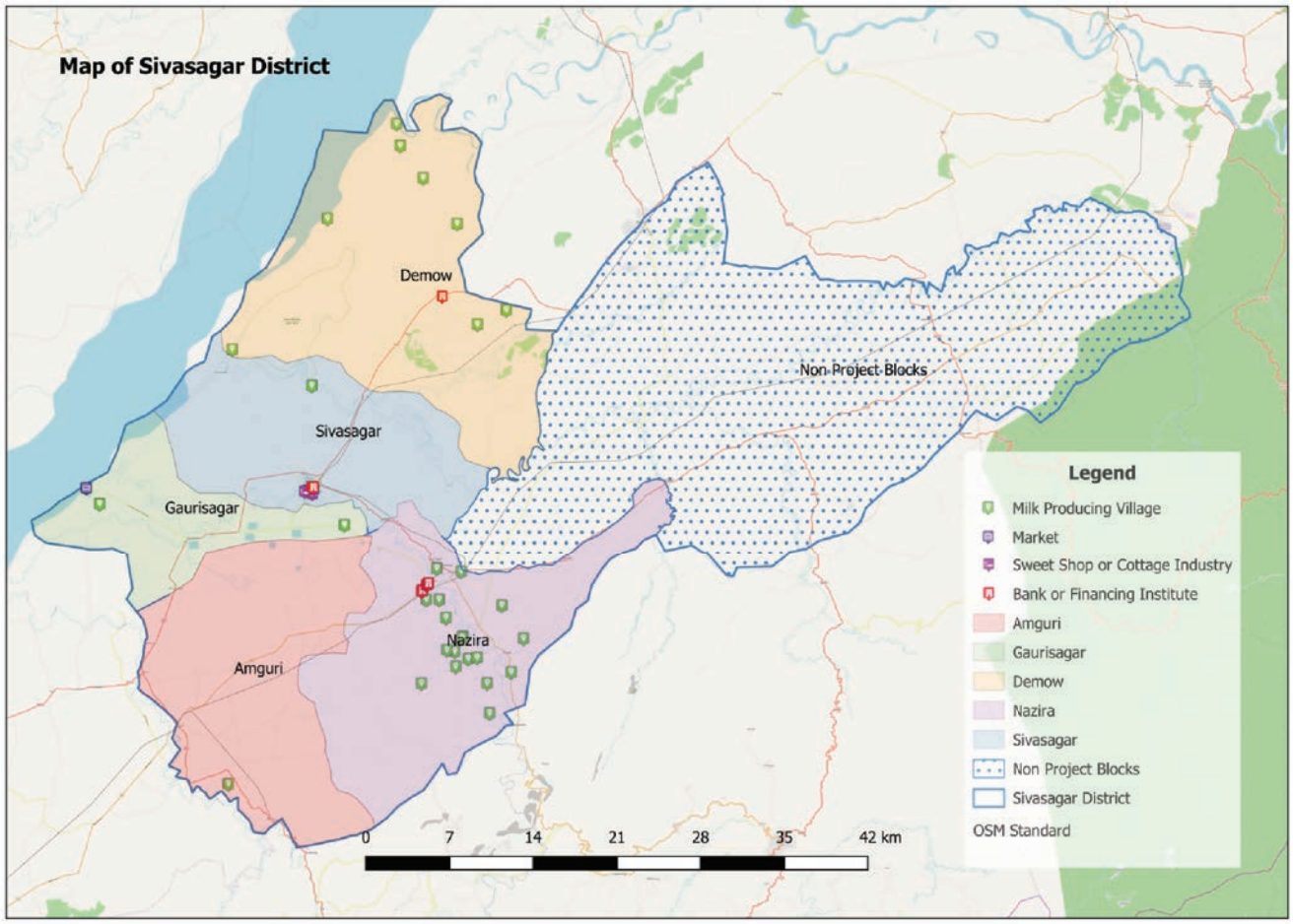
4.16.1 Cluster villages identification based on field visit

The clusters identified in Sivasagar district for intervention of the dairy value chain actors under APART are Nazira, Gaurisagarr, Sivsagar, Demow andAmguri. After an initial overview of the farm clusters and discussion with some of the informed sources such as DVO, VOs/BVOs of the respective clusters, the enumerators from ILRI deployed for surveying finalized the cluster villages as listed by the DDD as potential clusters from where the village-specific information was drawn. The lists of villages are presented in Table 4.16.1.

Table 4.16.1: Cluster villages of Sivasagar district

Dairy cluster	Names of the DDD-listed villages	Names of the ILRI-listed villages	Potential villages incorporated	Non-potential villages dropped
Nazira	Sundarpukhuri, Baulimaidam, Bamunpukhuri, Halua, Nirmolia, Phulonibari, Selengpathar, Chakimukh, Sonbesa, Helani, BorbaruaHandique, Budhbari Handique, Nazira, Rajapul, Simaluguri, Borduamukh, Karibasti, Balighat, Nimaigarh, Nagaon, Mohangaon, Patorgaon, BihuborNepalikhuti, Gaormur Mirigaon	Sundarpukhuri, Baulimaidam, Bamunpukhuri, Halua, Nirmolia, Selengpathar, Chakimukh, Borbarua Handique, Budhbari Handique, Nazira, Bihubor Nepalikhuti	0	Phulonibari, Sonbesa, Helani, Rajapul, Simaluguri, Borduamukh, Karibasti, Balighat, Nimaigarh, Nagaon, Mohangaon, Patorgaon, GaormurMirigaon
Gaurisagar	Bogidol, Bharalua, Dikhowmukh, Brahamputra Chaparis	Dikhowmukh, Brahamputra Chaparis	0	Bogidol,Bharalua
Sivsagar town	Lepaigaon	Dikhowmukh, Brahamputra Chapari, Demowmukh, Dihingmukh	Dikhowmukh, Brahamputra Chaparis, Demowmukh, Dihingmukh,	0
Demow	Chakalia, Khagarijan, ThowraTE, Saragua, Demowmukh, Samarajan, Dhundamukh, Dehajan Habi, Pachim Panidihing, Dihingmukh, Dopani, Gelapathar, Dhundurbam, Teteliaguri	Demowmukh, Dihingmukh	0	Chakalia, Khagarijan, ThowraTE, Saragua, Samarajan, Dhundamukh, Dehajan Habi, Pachim Panidihing, Dopani, Gelapathar, Dhundurbam, Teteliaguri
Amguri	Dhuniagaaon, Haluating Grant, Borpam Grant	Dhuniagaaon, Haluating Grant, Borpam Grant	0	0

Figure 4.16: The map of surveyed clusters in Sivasagar district.



4.16.2 FGD participants' profile

Table 4.15.2 shows the number of participants segregated by gender and social status. The average number of participants across the project clusters is 7.51 in Karbi Anglong district (males 6.44 85.75 and females 1.07 14.25%). Among the participants across the project clusters, representation of the participants from 'general' category is the highest (66.40%) followed by the ST category (23.78%). Participants from SC and OBC communitiesare found to be 4.62 and 5.20% respectively.

Table 4.16.2: Distribution of participants by gender and social status

Dairy cluster	Average no. of participants			% Social status of participants			
	Male	Female	Total	General	SC	ST	OBC
Nazira	5.67	2.85	08.52	65.76	00.00	31.65	02.59
Gaurisagar	6.98	1.57	08.37	71.00	12.66	15.00	01.34
Sivsagar	6.22	3.79	10.01	44.38	00.00	34.81	20.81
Demow	9.34	0.00	09.34	88.32	00.00	11.68	00.00
Amguri	8.44	0.54	08.98	62.54	10.43	25.76	01.27

4.16.3 Farming system by type of bovine stock

The dairy farming system based on type of bovine stock in the selected project clusters as indicated in Table 4.16.3 shows that the district as a whole has 2,015 HH who have atleast one dairy cattle or buffalo, representing

26.58% of HH among the total HH across project clusters. Three clusters namely Gaurisagar, Sivasagar town and Dimow have only *khutis* based on local cattle and buffalo stock which supply milk to the major market centres of the clusters including Sivasagar town. The other two clusters namely Nazira and Amguri farms are in a HH system of rearing. In these two clusters an average of 13.53% of farming HH rear purely improved breed cattle and 7.75% farming HH rear both local and improved cattle. Proportions of farming HH with buffalo stock across all the clusters constitute only 3.1% of the total HH (Table 4.16.3).

Table 4.16.3: Distribution of farm HH by type of bovine stock

Dairy cluster	Total HH	Total farming HH	% HH keeping cattle from local breeds	% HH keeping cattle from improved breeds	% HH keeping cattle from both local and improved breeds	% HH keeping buffaloes
Nazira	3,450	1,220	77.37	14.38	08.25	0.00
Gaurisagar	500	120 (*khutis*)	95.86	-	-	4.14
Sivsagar	406	205 (*khutis*)	96.00	-	-	4.00
Demow	265	85 (*khutis*)	96.00	-	-	4.00
Amguri	698	385	80.07	12.68	07.25	0.00

4.16.4 Farming system by rearing practices

As indicated before, the *khuti* system of rearing with local cattle and buffalo stock is the only practice for the commercially oriented farmers in the three clusters (Gaurisagar, Sivsagar and Demow). In Nazira and Amguri, 85% and 88% farm HH rear cattle in a partly stall-fed condition and the remaining with fully stall-fed condition.

Table 4.16.4: Distribution of farm HHs by rearing practices

Dairy Cluster	% fully stall fed	% partly stall fed	*% khuti* (forage herd) system
Nazira	15	85	0
Gaurisagar	0	0	100
Sivsagar	0	0	100
Demow	0	0	100
Amguri	12	88	0

4.16.5 Women's participation in dairy production and income control

Women's role is lower compared to their male counterparts across the project clusters (30.46%). On the other hand, women's role on the control of income is measured as (38.21%) for all the selected project clusters of Sivasagar district (Table 4.6.5). The lower rate of women's role is mainly due to *khuti* system of rearing in 3 out of 5 project clusters of the district.

Table 4.16.5: Women's participation in dairy production and income control

Dairy cluster	No. of total HH	% women have role in milk production	% women have control in income from milk production
Nazira	1,220	48.28	38.65
Gaurisagar	120	15.28	30.00
Sivsagar	205	16.38	38.32
Demow	85	10.22	35.17
Amguri	385	62.15	48.93

4.16.6 Average herd size (adult animals) of the farm HH according to type of bovine stock

The average herd size of the cattle stock equivalent to adult animal unit according to the type of bovine stock is reported in Table 4.16.6. It indicates that the number of adult indigenous cattle per HH is 27 across the project clusters. This average local holding is due to the *khuti* system of rearing in Gaurisagar, Sivasagar and Demow cluster. The only clusters with presence of improved cattle stock are Nazira and Amguri with average of 2.95 cattle heads. The average size of buffaloes held in the *khutis* of respective clusters is 12.89.

Table 4.16.6: Average herd size (adult animals) by the bovine stock in the project clusters

Dairy cluster	No. of local cows	No. of improved cows	No. of buffaloes
Nazira	2.4	2.9	0.00
Gaurisagar	46.0	0.0	12.65
Sivsagar	44.0	0.0	13.15
Demow	42.0	0.0	12.88
Amguri	2.8	3.0	0.00

4.16.7 Milk productivity and production of the bovine stock at cluster level

The daily milk yield of the bovine stock is not uniform in the entire lactation length. Immediately after the calf born the yield remains relatively less and gradually it reaches the peak yield and after getting pregnant the yield again comes down. While doing the interview the farmers were asked about their response on the average daily milk yield during the lean and peak period of the cattle in milk. In the selected project clusters of Sivasagar the daily milk productivity of local cows during the lean period is 0.41 litres. During the peak lactation days of an indigenous cow it gives an average of 1.86 litres. The average lean and peak productivity of improved cattle stock is 2.23 and 8.43litres and of buffaloes is 0.93 and 2.87 litres respectively.

Table 4.16.7: Lowest and highest levels of average daily milk production per cow in the clusters

Dairy cluster	Milk production of local cowslitres		Milk production of improved cows litres		Milk production of buffaloes litres	
	Low	High	Low	High	Low	High
Nazira	0.50	2.00	2.31	7.88	-	-
Gaurisagar	0.40	1.84	-	-	1.00	03.20
Sivsagar	0.33	1.68	-	-	0.88	02.40
Demow	0.34	1.78	-	-	0.91	03.00
Amguri	0.50	2.00	2.15	8.99	-	-

Tables 4.16.8 to 4.16.10 show the average milk production of local, improved and buffalo stock of the district. Based on local cattle stock, the total milk production across the clusters is 11,086 litres with highest milk production recorded as 4351 litres in Sivasagar cluster followed by Gaurisagar. The total milk production of the improved cattle stock in the selected project clusters is 1,704 litres. This is the combined production of Nazira and Amguri cluster. The three clusters reporting the presence of buffalo stock in a *khuti* system of rearing shows that total milk production based on buffalo population is only 197 litres across the clusters. Looking at the proportionate share of total milk production by all three category of bovine stock of the selected project districts, the local cows, improved cows and buffaloes share 85.36, 13.12 and 1.52 respectively.

Table 4.16.8: Estimated total milk production based on total local cattle stock

Dairy cluster	Estimated no. of HH with local cattle	Average no. of HH with adult local cattle	Average milk production per local cow	Total milk production with local cattle stock*
Nazira	943.91	1.2	1.25	1,416
Gaurisagar	115.03	23	1.12	2,963
Sivsagar	196.80	22	1.01	4,351
Demow	81.60	21	1.06	1,816
Amguri	308.27	1.4	1.25	539

*In estimating total milk production of local cows only the lactating animals were considered assuming 50% of the total adult local cattle as lactating.

Table 4.16.9: Estimated total milk production based on improved cattle stock

Dairy cluster	Estimated no. of HH with improved cattle stock	Average no. of HH with adult improved cattle	Average milk production per improved cow litre	Total milk production with improved cattle stock* litre
Nazira	175.44	1.45	5.10	1,296
Gaurisagar	000.00	0	0.00	0
Sivsagar	000.00	0	0.00	0
Demow	000.00	0	0.00	0
Amguri	048.82	1.50	5.57	408

*In estimating total milk production of improved cattle only lactating animals are considered assuming 50% of the total adult improved cattle as lactating.

Table 4.16.10: Estimated total milk production based on buffalo stock

Dairy cluster	Estimated no. of HH with buffaloes	Average no. of HH with adult buffaloes	Average milk production per buffalo litre	Total milk production with buffaloes* litre	Total milk production across bovine stock# litre
Nazira	0.00	0	0.00	0.00	**2,712**
Gaurisagar	4.97	6.33	2.10	65.99	**3,029**
Sivsagar	8.20	6.57	1.64	88.42	**4,440**
Demow	3.40	6.44	1.96	42.81	**1,859**
Amguri	0.00	0	0.00	0.00	**947**

*In estimating total milk production of buffaloes only lactating animals were considered assuming 50% of the total adult buffaloes as lactating.

Total milk production is the summation of milk production across bovine stock in table 4.16.8 to 4.16.10.

4.16.8 Marketing behaviour of farmers at cluster level

All types of farms are found to sell their surplus milk. Farmers with local cattle stock keep a part of their milk produced for home consumption and offered to relatives/kith and keen and the remaining part is marketed to earn cash. Farmers with improved cattle stock produce primarily for market to earn profit, while some portion of the produce is kept for HH consumption. Since, total milk production is more in commercial farms with crossbred/ improved cattle proportion of milk marketed is also high. Unlike subsistence farms with one or two litres of milk production based on local cattle, where more than 50% of milk produced is consumed at home in Sivasagar district 75% of milk is sold. Table 4.16.11 shows that farm HH with improved cattle stock sell 89% of their total HH milk production. Project clusters with presence of buffaloes sell 95% of their total milk production with buffalo stock.

Table 4.16.11: Bovine stock percentage of milk sold per HH

Dairy cluster	% with local cows	% with improved cows	% with buffaloes
Nazira	40	90	-
Gaurisagar	98	-	95
Sivsagar	98	-	95
Demow	96	-	95
Amguri	45	88	-

Table 4.16.12 presents the sources of milk sale in the project clusters. Selling milk in the neighbourhood or in the local market is not a predominant source of income in Sivasagar unlike the other districts. These are are generally found to be small holder dairy farmers rearing dairy animals of indigenous breed to cater to the local raw milk consumers in their neighbourhood. Considering the district as a whole based on the selected clusters 62% of farmers sell milk to traders, followed by selling to DCS (19%). Selling milk locally in all the project clusters is only 17%. The informal market actors such as milk traders and private processors together procure milk of almost 64% of the producers establishing an informal value chain between producers to traders and producers to SMs/CPs or producers to consumers to SMs.

Prices offered to producers by various marketing sources are the highest when farmers sell milk locally and private processors (Rs. 40/litre). As shown by empirical studies in Assam and the rest of India that cooperatives are weak in offering better prices to consumers (Kamuar et al. 2013; Kumar and Staal 2010; Bayan, 2018), a similar finding is also reported in the study sites where cooperatives offer only INR 35/litre across clusters. Price offered by milk traders is little higher as Rs 36/litre.

Table 4.16.12: Percentage of milk sale by sources and their respective farm gate prices

Dairy cluster	Neighbours or local sale		To traders		To cooperatives		To private processors	
	%	Price/litre	%	Price/litre	%	Price/litre	%	Price/litre
Nazira	40.00	40.00	-	-	60.00	35.00	00.00	-
Gaurisagar	-	-	100.00	36.00	00.00	-	00.00	-
Sivsagar	-	-	100.00	36.00	00.00	-	00.00	-
Demow	-	-	100.00	36.00	00.00	-	00.00	-
Amguri	45.00	40.00	010.00	36.00	35.00	35.00	10.00	40.00

4.16.9 Access to veterinary services

For the consumers' safety and quality of milk, adequate access to veterinary services is important. Table 4.16.13 presents the number of veterinary service providers which include local veterinarians, VFA, CAHW and AI practitioners providing services to the farmers.

Table 4.16.13: Access to veterinary services at the selected project clusters of the district

Dairy cluster	No. of local veterinarian*		Distance from the FGD location/ village km	No. of VFA		Distance from the FGD location/village km	No. of CAHW		Distance from the FGD location/village km
	Male	Female		Male	Female		Male	Female	
Nazira	3	0	8	5	0	10	0	0	0
Gaurisagar	1	0	4	1	0	4	0	0	0
Sivsagar	2	0	5	3	0	5	0	0	0
Demow	1	0	12	2	0	7	0	0	0
Amguri	0	1	4	2	0	4	0	0	0

* Local veterinarian includes both private and governmentemployed.

4.16.11 Availability of producers/traders' organizations and input supplying institutions at cluster level

In regards to availability of active producers/traders organizations, farmers report that there are not any registered milk traders organizations in the selected clusters. Similarly, there are not any SHG related to dairy farming practices or active milk producers organizations. Except Nazira and Amguri clusters there is no active DCS in the selected clusters (see Table 4.1.14)

Table4.16.14: Availability of producers/traders organization at cluster level

Dairy cluster	No. of milk traders organizations	No. of DCS
Nazira	0	2
Gaurisagar	0	0
Sivsagar	0	0
Demow	0	0
Amguri	0	1

Farmers report that there is one dairy processing plant in Nazira cluster while none of the respondents in the FGD of all of the other project clusters reported the availability of DDL, feed testing laboratory or feed mill. Table 4.1.15 indicates that there are 4 private veterinary clinics in Sivasagar, 2 in Nazira and 1 each in the remaining clusters from where medicines for animal health care/consultation with the veterinary doctors is available.

Table 4.16.15: Availability of input supplying institutions at cluster level

Dairy cluster	No. of dairy plant, chilling plant, BMC	No. of DDL	No. of feed testing laboratory	No. of feed mills	No. of private veterinary clinics
Nazira	1 (Sundar PukhuriDugdha Farm)	0	0	0	2
Gaurisagar	0	0	0	0	1
Sivsagar	1 (Joysagar-non-functional)	0	0	0	4
Demow	0	0	0	0	1
Amguri	0	0	0	0	1

4.16.12 Major milk market actors and other infrastructure in the dairy value chain

In Table 4.16.16, the number of milk market actors involved in the dairy value chain of the selected project clusters is presented. These market actors are linked to the major town or market point of the cluster. Highest numbers of milk traders are found in Sivasagar cluster followed by Demow. Similarly, cottage industry owners are seven and three respectively. The number of sweet shops in Sivasgar town is the highest with 22 while lowest is six inAmguri.

Table 4.16.16: Number of milk market actors at cluster level (based on KII and FGD)

Dairy cluster	No. of milk traders	No. of cottage industry owners	No. of sweet shop owners
Nazira	15	2	10
Gaurisagar	20	2	10
Sivasagar	33	7	22
Demow	24	3	7
Amguri	10	2	6

The major linked markets where milk and milk products are traded are shown in table 4.16.17. Farmers were

asked if they accessed credit from a bank during the 12 months preceding the survey and to name the banks. Dairy farmers of all the clusters except Gaurisagar and Amguri reported receiving credit from formal financial sources. Some of the unorganized commercial farms in Nazira, Gaurisagari and Demow clusters reported access to insurance services from the government supported insurance scheme under NLM Guwahati through New India Assurance/Oriental Insurance.

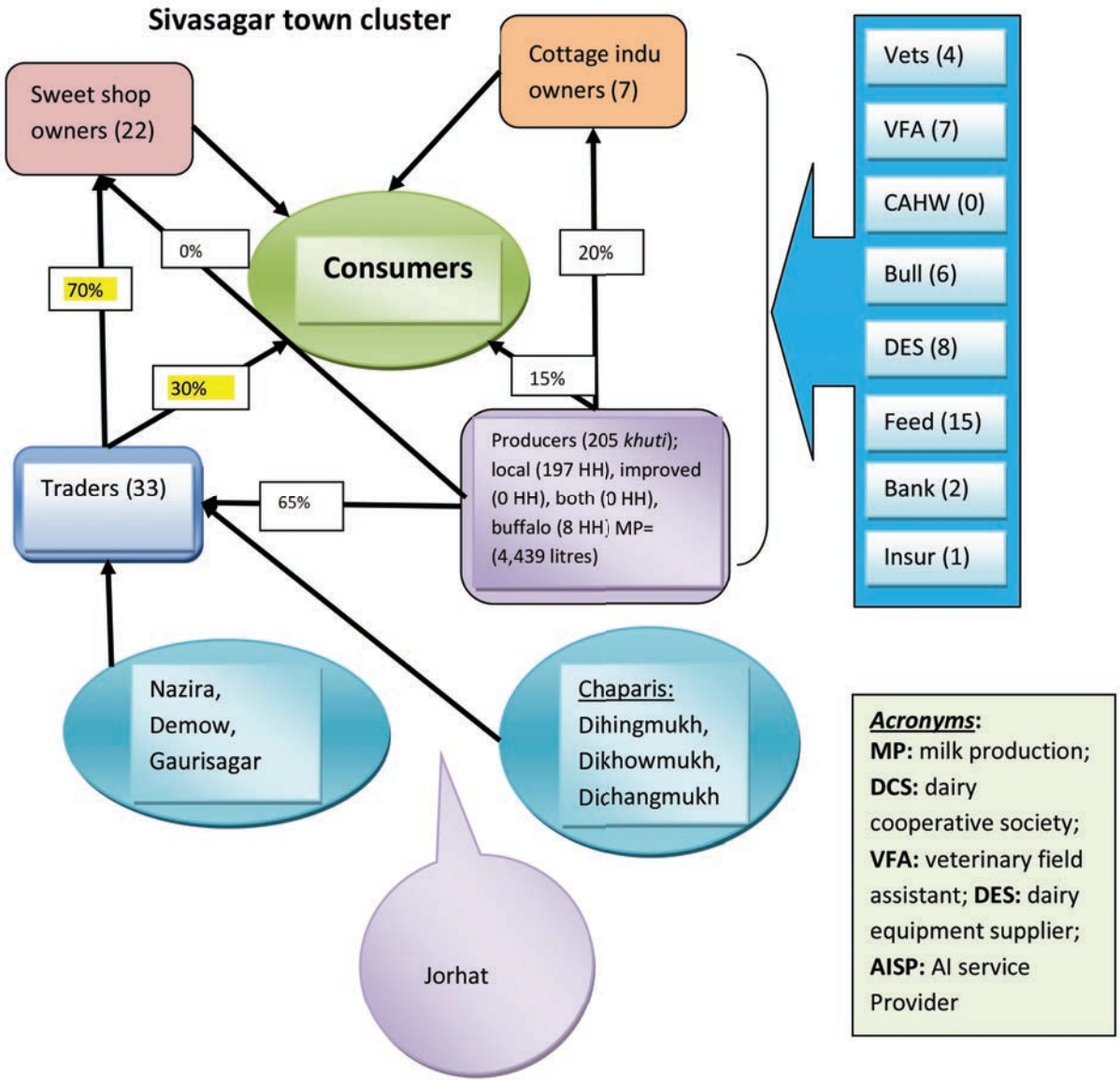
Table 4.16.17: Markets and other infrastructure at cluster level

Dairy cluster	Markets with trading of milk and milk products*	Bank and other financing institutions	Insurance for livestock	Approach road quality (% of cluster villages)		
				Blacktop	Gravel	Earthen
Nazira	Nazira, Simaluguri, Sivasagar	SBI and Canara Bank-Nazira Branch	New India Assurance/ Oriental Insurance	40	20	40
Gaurisagar	Gaurisagar	0	New India Assurance/ Oriental Insurance	60	10	30
Sivsagar	Sivasagar	SBI-Santak Branch	New India Assurance/ Oriental Insurance	50	20	30
Demow	Demow, Sivasagar, Maran	SBI- Demow Branch	0	60	30	10
Amguri	Amguri	0	0	50	30	20

4.16.13 Progressive farmers at cluster level

There are not any progressive farmers identified in the clusters of this APART district.

Figure 4.16.1: Schematic representation of the value chain actors of the major recommended clusters.



4.16.14 Quick observations and recommendations

Mainly milk is supplied to the town from Chapari areas like Dihingmukh, Dichangmukh and Dikhowmukh. In Chapari areas there are indigenous breed cattle *khutis* and some buffalo *khutis*. In the Demow cluster there are more than 200 indigenous cattle and buffalo *khutis* in *Chapari* areas, and 20–25 *khutis* at Sanakpara reserve area. The average daily milk production per *khuti* ranges from 20 to 100 litres. Besides, there are some other villagers where milk is being produced in low quantity. These villages are near the main market and producers have a few improved breed cattle but maximum producers have indigenous breed cattle and indigenous breed buffaloes (villages are Dhaibari, Ronuabari, Laibil, Rupohibam, Bohuabari, Bhimpura etc.). Mainly milk is being supplied to Sivasagar and Moran town by some specific traders who collect milk from other small traders of the producing areas and supply milk on a milk van. In Gourisagar cluster Dikhowmukh and Rupohimukh are two main Chapari

areas for milk production. Some villages like Bogidol, Bharalua having few numbers of improved cattle but mostly farms are with indigenous cattle. Milk is supplied in small quantity from this cluster to Gaurisagar market which is the main market in the cluster. In Sivasagar town Almost 20-25 major sweet shops are there at the town and almost 30–40 milk traders supplying milk to the town. In the *Chapori* areas an average of 27 local cattle are in each of the *khutis* from where the milk is entirely supplied by traders to sweet shops and urban and peri-urban consumers. For conducting training of market actors following sequence may be followed.

Table 4.16.18: Cluster level planning for conducting training in Sivasagar district

Rank of importance	Name of the cluster	Possible no. of trainingsessions				Recommendations
		Prod (25)	SM (3)	CP (1)	MT (5)	
Most potential	Sivasagar town	8	2	0.2	3	1. Milk in Sivasagar town mainly comes from the *Chapori* areas (Dikhowmukh, Dihingmukh, Disangmukh etc.). It would thus be ideal in organizing training in those *khutis* to have feel of the farmers to the utmost association of their daily practices. 2. Market actors' training should be merged because of non-compliance to one full batch training
	Gaurisagar	5	0.3	0	0.5	
Medium potential	Demow	3	0.25	0.25	0.7	1. Demowmukh, Dihingmukh and Dhundamukh chapories are part of Demow cluster and thus three such trainings be conducted in each of these clusters. 2. for not conforming to a full batch training market actors may be adjusted across clusters if needed.
	Nazira	7	1	0.05	0.65	
Less Potential	Amguri	2	0.2	0	0.3	

5. Conclusion and recommendations

The foregoing district-specific analyses of the value chain actors under various parameters indicate that various characteristics prevail in the dairy value chain, broadly related to production and marketing systems of milk and milk products in the project districts of the state. It is understood from the discussion that a single prong agenda of intervention may not work to develop the dairy sector of the identified potential districts of the state. Further more, the value chain analysis approach has pointed out that if a certain district and/or a cluster within has a problem related to feeding or marketing of milk, another district or cluster may have the problem of accessing a service provider (such as veterinary doctor or VFA) or credit. The findings of the mapping analysis of value chain actors will guide policy makers to design a specific approach for sustainable dairy development of the select districts of Assam. Given that farmers and market actors have limited knowledge on clean and hygienic milk production and handling techniques, the present report will serve as a guide to strategically impart training of these actors for wider coverage and to have a cascading effect of the trained actors on others through a peer learning process subsequently. This will certainly enable a tangible and meaningful change of production environment together with partially countering global climate change challenges by reducing antimicrobial load in milk and milk products.

A district-level summary of the dairy production data and market actors/service providers obtained from the field-based mapping exercises are shown in Tables 5.1 and 5.2 respectively. The number of farming HH ranges from as low as 1,446 in Morigaon district to as high as 18,591 in Nagaon district. The total milk production is the highest in Kamrup district for the largest share of improved animals in the Guwahati city cluster and lowest is in

Morigaon district resulting from formal sector procurement in the listed production villages. The diversity of the production and marketing systems is quite evident in the district level analysis where the *khuti* system of cattle rearing is predominant in districts like Sivasagar, Dhubri and Darrang (Dalgaon cluster) while crossbred cattle is the largest source for clusters in Guwahati city in Kamrup. Some districts face marketing challenges reflected in lower wet market prices, while in some districts labour shortage hinders dairy intensification in spite of having good market potential. In districts like Barpeta (excluding Bajali and Rupsi cluster), more than 97% of milk passes through informal actors where producers themselves sell in the retail milk markets and vendors buy the milk from these markets. Milk price fluctuates dependent on seasons (marriage and pujas) and on the number of buyers heading to these markets. In Dalgaon cluster the retail milk market receives the unsold milk only when buyers fail to deliver allof the milk to private processors or door to door vending. A similar status exists in Dhubri district when producers in *Chapori* areas fail to sell to vendors or processors across the river in Dhubri town. In a few of the project districts local production is insufficient, so some processed items like *Khowa* and *Channa* enter the market from West Bengal (Siliguri) and Rajasthan (e.g. in Goalpara and Bokakhat). In Sivasgar district it is the traders through which milk produced in the *khutis* are delivered to the urban consumers indicating informal market actors' dominance in the milk business.

The summary table of market actors and service providers (Table 5.2) indicates the need for conducting a number of training sessions for each of the value chain actors. The total number of commercial farmers is almost 14,400 constituting 11.50% of the total farming HH. This necessitates 576 training sessions to producers to cover the entire potential informal farm HH. Similarly, 100 training sessions for SMs and 94 training sessions for milk traders may be targeted prioritizing a few important clusters in each district in a phased manner. Since cottage processors are not abundantly present in all of the districts, only ninetraining sessions for cottage processors may be targeted prioritizing Barpeta, Nagaon etc. in the first phase.

Table 5.1: HH and dairy production data at district level

District	No. of clusters	Total no. of farming HH	Total milk production litre	Total milk production (local) litres	Total milk production (improved) litre	Total milk production (buffalo)litre
Golaghat	5	6,890	24,969	10,104	14,776	97
Sonitpur	11	13,642	33,161	12,663	20,117	381
Jorhat	8	16,288	44,294	22,115	21,300	879
Nalbari	4	6,150	12,302	4,144	7,179	979
Lakhimpur	4	5,755	8,270	4,245	4,096	0
Kokrajhar	5	4,098	7,576	5,325	1,942	308
Goalpara	4	6,640	13,631	8,814	4,767	50
Darrang	6	15,481	57,967	22,821	29,870	5,275
Barpeta	10	12,914	22,951	12,530	9,222	1,200
Nagaon	18	18,591	36,784	17,223	15,176	1,589
Dhubri	3	7,298	25,781	6,722	8,136	10,923
Kamrup	5	1,380	102,284	4,459	97,597	227
Cachar	2	3,592	8,546	3,385	4,007	1,153
Morigaon	2	1,446	2,180	990	1,129	61
KarbiAnglong	6	2,996	6,863	4,108	2,646	109
Sivasagar	5	2,015	12,987	11,086	1,704	197
Total	**98**	**125,176**	**420,546**	**150,734**	**243,664**	**23,428**

Table 5.2: Number of market actors and service providers at district level

District	No. of SMs	No. of CPs	No. of milk traders	No. of progressive farmers	No. of banks	Insurance	No. of dairy plant/ chilling plant
Golaghat	62	6	53	2	4	2	1
Sonitpur	166	17	203	14	6	2	1
Jorhat	99	2	118	3	8	2	1
Nalbari	53	0	85	9	5	2	1
Lakhimpur	81	5	75	3	3	2	0
Kokrajhar	27	5	43	5	1	2	0
Goalpara	64	5	80	4	5	2	0
Darrang	128	14	290	5	5	2	0
Barpeta	148	43	165	1	8	2	1
Nagaon	246	32	245	21	5	2	1
Dhubri	38	3	50	0	4	2	0
Kamrup	288	18	466	557	6	2	3
Cachar	64	0	60	3	2	2	1
Morigaon	23	9	20	7	1	2	2
KarbiAnglong	58	15	81	1	3	2	2
Sivasagar	55	16	102	0	4	2	0
Total	**1,600**	**190**	**2,136**	**635**			**14**

General recommendations

- For operational purposes, an informal cluster is defined by the presence of informal market actors (milk vendors, cottage processors, sweet makers). Mere presence of a sizable number of milk producers in a cluster does not necessarily qualify it to be a potential cluster unless there is reasonable presence of milk market actors procuring milk from the producers.
- Clusters with presence of sizable numbers of market actors (at least 20 vendors/sweet makers) and visible flow of market from producers to these market actors should be prioritized first. Clusters with little lower than the minimum requirement of market actors should be grouped with the nearest clusters and training sessions may be organized by joining the market actors.
- Clusters found with the lowest milk production and presence of market actors may be ignored / dropped from APART. For each district, dairy clusters are ranked in terms of the potentiality to be an informal cluster and it is suggested to group a few other clusters with medium potentiality (refer to district-specific recommendations).
- Apart from presence of market actors and flow of milk, contiguous villages within a cluster should be prioritized at the beginning for the sake of resource optimization. The villages lying away from the cluster of villages may be tried at a later phase.
- The clusters and villages within clusters having easy access to inputs, veterinary services, markets for milk and milk products may show rapid changes in terms of the outcome indicators (higher market- led production and productivity of milk, and adoption of clean and hygienic milk production) and thus should be prioritized. Far-flung villages with potential constraints may be considered at a later stage.
- Some villages or clustersmay have evidence of a growing number of dairy entrepreneurs compared to others. These entrepreneurs provide a win-win situation to APART by supplying/procuring milk

to/of informal actors on a larger scale and by availing services under the project to leverage growth momentum. Importance should be given to villages/clusters with the highest number of entrepreneurs

- Among the project clusters, those clusters having conducive socio-political situations should be prioritized over those with disturbed socio-political situations.
- The clusters or villages having conducive institutional environments (with more banks, insurance services, retail milk markets etc.) should be taken up under the priority list.
- One may also consider suitability of road infrastructure and environmental factors to realize higher participation rates in the training intervention.

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Annexure

Table A1: Project district composition of milk production

District	Indigenous (%)	Crossbred (%)	Buffalo (%)	Others* (%)	Total milk (litre)
Golaghat	22,243,678 (58.53)	10,442,634 (27.48)	3,684,617 (9.70)	1,632,797 (4.30)	38,003,726
Sonitpur	85,924,651 (68.04)	26,247,458 (20.78)	10,887,548 (8.62)	3,234,355 (2.56)	126,294,011 (100)
Morigaon	14,793,724 (53.45)	10,530,024 (38.04)	1,226,720 (4.43)	1,129,115 (4.08)	27,679,583
Jorhat	35,591,501 (56.41)	16,854,135 (26.71)	8,957,657 (14.20)	1,687,628 (2.67)	63.090,921
Nalbari	1,5042,401 (48.01)	13,751,883 (43.89)	2,012,767 (6.42)	524,541 (1.67)	31,331,593
Lakhimpur	2,1967,948 (64.95)	3,793,241 (11.21)	6,677,134 (19.74)	1,386,095 (4.10)	33,824,418
Kokrajhar	18,311,051 (75.34)	3,304,855 (13.30)	1,862,635 (7.66)	824,437 (3.39)	24,302,978
Sivasagar	2,9084,044 (61.32)	12,771,118 (26.92)	4,034,477 (8.51)	1,543,659 (3.25)	47,433,298 (100)
Goalpara	2,4723,609 (73.41)	7,229,583 (21.47)	1,027,858 (3.05)	696,668	33,677,718
KarbiAnglong	4,2391,854 (57.98)	22,114,268 (30.25)	2,729,262 (3.73)	5,878,142 (8.04)	7,3113,527
Darrang	18,454,011 (58.45)	7,554,780 (23.93)	4,459,770 (14.13)	1,103,904 (3.50)	31,572,464
Barpeta	61,926,181 (49.11)	55,088,943 (43.68)	7,932,386 (6.29)	1,160,881 (0.92)	126,108,391
Nagaon	55,193,575 (44.12)	62,910,524 (50.29)	3,289,014 (2.63)	3,710,961 (2.97)	125,104,074
Dhubri	27,380,252 (65.54)	8,983,837 (21.51)	3,390,901 (8.12)	2,019,348 (4.83)	41,774,338
Kamrup	39,576,122 (26.57)	105,458,125 (70.79)	2,324,414 (1.56)	1,604,362 (1.08)	148,963,024
Cachar	37,574,704 (47.11)	23,089,825 (28.95)	17,839,313 (22.36)	1,262,599 (1.58)	79,766,441
Total	550,179,306 (52.30)	390,125,233 (37.08)	82,336,473 (7.83)	29,399,492 (2.79)	1,052,040,505
Assam total	**470,026,307 (52.92)**	**270,109,157 (30.41)**	**123,053,809 (13.86)**	**24,957,616 (2.81)**	**888,146,889**

*Others include primarily the contribution of goat milk.

Table A2: Major input suppliers in the dairy value chain

Golaghat						
Dairy cluster	Dairy equipment supplier		Feed supplier/grocery shop selling feed		Breeding bull service provider/ community bull	
	No.	Distance from the FGD location/village km	No.	Distance from the FGD location/village km	No.	Distance from the FGD location/ village km
Kathalguri	1	3	0	-	0	-
Podumoni	5	4	12	4	1	2
Bokakhat	1	3.5	2	3.7	0	-
Dergaon	1	2.3	1	2.8	0	-
Sarupathar	2	3.4	2	3.0	0	-
Jorhat						
Dairy cluster	Dairy equipment supplier		Feed supplier/grocery shop selling feed		Breeding bull service provider/ community bull	
	No.	Distance from the FGD location/village km	No.	Distance from the FGD location/village km	No.	Distance from the FGD location/ village km
Dekorgarha	2	3.6	2	1.5	2	2.7
Titabor	5	1.5	3	2.6	3	2.3
Sipahikhola	2	2.8	3	2.4	1	2.6
Kaliapani	3	4	1	1.4	1	2
Selenghat	2	3	1	1.8	0	0
Ujani Majuli	1	2	3	2.5	1	2
Majuli	1	1.5	4	2	2	1.5
Jorhat	9	5.3	5	1.5	3	3.7
Barpeta						
Dairy cluster	Dairy equipment supplier		Feed supplier/grocery shop selling feed		Breeding bull service provider/ community bull	
	No.	Distance from the FGD location/village km	No.	Distance from the FGD location/village km	No.	Distance from the FGD location/ village km
Mandia	5	3.50	3	2.50	2	1.5
Chenga	1	2.50	7	2.50	3	1
Rupsi	2	3.00	4	3.60	2	2
Bhawanipur	3	3.50	4	3	3	1.4
Goma Phulbari	0	-	4	2.50	2	2
Gobardhana	20	2.45	20	3.15	5	2.1
Barpeta	6	3.20	5	3.10	3	1.2
Bajali	1	10	5	4	2	1.5
Pakabatbari	0	-	3	3.17	3	1.6
Sarukshetri	0	-	2	2.40	2	1.1

Lakhimpur						
Dairy cluster	Dairy equipment supplier		Feed supplier/grocery shop selling feed		Breeding bull service provider/ community bull	
	No.	Distance from the FGD location/village km	No.	Distance from the FGD location/village km	No.	Distance from the FGD location/ village km
Narayanpur	1	4	2	3.5	2	2.7
Bihpuria	2	2.5	2	2.3	2	2.3
Kadam	2	3.6	3	3	1	3.5
North Lakhimpur	2	4.4	7	3.4	2	3.1
Morigaon						
Dairy cluster	Dairy equipment supplier		Feed supplier/grocery shop selling feed		Breeding bull service provider/ community bull	
	No.	Distance from the FGD location/village km	No.	Distance from the FGD location/village km	No.	Distance from the FGD location/ village km
Mayong	5*	6 km	10	3 km	0	0 km
Jagirad town	7	5 km	10	5 km	0	0 km
Darrang						
Dairy cluster	Dairy equipment supplier		Feed supplier/grocery shop selling feed		Breeding bull service provider/ community bull	
	No.	Distance from the FGD location/village km	No.	Distance from the FGD location/village km)	No.	Distance from the FGD location/ village km
Paschim Mangaldoi	5	3	10	4.2	4	2.1
Pub Mangaldoi	0	0	1	2.4	1	1.2
Sipajhar	3	2.4	4	2.3	3	1.5
Kalaigaon	0	0	2	3.1	2	1
Dalgaon	5	2.5	7	3.5	3	2
Bechimari	0	0	3	2.5	2	1.5
Sonitpur						
Dairy cluster	Dairy equipment supplier		Feed supplier/grocery shop selling feed		Breeding bull service provider/ community bull	
	No.	Distance from the FGD location/village km	No.	Distance from the FGD location/village km	No.	Distance from the FGD location/ village km
Balipara	10	10	10	4.5	0	-
Gavaru	2	4	2	3	2	3
Na Duar	3	3	10	2.5	0	-
Sootia	1	5	5	2	1	2
Dhekiajuli	4	5	3	3.4	0	-
Biswanath	5	4.5	4	4.3	2	2.4
Chokomatha	2	2.3	6	3.5	0	-

Baghmara	2	3	0	0	0	
Bihali	0	-	5	2.5	1	2.5
Chaiduar	1	2	4	3	0	-
Tezpur town	10	8	10	5	0	-
Goalpara						
Dairy cluster	**Dairy equipment supplier**		**Feed supplier/grocery shop selling feed**		**Breeding bull service provider/ community bull**	
	No.	**Distance from the FGD location/village km**	**No.**	**Distance from the FGD location/village km**	**No.**	**Distance from the FGD location/ village km**
Kushdhowa	1	2	3	3.5	3	2.1
Matia	0	0	5	3.2	3	1.3
Goalpara M Board	4	2.5	3	2.5	2	1.5
Lakhipur	5	3.5	7	3.8	5	2.4
Kokrajhar						
Dairy cluster	**Dairy equipment supplier**		**Feed supplier/grocery shop selling feed**		**Breeding bull service provider/ community bull**	
	No.	**Distance from the FGD location/village km**	**No.**	**Distance from the FGD location/village km**	**No.**	**Distance from the FGD location/ village km**
Dotoma	2	4	10	3	5	2
Kokrajhar	6	5.3	5	4.2	3	1.5
Mahamaya	1	5	0	0	0	0
Gossaigaon	1	3	1	3.5	4	1.5
Kachugaon	0	0	0	0	0	0
Nagaon						
Dairy cluster	**Dairy equipment supplier**		**Feed supplier/grocery shop selling feed**		**Breeding bull service provider/ community bull**	
	No.	**Distance from the FGD location/village km**	**No.**	**Distance from the FGD location/village km**	**No.**	**Distance from the FGD location/ village km**
Paschim Kaliabor	0	0	5	3.2	3	1.5
Lumding	3	5	10	4.5	2	2.4
Roha	2	4				
Dholpukhuri	0	0	0	0	0	0
Udali	3	2.8	8	3.4	3	2.1
Juria	4	2	2	2	2	2.4
Batadrawa	3	2.4	2	1.7	2	1
Bajiagaon	0	0	2	3.5	1	1.5
Barhampur	0	0	1	2.4	1	1
Laokhowa	0	0	5	3.5	2	1.1
Khagorijan	0	0	1	2.4	1	1.5
Fakimara	0	0	1	1.6	0	0

Dalanghat	0	0	1	3	1	1.5
Kathiatali	2	3	3	1.5	2	2
Kaliabor	0	0	2	3	2	1.6
Rupahihat	0	0	8	3.4	3	2
Jogijan	0	0	1	2.4	2	1.4
Binakandi	1	3.5	2	2.5	2	2.1
Dhubri						
Dairy cluster	**Dairy equipment supplier**		**Feed supplier/grocery shop selling feed**		**Breeding bull service provider/ community bull**	
	No.	**Distance from the FGD location/village km**	**No.**	**Distance from the FGD location/village km**	**No.**	**Distance from the FGD location/ village km**
Debitola	8	3.4	6	2.6	3	1.7
Birshing	6	2.2	7	3.1	2	2.3
Dharamsala	0	0	0	0	0	0
Kamrup						
Dairy cluster	**Dairy equipment supplier**		**Feed supplier/grocery shop selling feed**		**Breeding bull service provider/ community bull**	
	No.	**Distance from the FGD location/village km**	**No.**	**Distance from the FGD location/village km**	**No.**	**Distance from the FGD location/ village km**
Rangia	10	2.5	10	2.7	2	1.5
Rampur	1	3	1	3	0	0
Chayagaon	5	3	8	3.5	3	1.4
Bihdia Jajikona	1	2	1	2	1	2
Guwahati	30	5.5	25	4	4	1.4
Cachar						
Dairy cluster	**Dairy equipment supplier**		**Feed supplier/grocery shop selling feed**		**Breeding bull service provider/ community bull**	
	No.	**Distance from the FGD location/village km**	**No.**	**Distance from the FGD location/village km**	**No.**	**Distance from the FGD location/ village km**
Norsingpur	0	0	4	4.1	1	1.7
Silchar town	4	5.1	10	3.5	2	1.5
Karbi Anglong						
Dairy cluster	**Dairy equipment supplier**		**Feed supplier/grocery shop selling feed**		**Breeding bull service provider/ community bull**	
	No.	**Distance from the FGD location/village km**	**No.**	**Distance from the FGD location/village km**	**No.**	**Distance from the FGD location/ village km**
Bokajan	5	5	4	5	0	-
Lumbajong 1	5	7	5	4	0	-
Lumbajong 2	10	12	5	5	0	-
Longsomepi	0	-	1	3	0	-
Hawraghat	4	10	8	10	0	-

Rongkhang	3	5	6	5	0	-
Sivasagar						
Dairy cluster	**Dairy equipment supplier**		**Feed supplier/grocery shop selling feed**		**Breeding bull service provider/ community bull**	
	No.	**Distance from the FGD location/village km**	**No.**	**Distance from the FGD location/village km**	**No.**	**Distance from the FGD location/ village km**
Nazira	5	10	10	10	2 (Rudra Sarma, Tikaram Sarma)	5
Gaurisagar	3	5	7	5	0	0
Sivsagar	8	4	15	4	0	0
Demow	3	5	5	5	3	3
Amguri	2	3	5	3	0	0
Nalbari						
Dairy cluster	**Dairy equipment supplier**		**Feed supplier/grocery shop selling feed**		**Breeding bull service provider/ community bull**	
	No.	**Distance from the FGD location/village km**	**No.**	**Distance from the FGD location/village km**	**No.**	**Distance from the FGD location/ village km**
Pub Nalbari and Borigog	0	0	15	0.5	0	0
Pachim Nalbari	12	8	5	3	2 (Community Bull)	1
Barkhetri	1	5.5	10	5	3	2
Tihu	1	5	15	3.5	7	5

Table A3: Status of feed mills in Assam

District	Public	Status	Private	Status	Cooperatives	Status
Golaghat	1 (under ALPCo)	Functional	0		0	
Jorhat	1	Non-functional	0		0	
Barpeta	0		0		1 (at Nityananda)	Functional
Lakhimpur	0		0		0	
Morigaon	0		0		1 (under Sitajakhala DUSS)	Functional
Darrang	0		1 (Sanjukta Feed)	Functional	0	
Sonitpur	1	Non-functional	1 (Sri Ram Feed)	Functional	0	
Goalpara	0		0		0	
Nalbari	0		0		0	
Karbi Anglong	1 (6–7 t through district council)	Functional	0		0	

Kokrajhar	2 (1 under AHVD; 1 under BTC at Runikhata)	Non-functional	1 (at Titaguri)	Functional	0	
Sivasagar	0		0		0	
Kamrup	4 (under ALPCo 1 Mesh atBirubari; 1 mesh atSonapur; 1 pelletfeed at Sonapur, AHVD)	Functional (The one under AHVD is non-fuctional)	6 (Smart Feed; Sona Vets; Godrej Agrovets (P) Ltd.; SKM Animal Feeds and Foods India Ltd.; Delux Feeds Products (P) Ltd.; Manas Products (P) Ltd.)	Functional	1 (at Changsari under WAMUL)	Functional
Cachar	1	Non-functional	0		0	
Total	11		9		3	

Table A4: Milk processing and preservation infrastructure in Assam

Sr. No.	Name of the unit	Type of plant	Scheme under which established	Administrative control	Year commissioned	Installed capacity (LPD)	Activity status
1	Central Dairy, Jorhat	Pasteurization	TMSS	TMSS, Jorhat	1966	5,000	Non-functional (1997)
2	Joysagar, Shibsagar	Chilling	TMSS	TMSS, Jorhat	1966	2,000	Non-functional
3	Central Dairy, Khanapara	Pasteurization	TMSS	TMSS, Guwahati	1968	10,000	Functional
4	Jagiroad, Morigaon	Chilling	TMSS	TMSS, Guwahati	1968	2,000	Non-functional (1995)
5	Bokakhat, Golaghat	Chilling	TMSS	TMSS, Jorhat	1968	2,000	Functional
6	Sipajhar, Darrang	Chilling	TMSS	TMSS, Guwahati	1969	2,000	Non-functional (1983)
7	Dudhnoi	Chilling	TMSS	TMSS, Guwahati	1972	2,000	Non-functional (1991)
8	Kharupetia, Darrang	Chilling	TMSS	TMSS, Guwahati	1972	2,000	Non-functional (1995)
9	Garampani, Umrangso	Creameryscheme	TMMS	ADDO, Garampani	1973	500	Functional
10	Lahowal, Dibrugarh	Chilling	TMSS	TMSS, Dibrugarh	1975	2,500	Non-functional (2004)
11	Dhekiajuli, Sonitpur	Chilling	TMSS	TMSS, Tejpur	1975	3,000	Non-functional (1994)
12	Dhola, Tinsukia	Chilling	TMSS	TMSS, Dibrugarh	1976	2,500	Non-functional (1992)

Sr. No.	Name of the unit	Type of plant	Scheme under which established	Administrative control	Year commissioned	Installed capacity (LPD)	Activity status
13	Biswanath Chariali, Sonitpur	Chilling	TMSS	TMSS, Tejpur	1980	2,500	Non-functional (1996)
14	Silonijan	Chilling	TMSS	TMSS, Jorhat	1981	2,000	Non-functional (1986)
15	Gungoor, Silchar	Chilling	TMSS	TMSS, Silchar	1981	5000	Upgraded to dairy plant
16	North Lakhimpur	Chilling	TMSS	TMSS, N. Lakhimpur	1984	2,000	Functional
17	Tinsukia	Chilling	TMSS	TMSS, Dibrugarh	1986	2,000	Non-functional (July, 1992)
18	Babeja, Nagaon	Chilling	TMSS	Dairy Dev. Officer, Nagaon	1987	2000	Upgraded to dairy plant
19	Purabi Dairy, Khanapara	Pasteurization	NDDB	WAMUL, Cooperative Sector	1989	60,000	Functional
20	Gutlung, Tezpur	Chilling	TMSS	TMSS, Tezpur	1996	2000	Upgraded to Dairy Plant
21	Sarbhog, Barpeta	Chilling	TMSS	Dy. Director, Nalbari	2000	2000	Upgraded to dairy plant
22	G.R. Dairy and Food Products, Khanapara	Pasteurization	Private Plant	MD GR Dairy	2003	20,000	Functional
23	Dairy Plant, Silchar	Pastueriza ation	IDDP	TMSS, Ghungoor	2004	5,000	Functional
24	Dairy Plant, Tejpur	Pastueriz-ation	IDDP	TMSS, Tejpur	2004	5,000	Functional
25	Dairy Plant, Nagaon	Pasteurization	DRDA	Dairy Development Officer, Nagaon	2005	2,000	Functional
26	Dairy Plant, Sarbhog	Pasteurization	Private plant, NGO, Asomi	MD Asomi	2006	2,000	Functional
27	Prithvi Dairy, Guwahati	Pasteurization	Private plant	MD Prithvi Dairy	2007	50,000	Functional
28	Kajalgaon, Goalpara	Chilling	TMSS	TMSS, Guwahati	Not commissioned		
29	Manza, Diphu	Chilling	TMSS	TMSS, Manza	Not commissioned		
30	Hailakandi	Chilling	TMSS	TMSS, Cachar	Not yet commissioned		To be set up

Sr. No.	Name of the unit	Type of plant	Scheme under which established	Administrative control	Year commissioned	Installed capacity (LPD)	Activity status
31	Karimganj	Chilling	TMSS	TMSS, Cachar	Not yet commissioned		To be set up
32	Dairy Plant Bhawanipur, Barpeta	Pasteurization	IDDP	Deputy Director, Nalbari	Yet to commission	5,000	Under construction

Figures in parenthesis indicate the year from which the plant is non-functional

Source: Deka et al. (2008)

Table A5: List of chilling centres/BMCs under DDD, Government of Assam

Statement indicating chilling capacity created under state/central government Schemes							
Sl. no.	District location	Under AACP		Under RKVY scheme		Under other programme (state plan)	
		Chilling centre/BMC		Chilling centre/BMC		Chilling centre/BMC	
		Place	Capacity (in LPD)	Place	Capacity (in LPD)	Place	Capacity (in LPD)
1	Dhubri					Bilachipara	2,000.00
						Chapor	500.00
						Mancachar	500.00
2	Goalapara			Bahati	500.00	Dudhnoi	2,000.00
						Bhalukdubi	500.00
3	Kamrup			Adhiapara	500.00	Rampur	1,000.00
4	Nalbari					Sariahtali	2,000.00
5	Barpeta			Baghmara	500.00	Howly RDC	500.00
				Howli	500.00	Kolgachiya	1,000.00
						Barbang	4,000.00
6	Darrang			Duni, Sipajhar	500.00	Kharupetia	2,000.00
						Mahaliapara	500.00
						Athaibari	500.00
						ChengarparKapili	500.00
7	Sonitpur					Bhutpara, Dhekiajuli	2,000.00
		Tezpur	1,000.00	Gutlung (ADDO Office Campus)	500.00		
8	Lakhimpur			Charaimowa (ADDO Campus)	500.00	Pathalipahar	500.00
						Boginadi	500.00
9	Sivasagar			Dhaiali	500.00	Joysagar	1,000.00
						Bogidol	1,000.00
10	Jorhat	Rowriah	1,000.00	Felengichok, Titabor	500.00		
				Namgungi, Titabor	500.00		
11	Golaghat	Furkating	500.00				

Statement indicating chilling capacity created under state/central government Schemes							
Sl. no.	District location	Under AACP		Under RKVY scheme		Under other programme (state plan)	
		Chilling centre/BMC		Chilling centre/BMC		Chilling centre/BMC	
		Place	Capacity (in LPD)	Place	Capacity (in LPD)	Place	Capacity (in LPD)
12	Nagaon	Sing Gaon, Borkola	1,000.00	Deurigaon	500.00	Kathiatoli (under installation)	2,000.00
		Bhimarali, Hojai	1,000.00			Bheluguri	1,000.00
		Chalchali, Puranigudum	500.00			Amtola (under installation)	2,000.00
		Phulaguri, Jakhalabandha	500.00				
13	Marigaon					Jagiroad (Under Installation)	2,000.00
						Bhurbandha	500.00
14	Cachar					Harinagar	1,000.00
						Kalain	1,000.00
15	Karbi Anglong			Kheroni	500.00	Chilonijan	1,000.00
				Dhansiri	500.00		
Total			**5,500.00**		**6,500.00**		**33,000.00**

Table A6: Name and contact information of progressive farmers, veterinary officers and veterinary field assistants

1. Barpeta

Dairy Cluster	Progressive farmers	Veterinary doctors	VFAs
Mandia	Abul Kasem (Morigaon village)-8996161548; Anwar Hussain(Morigaon village)-8135909086; Nur Islam (Bhoirar Pam)-8473967898; Samser Ali (Paharpur)-6001174537	Dr Maniruz Zaman – 9365110927	Hasem Ali-986492559, Moinal Haque-9957375870
Chenga	Nil	Dr Khanindra Bayan (9954087508)	Mahibur Rahman (8876493950)
Rupsi		Dr Sahajahan Ali (9435321421)	Abdul Rashid(7663835578)
Bhawanipur		Dr Satish Medhi (8473991011); Dr Dhrubajyoti Kalita (8133883003)	Mainul Haque, Paresh Talukdar, Nazrul Isam (9435973819); Saiful Isalm (9101572471); Ansar Ali Ahmed (9435643858);
Goma Phulbari		Dr Manirus Zamman (9365110927), DrDhiraj Das (7002079407)	Abdul Kader,Abdul Hussain,Pashan Ali Ahmed,Poziruddin Ahmed(9854202705)

Dairy Cluster	Progressive farmers	Veterinary doctors	VFAs
Gobardhanaa	Arup Kr Das (6900193200), Ranjit Rajbangsi(9706353958), Rajani Rajbangsi(8811919073), Satish Rajbangsi (97069355790), Bidya Rajbangsi(9957112785), Hiren Devnath(985477289), Mazibar Miya(8011392524), Satish Arya(8486226570), Mukul Devnath(9854294814), Ainuddin(9954724506), Ashad Ali(7002817301), Rahim Ali(7896028009)	Dr Kuladhar Talukdar (8638047814),Dr Mukleswar Rahman(9957651440), Dr Abdul Malik(9435125127),Dr Bulajit Pathak	Shahjahan, Shabarat,Jehen Ali,Upendra Goswami (9435123529), Satish Roy, Kamal Roy (9435328747), Jiten Baishya (9435328747), Moinal Haque, Hussain Amjad
Barpeta	Entrepreneurs linked to Mandia, Bhawanipur	Dr Satish Medhi (8473991011) (linked to Kayakuchi), Dr Bhumidhar Das-9854986738 (Barpeta town), Dr Maniruz Zaman – 9365110927 (linked to Mandia), Dr Rafikul Ahmed- 9435026056 (Palhaji)	Mainul Haque-9957375870, Hasem Ali-986492559; Paresh Talukdar, Poziruddin Ahmed(9854202705); Rahman Ali (9957063848); Ajay Pathak (9954080838); Nazrul Isam (9435973819); Saiful Isalm (9101572471); Ansar Ali Ahmed (9435643858); Akkash Ali (9101857557)
Bajali	Ripul Das, Manoj Deka, Niranjan kalita, Utpal Das, JunaTamuli Barman (9435692015)	Dr Hitesh Pathak, Dr Tapan Medhi (9864414380), Dr Satyajit Talukdar (943571183), Dr Dhruba Choudhary (9954590944), Dr Kalyan Talukdar (8638302275)	BhabenKalita,Hiralal Baishya,Bhupendra Das(9707392257),Bhupen Pathak(9435310102),Pabin Kalita(9435481479),Gautam Pathak,Dimbeswar Khatoniar
Pakabatbari	Nil	Dr Satish Medhi (8473991011)	Nil
Sarukshetri	Nil	Dr Bhagirath Deka (9954264848)	Ramen Talukdar (9577376544), Gadadhar Nath (7896753140); Mirajul Haque (9859849078); Hazarat Ali (9435756272); Nripen Talukdar (6000160997); Bhaben Kalita (9954010415); Rubul Ojah (6000859605)

2. Cachar

Cluster Name	Progressive farmers (name and contact number)	Veterinary doctors (name and contact number)	VFAs (name and contact number)
Narsingpur	Kapurchand Gowala-9435625889; Uttam Sarma-9864875765; Surajit Nath-9435622106	Dr Jiten Bhuyan (9127063803)	Sukumal Nath(9706463032) Pranesh Nath-(9401337461), Mahmud Hussain Lahkar(9864908070),Zakir Hussain Borbhuyan(9401740274),Badal Ch. Roy(9401307104)
Silchar town		Dr Manoranjan Sarkar (9405071633), Dr Molay Kranti Nath (9435171092), Dr Parag Sarma (9101643820), Dr.Bhupen Saikia (9435474564/9435482274),	Jan Ahmed (9435911180),Inamul Mazumder (9954148487), Mannan Borbhuyan (9706217060), Mam Singh (9101492249), Y.Hussain (9101359217) Nilkumar Singh-8133692840, Sasankar ch. Nath (9435618156), Imdad Hussain Laskar (9613964540), Md.A.K Borbhuyan (9935884452), Jaindai Dehangmai (9101151327), Niranjan Kr. Nath (9101000958), Shymal Chandra (9401083173), Thaina Chengmai (7399229227)

3. Darang

Cluster name	Progressive farmers (name and contact number)	Veterinary doctors (name and contact number)	VFAs (name and contact number)
Bechimari		Dr Prasanta Kr Ray(8399947015)	Zakir Hussian (7002426523)
Dalgaon	Dibakar Sarma (9954058112)-Kharupetia town ward no-2;	Dr Minnat Hussain (9457283944)	Mohibul Haque(8638904974),Tonjit Ali (9954217672),Chand Md Ali(8474866296),Zakir Hussain(7002426523)
Kalaigaon		Dr Janak Saikia(9365594065)	Mahibul Haque(7002824869),Fuleswar Baniya(9365035057)
Mangaldoi town		Dr Bajrlul Islam(9435185973)	
PachimMangaldoi	Lakeswar Deka, Dimbeswar Deka	Dr Jugabrat Nath(7086269841)	Pabitra Kr. Nath (9365624551); Tapeswar Kumar(9101048902)
Pub Mangaldoi		Dr Abul Hussain	Ali Ahmed,Haron,Imradul
Sipajhar	Ramesh Goswami	Dr Sahjahan Ali (8638253369), Dr Mofidul Haque(9101216430)	AjibUddin,Baharul (7002435318), Hiren Medhi(7896236296),Mainul Haque(9531312873),Nurul Islam(9365419958),Sayed Aminul Haque(9854574679),Narayan Deka(6000746741),Firod Ali Kadakar,Dipu Ram Das(8721880559),Musahid Ali,Motul,Fazar Ali(9854459722)

4. Dhubri

Cluster name	**Progressive farmers** (name and contact number)	**Veterinary doctors** (name and contact number)	**VFAs** (name and contact number)
Debitola		Dr Jamsher Ali (7002103892); Dr Abdul B Ahmed (8811885418)	Sameer Kr. Bhattacharya (9101360571); Jahanuddin (7002311671); Rafiqul Islam (9957510010)
Birsing		Dr Abdul Barek (9678483912); Dr Jayshree Baruah (8486686407/7035713395)	Raafiqul Islam(9864018497),Salam Sheikh, Mokshed Ali Sheikh (7002790091); Jiten Roy (9706375861)
Dharmasala	Nil	Dr Dani Borah (9101428882)	Nil

5. Goalpara

Cluster name	**Progressive farmers** (name and contact number)	**Veterinary doctors** (name and contact number)	**VFAs** (name and contact Number)
Matia	Pradeep Satgiri	Dr Utpal Das (9954889465)	Lakeshwar saud(84861944190), Jogen Nath(9435914723), Subodh Nath
Goalpara	Dipak Das(8721055106)-Marium Nagar;	Dr Kalyan Path, Dr D Chandan, Dr AN Islam,Dr Devajit Chaudhary,Dr Ajit Das	Jahanuddin Ahmed (9435313187)
Kushdhowa		Dr Utpal Das (9954889465); Dr Deepak Das; Dr Arup	Ranjit and Kabinda
Lakhipur		Dr Aminul Islam(9435196082),Dr Nurul Islam(9435196082)	Futbar rahman (9435756427), Hiren Das(9954962952)

6. Golaghat

Cluster name	**Progressive farmers**(name and contact number)	**Veterinary doctors** (name and contact number)	**VFAs** (name and contact number)
Bokakhat	Bikash Bharali (88766658550); Thaneswar Tamuli-Kalakuwa; Bhim Upadhyay- Palashguri	Dr S.Mahtaz (9864238491)	U.Gogoi (9954427254)
Dergaon		Dr.Abhijit Kakati (9435204208)	Montu Bora (9854354725), Moni Kanta Baruah (9435515271), Purna Kt. Bora (9435487689)
Kathalguri		Dr Girin Konwar (9435089733), Dr Sunil Haloi	Mrigen Sarma (9435354072), Mr Bhabesh Saikia, Mr Lakheswar Gogoi
Podumoni	Raju Saikia, Diganta Nath, Umesh Nath, Rajib Nath Arun Nath, Sarat Nath, Dilip Saikia, Pabitra Borah-Farkating	Dr Girin Konwar (9435089733); Dr Jyoti Phukan (9365843833), Dr Hyder Ali	Mr Ghana Bora (9954566090), Mr. Atul Hazarika (9435249807); Mr Bhabesh Saikia (9435727815), Dr Raju Rahman, Gangadhar Hazarika, Pabitra Hazarika (9435753065), Mr Mrigen Sarma (9435354072), Mr Prakash Bora

Cluster name	Progressive farmers(name and contact number)	Veterinary doctors (name and contact number)	VFAs (name and contact number)
Sarupathar	Birendra Singh Chetry(7002275245), Prem Sharma-8638156224; Rana Sarma-9101131419; Gyandeep Chetia-9101338780; Chinmoy Borgohain-8638301896; Pradip Kumar Singh-7002496359; Santosh Singh-9854646319; Lallan Singh-8136051416; Babab Singh-9957296989; Mohan Singh-9707665459; Gopal Singh-9365542953; Nanji Singh-9957876206;	Dr BisitraHaloi (7035867191), Dr Harendra Nath (9954484899), Dr C.P. Singh	Perihan Singh(9402113046); Dulal Saikia, Rajib Bora, Tarun Saikia

7. Jorhat

Cluster name	Progressive farmers(name and contact number)	Veterinary doctors (name and contact Number)	VFAs (name and contact number)
Dekorgorah	Pankaj Chetry- Kolbari, Pulin Borah-Namgorumora	Dr C.K Singh(9435050847),Dr Hemanta Baruah(9954471504),Dr Subodh Singh,Dr Naren Bora,Dr Sanjib Saikia(9435437086), Srimanta Mahanta(9435014128)	Naren Bora(943509704),Bipul Sarma (9854109384),Jiwan Das(8133913573),Kiran Hazarika(9864547072),Pintu Borah(9435450672),Srimanta Mahanta(9435014128),Mr Jayanta Saikia
Jorhat	Chandra KantaSaikia(9435090249)-Chinamara	Dr Hemanta Baruah(9954471504),Dr Subodh Singh,Dr Numal Doley(9678670233),Dr Dipak,Prasanta Hazarika(9954447507)	Naren Bora(943509704), Pintu Bora(9435450672),Mr Prasanta Hazarika(9954447507),Ranjit Borah(9854267226),Thaneswar Saikia(9435228698),Nipam Hazarika
Kaliapani		Dr Sunil Handique(8638596194),Dr Madhumita Gogoi(9864381524)	Rajib Barhoi(8638450257)
Majuli	Rohit Ch Kalita(9101156965)-DakhinpatKumargaon	Dr D. Barman (9435203344)	Rajen Dutta, Mohan Das (9707348670)
Selenghat		Dr Rajib Duora(8638450257)	
Sipahikhola	Will provide name and contact no of PF.	Dr Mrinmoy Chutia (9101728534), Dr Prabin Neog (9435094212)	Durlov kakati (9954905885), Baikuntha Bora

Cluster name	Progressive farmers(name and contact number)	Veterinary doctors (name and contact Number)	VFAs (name and contact number)
Titabor	Purnananda Saikia (8638249537)-11No. Block; Ajit Saikia(9954287068)-Borholla; Dhon Hazarika(8474041618)-Moran grant; Kamal Prasad Yadav(9954319001); Chittaranjan Sonowal(9601154606)-Gorjan grant; Putul Sonowal- Kheremagaon	Dr Sawal Sadar (7002868196), Dr Deepak Darasdhara (9435090417), Dr SH Choudhary(9535826195)	Mr KamalCh. Bora(9435466053),Partha Pratim Kakati(8473061225),Mr Kamal Ch.Bora(9435466053),Arun Borah(9864706710),Prakash Kalita(9435247334)
UjaniMajuli	Ramesh Ghosh (9101967461)-Jengrai	Dr D. Barman (9435203344)	Umesh Baruah(9101616255),Mahesh Baruah

8. Kamrup

Cluster name	Progressive farmers(name and contact number)	Veterinary doctors (name and contact number)	VFAs (name and contact number)
Rangia	Ajay Dutta,Pankaj Sarma(8486650040) Basudev Das and Society Members	Dr. Ram Nath (9435198001)	Tapan Deka (9435409370), Nashimuddin (9435409359), Dambaru Kalita (9435305606), Anil Deka (9101071580) Mukul Ali, Babul Ali Saikia (9365443707) Sarbeswar Baishya (9401251075) Jyotish Sarma (9531470054)
*Guwahati City	Krishna Prasad Sharma-9954114483(8thMile); Madan Lamisani/Shibu Sharma-9101025310 (11thMile and Jorabat); Bikash Sharma (8473924210) (10thMile); Amit Sharma (8486610395) (Amgaon, Bonda); Shiva Upadhay (9678458322) (Belguri, Panikhaiti)	Dr Manoj Kr. Goswami (9435082741), Santanu Nath(9435108146), Makhan Barman(9864054211)	Anwar Hussain (9508708340); Nirmal Talukdar; Banamali Bhatta; Paresh Thakuria (9859066155); Dhaneswar Das (9864016674); Somez Ali (9957649953; Biren Deka (9854834658); Ali Hussain (9864039902); Masam Ali (9957210873); Gokul Deka (9101090166)
Rampur	Nil	Dr Debokingkar Sarma (9435587006)	Ashwini Kalita (9854382012)
Chaygaon	Bhargav Jyoti Shrma (Balagoan)-9954020045	Dr Hemanta Das, Dr Sarukon Deka, Dr Raju Deka	Ananta Rabha (9678223068); Harmohan Goswami, Moneswar pathak; Jatil Das (9435731380)
Bihdia Jajikona		Dr Samir Phukan(9857132703)	Muku Sarma(9435117736); Putumoni Hazarika(9864533087); Anwar Islam(8822261024); Habibullah Ahmed(9854947759); Ainuddin Saikia(9854153847)

9. Karbi Anglong

Cluster name	**Progressive farmers**(name and contact number)	**Veterinary doctors** (name and contact number)	**VFAs** (name and contact number)
Bokajan		Dr Subodh Barman	Songsar Dey
Lumbanjong 1		Dr Rajen Ronghang(9101555560)	Sarlonki Mili(9435584319), DasdilionTeron(7002187313)
Lumbajong 2		Dr Barman(9365818587), Dr Anthoni Phangso(9101046861)	Jogneswar Das (9435315496), Suresh Hanse (86385300426), Gajen Timung (8403841134), Gopal Ingti (8403020213)
Hawraghat	Krishna Devnath-9957699006; Harindra Harijon-8402809317	Dr Dibya Jyoti Neog(9859301859)	Rubul Teron (8638375974), Tarun Chandra Basumatary (7637033471), Rajyalal Langhasa (9435945766)
Rongkhang	Sanjay Bhagat-8011120349 (Kheroni); Sanjay Pandey- 9365426200 (Kheroni Puranabasti)	Dr Chandan Bhatta (8638922423), Dr Giasuddin Ahmed(8812036151), Dr Bhaskar J.Pegu(8473007661), Dr Pankaj Kr. Laskar(7086172946)	SecondraTeron(7896464438), Masukuddin Borbhuyan(8473019245), Pabihar Sagma (9435361442), Puspendra Bora (8011724829)
Longsomepi		Dr. Prince Boro(7002838717)	

10. Kokrajhar

Cluster name	**Progressive farmers** (name and contact number)	**Veterinary doctors** (name and contact number)	**VFAs** (name and contact number)
Kokrajhar	Sahadev Mitra - (9435322695)	Dr GN Sen-9854289976,Dr S Narzary-8135007453, Dr S. Nath	Apurba Borman, Deepak Kr. Gayari (9864638510); Janat Jonkar Basumatary (9678787440); Babulal Sharma (9957955386); Bakul Ch. Bargoyari
Dotoma	Mohan Kr.Bastola, Sunil Ray-8638408265	Dr Gargaram Mohilary-9577967204, Dr Gonin Chaudhary-9864394026, Dr Hasim Ali	Radhika Narzary 9854315750, Gopi Basumatary-6900484533, Jaibhadra Borma, Ranjan Kr Borma, Abdul Salm Mondol 8638300277, Nirmal Dey, Jamini Chetry
Gossaigaon		Dr MN Talukdar- 9954871125	Pradip Brahma-9401348663
Kachugaon		Dr Bijit Dev Choudhuri (9864033185)	Kamaleswar Bharhma (7002611936); Manoranjan (8011937849)
Mahamaya		Dr Rafiqul Islam(9101423445)	

11. Lakhimpur

Cluster name	Progressive farmers (name and contact number)	Veterinary doctors (name and contact number)	VFAs (name and Contact number)
Narayanpur	Paresh Bhuyan(Pathalipahar)	Dr Minakshi Mili(9435650478)	Putul Borah(9854042959),Manik Duaria(9127148014), Atul Baruah(9854042959), Manik Duaria(9127148014)
Bihpuria		Dr Pranjal Chetia(7657965963)	
Kadam	Talibar Ali (8473070468) (Boginodi PGR)	Dr Manabjyoti Saikia(8638825800)	Dinabandhu Barman(7896828110),Anil Hazarika(9954332720)
North Lakhimpur (town)	Jagat Kr.Roy (9954241434) (Naoboicha)	Dr Anupal Saikia(8473813342); Dr Tilak Sonowal Dr.Kushal Baruah(9854072075),Dr Jagannath Gogoi(9101250668); Dr Hirang Gogoi	Umesh Misra (9435033299), Arun Hazarika (9401269357), AbdujShattar (9401390595), Arun Hazarika (9401269357), Mr Amulya Baruah (9957131709)

12. Morigaon

Cluster name	Progressive farmers (name and contact number)	Veterinary doctors (name and contact number)	VFAs (name and contact number)
Mayong			

13. Nalbari

Cluster name	Progressive farmers (name and contact number)	Veterinary doctors (name and contact number)	VFAs (name and contact number)
Pub Nalbari	Anjana Chakraborty-Sondha Ramen Barman-Digheli	Dr Bibhuti Chakraborty (8812965861)	
Pachim Nalbari	Jiten Barman, Pradeep Barman-Chamata; Jitu Mena(9365723751), Biju Mena-9085040893-Belsor	Dr Pulin Barman (9101701238), Dr Deepak Thakuria (9435310914)	Dhiren Barman(9101529256),Dildar Hussain(9435714055), Narayan Barman(9613400835), Bhaben Sharma(9854975984)
Tihu	Sailen Goswami(6000096082)-Nathkuchi; Pankaj Haloi-Sialmari	Dr Satyajit Talukdar (9954098147), Dr Tapan Medhi (9864414380)	Gajen Barman,HemantaTalukdar,Dilip Sarma-8822620329,Gajen Majundar, Deepak Kr.Pathak(7578015264)
Borkhetri	Gaurab Dairy Farm-Banamali Medhi(6900193169)-Rampur	Dr Ajoy Sharma (9706178136), Dr Anjanjyoti Sarma (8723922514), Dr Ahedu Rahman (9365959255)	Krishna Medhi(9707123497),Sahid Ali(9957905794),Nazim Ali, Hussain Ali(8011584690),Pranab Talukdar(9707736905), Chand Md.Ali(9854775329),Moinul Haque(9864495412),Hitesh Ch.Kalita(8011510299), Basiruddin Ali

14. Nagaon

Cluster name	**Progressive farmers** (name and contact number)	**Veterinary doctors** (name and contact number)	**VFAs** (name and contact number)
Bajiagaon		Dr Bharat Bora- 9435080186	Safikuddin Ahmed-9954320703
Binakandi		Dr Prasnta Mazumdar-9435161205, Dr Nurazzaman- 9864528348	Nava Prasad Bhuyan 9957454064
Batadrawa		Dr Rafikul Islam (9864528252)	Afazuddin Ahmed, Munul Haque
Barhampur		Dr Pravin Saikia- 9435160790	Madan Chandra Neog -9435360808, Lakhi Bora
Laokhowa		Dr Krishna Prasad Borah	Faijuddin Ahmed (6000788826)
Kaliabor	Pradeep Saikia-9476861942	Dr Khirud Sharma- 7896863258, Dr Suraj Kakati- 9101591651	Birinchi Borah-9365241227
Kathiatoli		Dr Anamika Bora- 7086988615, Dr Manoj Laskar (9435068164), Dr Utpal Talukdar (8724824089)	Wahidur Rahman-98642645510, Mainul Islam-9401037478
Dalangghat		Dr Nabajyoti Bora (7002211051)	Mr Digen Bora(9435096752)
Pachim Kaliabor		Dr Kandarpa Hazarika 9435367973	Jyotish Medhi(8876295703)
Rupahihat		Dr Niren Das-9435395670	Ibrahim Ali-9435474465, Shahuddin-9435317450
Roha	Bishnu Chauhan-9435837501 (Rajagaon); Deepak Kalita	Dr Pori Mazumdar	Dhiren Chandra Das, Mr bhupen chandra Saikia -9954212877, Ranjan Konwar 9954153887
Jogijan	Fakuruddin Ahmed-9678526657	Dr M Hussain 9435208821	H.S. Gupta 9954803064
Dholpukhuri	Ramnath Chahuhan-8404058069; Naresh Chahuhan-9004952447	Dr. A. Iqbal-8638382637	MU Borbhuyan-9954386183,BP Banik-86381774400
Lumding	Anukul Ghosh- 9002093669; Bashu Das; Bhola Nath Sarma-9957229290	Nil	Gopal Chakraborty (9435165792), Biswajit Nath (9954783180)
Udali		Dr Shiva Prasad Hazarika (8402090316)	SukantaDas (9435253151)
Pakhimoria	Anwar Hussain- 9401091212; Rohit Sharma-7896889765; Bubul Ali- 9957955897; Hussain Ali; Bijay Kakati-9957271880; Uttam Kr.Bhuyan- 7896886055	Dr.Bhuban Sharma (9435160523)	Bahrul Islam (9706157440), Padum Kr.Bania (9401997574)
Khagarijan	Umesh Borah; Gitu Sharma-7086164406; Dipan Nath-7896557949	Dr.Binoy Bordoloi-9435068460	Ashwini Kr.Borah-9894242220
Juria		Dr Bhaben Borgohain-7002810803/9859539224	Abdul Awal-9435924393, Zakir Hussian-7002426523
Nagaon town		Dr Santanu Khaund, Dr Rupak Nath(9435360028)	Baharul Islam, Hema Kalita, Binod Kr.Borah, Sofikul Islam(9435068208

15. Sivasagar

Cluster name	**Progressive farmers** (name and contact number)	**Veterinary doctors** (name and contact number)	**VFAs** (name and Contact number)
Nazira	Dr Jagadish will provide name and contact no. of PF by day after tomorrow	DrJagadish Barman (9435227325), Dr Lachit Bora (9435204769), Dr Dushmanta Saikia	
Gaurisagar		Dr Debananda Chelleng(9435537503)	
Sivasagar		Dr Sankar Dev(8812878361)	
Demow		Dr Debasish Dulakahoriya (9864382003), Dr Santanu Changmai (7002302565)	Bhuyan(9854016278) Basanta Bhuyan(9365308252)
Amguri		Dr Marzina Begum(9706776676)	

16. Sonitpur

Cluster name	**Progressive farmers** (name and contact number)	**Veterinary doctors** (name and contact number)	**VFAs** (name and contact number)
Gavaru	Kabul Sarma-9538080858; MintuBorah, JayantaDas	Dr Digen Talukdar (9435505584)	Bikash Katal (30073020495), Satya Kakati-9435180295, Pankaj Borah (9435638984)
Dhekiajuli	Babar Ali(8876743586);Taijul Ali(7399582238)		Md. Jakhan Mia Choudhury (94355081400)
Bihali	Badan Das	Dr MilanUpadhaya	Chakra Hazarika, Joan
*Balipara	Kamalish Shah,Binod Kumar,Prabhu Singh(9954172953)	Dr Tulsi Prasad Fayel (7578051388)	Imran Ahmed (9954064130) Diku Bodo (9577758615)
Na Duar	Govind Kharka, Deep Moni Nath(8011825973)	Dr Sukumar Mishra(9435226401), Dr Deepak Sharma(9435182806)	Pradeep Pathak (9678377518), DigenBhuyan (9435453220)
Chaiduar	Sumanta Sarmah (8638514094)	DrSourabh Das(8134908777)	Harsha Basumatary(9365441072)
Biswantha		DrDipak Sharma(9435182806)	
Baghmara		DrPratulSarma(9435182144)	MantuKakati (9435485530)
Chokomatha		Dr BrindabanPhangso	Hussain,Pona Da (9435383211)
Sotea		DrDeepak Sharma(9435182806)	Lalit Borah (9854372856), LohitHaloi (9435486431), Tralukya Das (9864203974), Dharmeswar Borkakati (9706619221), Mahi Pratim Borbhuyan (9435485531), Ananta Borah (6901122910)

Note: *In Balipara cluster there are some progressive farmers at Goroimari, Betonijhar.

Images of meeting various key informants and market actors while conducting FGD and KII