CHAPTER –III
PRODUCTION, EMPLOYMENT AND INCOME FROM DAIRY FARMING

3.1 Introduction

Milk production in developing countries has been regarded as a tool to combat malnutrition and poverty alleviation. In ancient India, milk is thought to be *Amrit* or nectar of among all the food items. 'Cattle raising is also a component of many farming systems that are not mainly livestock-oriented since cattle utilize crop by-products and provide a store of capital and a source of draft power', manure and dietary(Alderman *et al.* 1987). At present, the utility of cattle as draught power has been reduced and it is generally used on the fragmented plots of land. Therefore, the cattle rearing at present naturally have become the activity of milk production, meat production, biogas and bio-manure production. Recently the biopesticide prepared by using cow urine is becoming popular. This generates the scope of varieties of production in the process of dairy farming generating the possibility of more employment and income.

In Assam, there are different directorates for animal husbandry and dairy. Department of Animal Husbandry and Veterinary (AH & Vety.) looks after the animal health and breeding *etc.* This is attributive to production and productivity. The post-production activity has been the responsibility of the Department of Dairy Development and is attributive to marketing. The infrastructures under the Department of AH & Veterinary forms the support services of the production side. However, the infrastructure created under the Department of Dairy Development, *viz.*, processing plant, chilling *etc.* and the whole system of dairy cooperatives forms the support services of the marketing side.

The milk production of PGRs had encouraged the Government of Assam at the initial stage to take up dairy development programme in the state (Dutta, 2011,2017). Which can be regarded as the genesis of Department Dairy Development in Assam. Therefore, it is necessary to study the graziers, how problems of dairy cattle have been evolved.

This chapter deals with the production side of milk; worldwide milk production, milk production in India, milk production and activities of milk production in Assam with its genesis, description of grazing reserves in Assam, departmental activities and support services created in the state and in Morigaon district, milch animals in Assam, milk production in Assam and in Morigaon district and in study area. The marketing side infrastructures and support services comprising cooperatives and genesis of cooperative are planned to discuss in the next chapter, the milk marketing.

3.2 World Milk Production

'Throughout history, in search of socioeconomically feasible and nutritionally superior sources of food, man has domesticated some milk-producing dairy species, and selected and bred them to produce large volumes of milk in excess of the necessary amounts needed to nourish the animal's own offspring. This surplus production of milk beyond nourishing the young has become the foundation of the modern dairy industry.' (Park and Haenlein, 2006).

In the recent past, the share of world milk production in developing countries have been increasing. World milk production has increased by more than 50 percent in the last three decades, 'from 500 million tonnes in 1983 to 769 million tonnes in 2013' (FAO 2017). Most of this increase is of the rise in the number of milk-producing animals rather than the increase in productivity. The countries of the developing world bear 'a long tradition of milk production'. In ancient India since *Vaidic* period cattle raising and milk production was the main occupation. Cattle raising for milk has been the tradition of Indian sub-continent. The living standard began to go up with time; this led to the interest of rural masses towards animal husbandry making India largest milk producer in the world. Most of the countries depend on bovine and small ruminants. In some places, other animals are also kept for milk. The USSR is known to be the milk deficit region where reindeer are also milked during late summer and autumn.

FAO assesses present world milk production facts as follows: (FAO 2017)

i. Since the 1970s, most of the expansion in milk production has been in South Asia, which is the main driver of milk production growth in the developing world.

ii. Milk production in Africa is growing slower than in other developing regions, because of poverty and in some countries adverse climatic conditions.

iii. The countries with the highest milk surpluses are New Zealand, the United States of America, Germany, France, Australia and Ireland.

iv. The countries with the highest milk deficits are China, Italy, the Russian Federation, Mexico, Algeria and Indonesia.

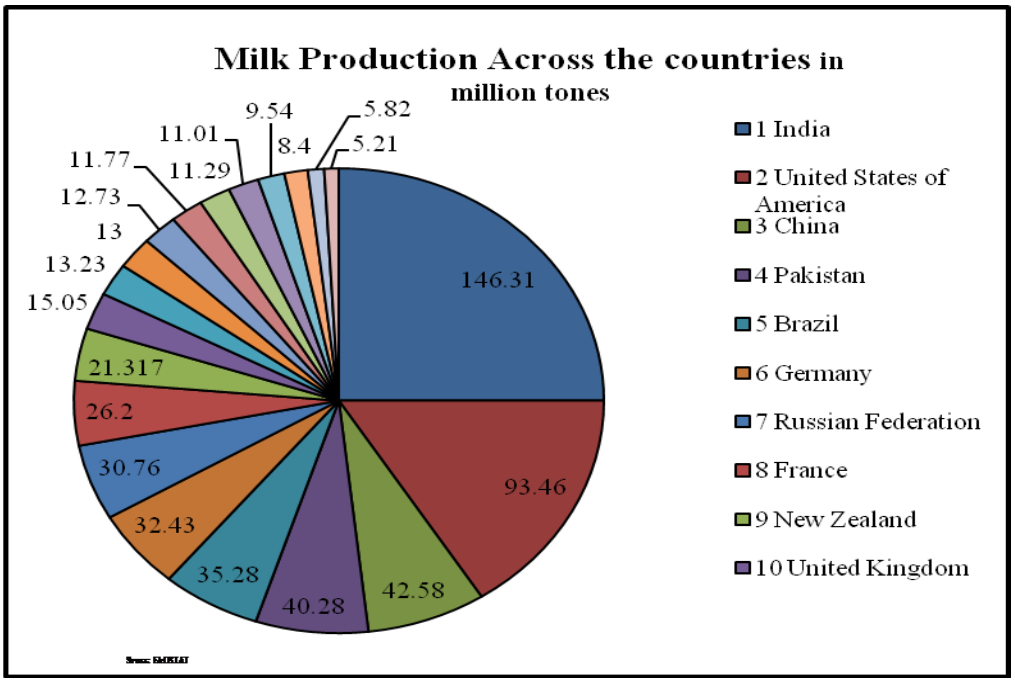
Table 3.1Milk Production across the countries

Sl. no	Country	Milk production in Million Tonnes					
		2009	2010	2011	2012	2013	2014
1	India	116.43 (16.48)	121.85 (16.89)	127.90 (17.31)	132.43 (17.50)	137.69 (18.00)	146.31 (18.48)
2	United States of America	85.88 (12.15)	87.47 (12.12)	88.98 (12.04)	91.01 (12.03)	91.28 (11.93)	93.46 (11.80)
3	China	40.39 (5.72)	41.16 (5.71)	41.80 (5.66)	42.64 (5.64)	40.51 (5.30)	42.58 (5.38)
4	Pakistan	34.36 (4.86)	35.49 (4.92)	36.66 (4.96)	37.86 (5.00)	39.11 (5.11)	40.28 (5.09)
5	Brazil	29.23 (4.14)	30.86 (4.28)	32.25 (4.36)	32.45 (4.29)	34.41 (4.50)	35.28 (4.46)
6	Germany	29.20 (4.13)	29.65 (4.11)	30.36 (4.11)	30.71 (4.06)	31.36 (4.10)	32.43 (4.10)
7	Russian Federation	32.57 (4.61)	31.84 (4.41)	31.64 (4.28)	31.75 (4.20)	30.52 (3.99)	30.76 (3.88)
8	France	23.52 (3.33)	24.25 (3.36)	25.29 (3.42)	24.88 (3.29)	24.57 (3.21)	26.20 (3.31)
9	New Zealand	16.48 (2.33)	17.01 (2.36)	17.34 (2.35)	19.13 (2.53)	19.47 (2.54)	21.32 (2.69)
10	United Kingdom	13.85 (1.96)	14.07 (1.95)	13.85 (1.87)	13.84 (1.83)	13.94 (1.82)	15.05 (1.90)
11	Afghanistan	11.79	12.87	13.19	13.13	13.36	13.23

Sl. no	Country	Milk production in Million Tonnes					
		2009	2010	2011	2012	2013	2014
		(1.67)	(1.78)	(1.78)	(1.74)	(1.75)	(1.67)
12	Poland	12.47	12.30	12.43	12.68	12.74	13.00
		(1.76)	(1.70)	(1.68)	(1.68)	(1.67)	(1.64)
13	Netherlands	11.66	11.81	11.84	11.89	12.44	12.73
		(1.65)	(1.64)	(1.60)	(1.57)	(1.63)	(1.61)
14	Indonesia	11.37	11.48	11.72	11.76	11.83	11.77
		(1.61)	(1.59)	(1.59)	(1.55)	(1.55)	(1.49)
15	Mexico	10.71	10.84	10.89	11.04	11.12	11.29
		(1.52)	(1.50)	(1.47)	(1.46)	(1.45)	(1.43)
16	Argentina	10.37	10.63	11.55	11.34	10.97	11.01
		(1.47)	(1.47)	(1.56)	(1.50)	(1.43)	(1.39)
17	Australia	9.39	9.02	9.10	9.48	9.52	9.54
		(1.33)	(1.25)	(1.23)	(1.25)	(1.24)	(1.20)
18	Canada	8.21	8.24	8.40	8.56	8.39	8.40
		(1.16)	(1.14)	(1.14)	(1.13)	(1.10)	(1.06)
19	Ireland	5.23	5.33	5.54	5.39	5.58	5.82
		(0.74)	(0.74)	(0.75)	(0.71)	(0.73)	(0.74)
20	Romania	5.81	5.06	5.16	4.98	5.02	5.21
		(0.82)	(0.70)	(0.70)	(0.66)	(0.66)	(0.66)
World		706.69	721.47	738.96	756.58	765.06	791.79

Source: FAOSTAT (Downloaded on 8th February 2017)
(Figures in parenthesis show percentage values.)

Figure 3.1 Milk Production across the countries (million tonnes)



3.3 Milk production in India

India is the world's largest milk producer, with more than 18.48 percent of global production, followed by the United States of America (11.8%), China (5.38%), Pakistan (5.08%), and Brazil (4.45%).

Officially, milk production activity in India is regarded as a subsidiary source of income. Almost all authors have unanimous that the milk production activity is mostly carried out by the small and marginal farmers as well as resource-poor landless farmers. As such, the resource-poor farmers hardly have another source of income. However, for most of the resource-poor, it is a primary source of livelihood. On the other hand, except North Eastern hills the milk production activity has been the tradition of Indian sub-continent since time immemorial.

'India's livestock sector is one of the largest in the world. It has 56.7 percent of world's buffaloes, 12.5 percent cattle, 20.4 percent small ruminants, 2.4 percent

camel, 1.4 percent equine[1], 1.5 percent pigs and 3.1 percent poultry. In 2010-11, livestock generated outputs worth ₹ 2075 billion (at 2004-05 prices) which comprised 4 percent of the GDP and 26 percent of the agricultural GDP. The total output worth was higher than the value of food grains.' (GOI, AHD Final Report 2012, 2012).

The AHD working group report also mentions livestock as an important source of livelihood for small and marginal farmers and has been contributing not less than 15 percent of their household income. It is more in the states like Gujarat (24.4%), Haryana (24.2%), Punjab (20.2%), and Bihar (18.7%).

In India, at least 50 percent of the total population is entirely dependent on agriculture and allied sector. The share of agriculture is slowly going down and it is less than 20 percent of the GVA[2] of the nation. In the year 2011-12 the share of Agricultural GVA to total national GVA was 18.5 percent whereas the share comes down to the level of 17.4 percent in the year 2014-15. However, the share of livestock sector is increasing slowly it was 4 percent of total GVA in the year 2011-12 reached the level of 4.4 percent in the year 2014-15.

Table 3.2Share of Agriculture & Allied and Livestock Sector GVA

(At current prices in ₹Crore)

Year	GVA (Total)	GVA(Agriculture& Allied)		GVA(Livestock Sector)	
		Amount	Share (%)	Amount	Share (%)
2011-12	8106656	1501816	18.5	327301	4.0
2012-13	9210023	1680797	18.2	357254	4.1
2013-14	10380813	1902452	18.3	429662	4.1
2014-15	11472409	1995251	17.4	500405	4.4

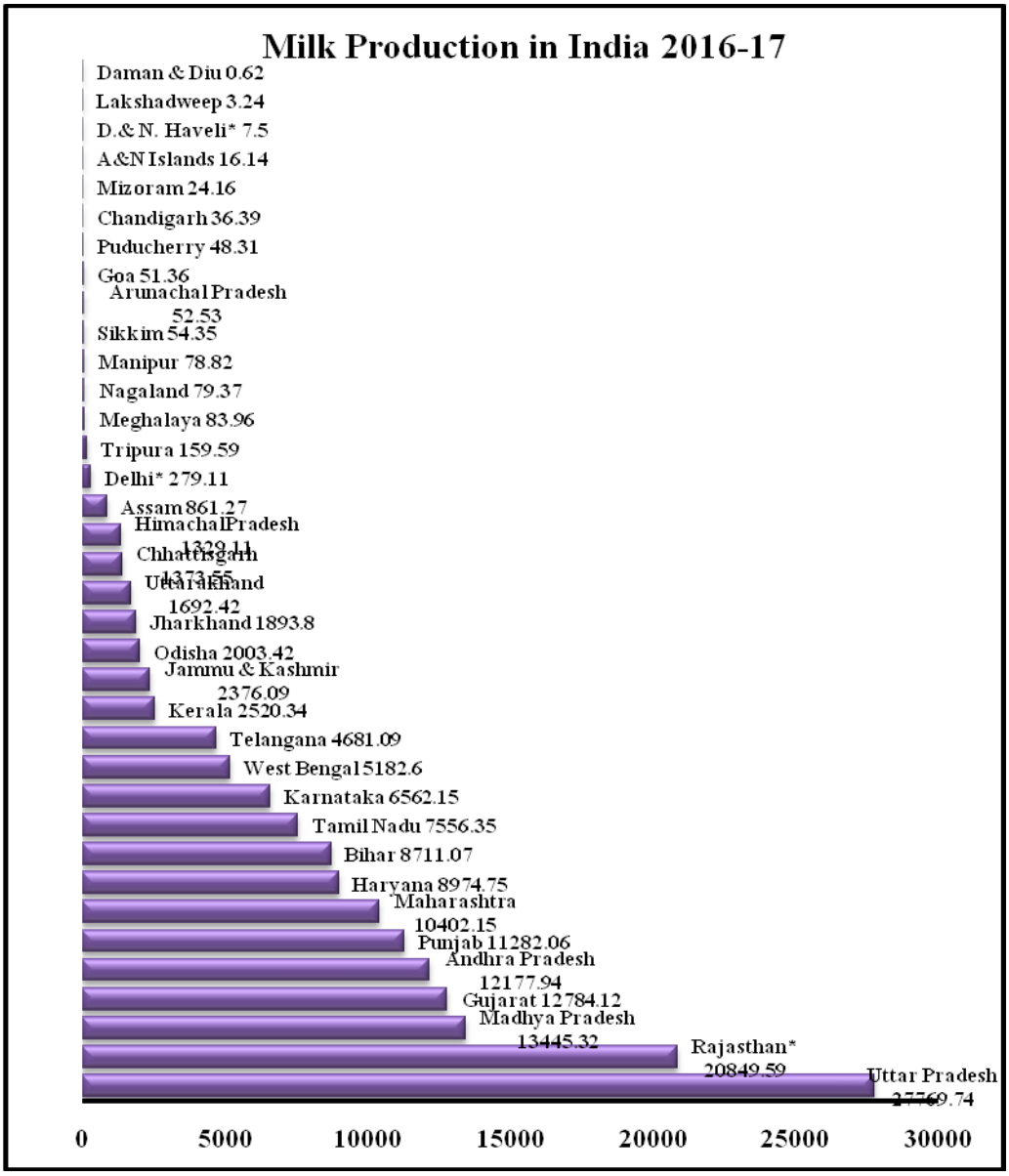
Source: National Accounts Statistics-2016; Central Statistical Organisation; GoI

[1]Horse like animals

[2]Gross Value Added (GVA) = GDP - product taxes + product subsidies

Milk production varies from state to state in India. Uttar Pradesh producing 27769.74 thousand tonnes of milk in the year 2016-17 tops the nation in volume of milk production whereas Punjab tops in availability with 1032 grams per capita. From the point of per capita availability, only nine states have availability more than the national average of 337 grams in the year 2015-16. Among the NER states, Assam records the lowest growth rate of milk production with 1.86 percent, whereas Arunachal Pradesh records highest growth rate with 90.80 percent. In the Indian scenario in terms of growth rate of milk production, Lakshadweep tops the nation with 174.64 percent, and Assam attains the 23rd position. Of course, it is to be noted that higher growth rate of state like Sikkim, Arunachal Pradesh, Lakshadweep *etc.* have less impact on the total supply scenario of the Nation as their volume of output is negligible in comparison to the total volume in the country.

Figure 3.2 State wise milk production in India



3.4 Activities of Milk production in Assam

3.4.1 The advent of professional cattle farming in Assam: the genesis behind

Until the last part of the 18th century, the cattle keeping in social purview were cultural in nature and not attached to the motive of profit or livelihood. It was the advent of British rule in Assam, which generated the demand for milk for supplying to the soldiers. Beforehand, there was no concept of professional dairy

farming in the state. With the advent of British rule, the professional cattle rearing had begun.

It had run without any socio-political complication until the 1940s. It has been evidential that before the "Grow more food" Campaign by the government, Assam was a land abundant state. Peasants in Assam enjoyed traditionally the free right to graze in common village lands and forests. Therefore, the fodder cultivation neither was the habit nor was considered common to agrarian activities' (Guha, 1977). 'It was only in the colonial context, 1817 to be precise, that migrations of the Gorkhas to Assam' had begun as Graziers as well as soldiers in the wake of the Treaty of Segauli (1815-16). With the deployment of the Gorkhas in the Sylhet operations as a part of the Cuttack legion, later known as the Assam Light Infantry (Sinha 1990). 'These soldiers after their retirement from service were encouraged to settle in the foothills, forest fringes, as well as in other strategic points; creating certain compact pockets of Gorkha settlements' (Sinha 1990). This had provided the basis for the rapid professionalism of dairy cattle farming in greater Assam. That led the British India Government to envisage for revenue from cattle farming in the region. The free right of cattle grazing was curtailed during the British regime, through tea plantation and levying Grazing Fees (Guha, 1977) through Assam Land and Revenue Regulation, 1886. The government of Assam had drawn the distinction between 'professional grazing' and 'village grazing'. In 1888 'A grazing fee per head of horned animals was introduced' and set apart the categories of land as Village Grazing Reserve (VGR) & Professional Grazing Reserve (PGR).

In the North East Region, **'**the local tribes do not have a tradition of cattle rearing; and the milk neither was a part of dietary habits nor considered vital as food. Even among indigenous people of the Brahmaputra Valley, cattle rearing were not integral to the farming system and had never given the kind of importance that the villagers of Northern India attach to**'** (Dutta 2011). 'For this very reason, the British encouraged migration of graziers to Assam. They came with their cattle to different parts of the North-east and set up *'khutis'* or small dairy units around urban areas. Large tracts were notified as "professional grazing reserves" and allotted to Gorkha graziers under the Assam Land Revenue

Regulations, 1886 on payment of fees' (Dutta, Rangan, 2017). During the period, Captain Woodforde who ran the Upper Shillong Government cattle farm introduced cross-breeding of local cows with Holstein Friesian bulls in the mid-1930s; which gave birth to a mixed breed of high milk yielding cows that locals of present Assam define as "Shillong" breed. (Dutta 2011). The breed had attracted more graziers to settle down in the region. The progeny was known as *Belaaite* by the peri-urban farmers of Shillong and were reared around the peri-urban areas in the stall feed system.

In the context, the then government encouraged Gorkhas in and out of the state for professional grazing beside their job as soldiers, so that revenue collection could be raised and soldiers could be facilitated with the supply of milk. In 1888, the grazing fee was 8 *annas* per annum per head of buffaloes and 4 *annas* per head of cows' (Nath, Lopita, 2006). For the purpose of increasing revenue, in the early 19th century, the provincial British Government and later the local administrations continuously encouraged the graziers to immigrate to this region of the country. In this regard, Amina Passah (2003) in her article, Gorkha's in Meghalaya: Diaspora and Identity, observed that 'the immigration of these graziers is, encouraged by the Syiems (chiefs) who levy a grazing tax on immigrants- a tax which they cannot levy on their own subjects and the immigration of Gorkha graziers is thus a source of considerable profit to them'. The Syiemships of Mylliem, Khyriem and Nongkhlaw entrusted with the power to collect Grazing fees, Housing fees (Dohory Khajna), and cultivation tax since British period and perpetuated even after independence (Upadhaya, Bishnu Prasad, 2017). Later most of that farmer shifted to the peri-urban areas of Guwahati city forming catchment of procurement of milk for Town Milk Supply Scheme, Guwahati. In this regard, Jugal Saikia found 92.3 percent of the farmer migrated from Meghalaya since 1971-72 in his study 'Economics of Informal Milk Producing Units in Guwahati City' (Saikia, 2009).

3.4.2 PGR and VGR and fate of Graziers

The discussion of milk production in Assam remains incomplete if we skip the discussion on erstwhile Grazing reserves and professional graziers. The numbers of cattle harder were large in Assam during the British period. Therefore,

the provincial Government envisaged for government revenue out of those graziers. At the initial stage, the government had divided the part of the open forest and uncultivated wasteland as Village Grazing Ground (VGG)/VGR and PGR and brought under the purview of grazing tax. The graziers were levied Grazing Fees on both the categories of Grazing land 'until the Government notification No. 2001-R dated 23 June 1937' (Chhetry, D B, 2009), thereafter, only on PGRs.

3.4.2.1 Graziers in old Darrang District

The old district of Darrang was home to the largest number of herdsmen since the middle of the nineteenth century. The present Silabandha, Borbhogia, Murhadal and Nagshankar Mauzas, as well as Hetou Chapari, Bhetamara, Choulkhowa Chapari, Balimari, Chiring Chapari, Lengrimara, Bangalputa and Dakhin Chapari were a grazing reserve. In that reserve, the considerable concentration of graziers was there earning a livelihood. (Chhetry, D B, 2009).

Later, unable to withstand the onslaught of the encroachers, the graziers ultimately disposed of their animals and shifted to safer destinations such as Udalguri, Rowta, Orang, Habigaon, Majbat, *etc*. Today, there are no graziers left at these locations where only four to five decades back, they held sway. **Invalid source specified.**

3.4.2.2 Kaziranga and Professional Graziers

A sizeable number amongst professional graziers were believed to have been in Kaziranga since 1880 or before. In those days, demand for milk being negligible, the only option left was to convert it into curd or ghee and explore linkages for marketing the product. They paid grazing tax and obtained in return unshackled grazing right over an extensive area. This was, indeed, an idyllic situation for the graziers. However, it did not last long. 'A proposal to declare Kaziranga a reserved forest was initiated during 1903-1904' (Chhetry, D B, 2009) and 'finally an area measuring 57,263.60 acres was declared a reserved forest on 3 January 1908' (Prakash, 2007). Later, more areas were added in 1913 and 1917. The graziers, who paid grazing fees, entailed considerable deliberation and delay of the evacuation order, the Chief Commissioner ultimately decided in favour of

constituting the reserved forest. Then in 1920, the Government ordered the graziers to vacate the reserve within twenty-four hours, and the forest officials burnt down their huts and drove them away (Guha, 1977; Bhandari, 1996).

3.4.2.3 Burachapori: A Home to Professional Graziers

An important and in a way, a much sought-after destination of Professional grazier was Burachapari, the second largest river - island in Assam next to Majuli, lying to the south of Tezpur town. 'Settlement of graziers was believed to had commenced at Burachapari around 1870 (Ghimire, 1983). As per records in the office of the Deputy Commissioner, Sonitpur, Burachapori PGR was constituted vide Government notification No 3129R, dated 31-10-1916 (Ghimire, 1983).

On the basis of settlement and production of Burachapori, the Tezpur Graziers' Association was set up in 1933 and later renamed as the Assam Graziers' Association with Chhabilal Upadhyaya as Chairman (Bhandari, 1996). The establishment of the Graziers' Co-operative Dairy on 7th February 1955at Tezpur was another significant event in the history of Dairying and milk business revolving around Burachapari (Ghimire, 1983).

Burachapori PGR has witnessed many ups and downs during its nearly nine-decade-old eventful existence. Encroachments had begun in Burachapori since the early thirties of the 20th century when landless people from East Bengal started to make their presence felt. During 1933-1941, large-scale encroachment hit Burachapori. 'Lambodar Kalita and Prasad Singh Subba organised a meeting at Tezpur to work out strategies, and they adopted a resolution for the eviction of encroachers but to no avail.' (Bhandari,1996).

'Government ended the Professional Grazing Reserve status of Burachapari on 10.09.1975 when it was declared a forest reserve with 4406.25 hectares of land' (Ghimire, 1983). Of course, here the graziers were allowed to continue where they were and carry on their trade as before, subject to the observance of specific conditions and payment of grazing tax to the Forest Department, which was Rs.6.00 per buffalo and Rs.3.00 per cow per annum. In 1988, the Government

decided to include Burachapari within the Laokhowa Wildlife Sanctuary without any rehabilitation. (Chhetry, D B, 2009)[3]

3.4.2.4 Barpeta PGRs

As in Sonitpur, large numbers of cattle-breeders were in the erstwhile Barpeta subdivision (now district) of the old Kamrup district since before Professional Grazing Reserves were constituted there. There was wide open grazing space extending from the railway track near Barpeta Road town in the south, up to the Bhutan border to the north and from Mandia to the far west up to the foothills of Baghbor. Population being minimal, there was no pressure on land.

Barapeta PGR was constituted on 02.11.1920 by curving out 13,892 *bighas* from two non-cadastral (NC) villages, Barapeta and Khudnabari.[4] 'Where, the share of "Barapeta NC" was 10,497 *bighas*.' (Chhetry, D B, 2009). 'Like Burachapari, Barapeta PGR with enough grassland and the bank of river Beki attracted a considerable number of cattle breeders.' During the period, upcoming urban growth centres at Sorbhog and Athiabari held out the promise of adequate scope for marketing of milk-products'.

Barapeta PGR also could not ward off the general climate of the encroachment of grazing reserves pervading throughout the province. Evictions were carried out, but the Grazing Reserve was never free from encroachment. 'The dereservation process started in 1962 when the Government ordered for taking out 6,000 *bighas* from the PGR vides order no. RSG 150/ 55/ 76/ 107 dated 22.2.1962,[5] for settlement of landless people (Chhetry, D B, 2009). With the dereservation of PGRs, the sway of grazier reduced to the minimum.

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[3] Cited from '*Grazing Reserves and Nepali Graziers in Assam',* by D B Chhetry (2009) i*n 'History and Culture of Assamese Nepali',* Guwahati, Assam: Department of Historical Antiquarian Studies, Government of Assam. Where he mentions that, the information was collected from Mr. J B Hagjer, IAS, Secretary, Department of Forest, Govt. of Assam. In 2001, he interviewed Late Somnath Ghimire, Chandmari, Tezpur, Distt. Sonitpur. This researcher also had a discussion with Somnath Ghimire in October 2009.

[4] (Chhetry, D B, 2009) found from Entries in Grazing Register in the office of Deputy Commissioner, Barpeta District.

[5] D B Chhetry stated that as entries in Grazing Register, maintained by Deputy Commissioner, Barpeta District (Chhetry, D B, 2009).

3.4.2.5 Govindapur PGR

'Govindapur PGR was created in the present district of Barpeta on 23.9.1922 out of the land of Konora and Mandia NC areas comprising 20,872 *bighas*. It was extended to the foothills of Baghbor. All graziers of Barpeta, who owned buffaloes, used to shift their *Bathan* to Govindapur during winter for abundant varieties of forage, suitable for buffaloes in its low lying areas. This PGR also had to face the pressure of encroachments and ultimately dereserved in the year 1963. (Chhetry, D B, 2009)

3.4.2.6 Laothowa PGR

Laothowa (Bhagnamari) PGR was present across the mighty Brahmaputra to the South of the present Mukalmuwa Bazaar in Nalbari district. This area also faced large-scale encroachment, ultimately leading to dereservation and consequent exit of Grazier. (Chhetry, D B, 2009)

3.4.2.7 Encroachment and De-reservation: the fate of grazing reserves

Encroachment of grazing lands in Assam is an old story dating back to much before 1947. It would perhaps be pertinent to note that in an unprecedented move of interference in the affairs of a neighbouring province 'the Bengal Legislative Council adopted a motion on 16th July 1943 calling upon the Government of India to take immediate steps to remove all restrictions by the Assam Government on the immigrant cultivators from Bengal. Exactly a year after its formation, the fourth Saadulla Ministry, therefore, adopted a new resolution on a land settlement under the slogan of "grow more food." The features of this resolution of 24 August 1943 clearly states that 'dereservation of select grazing reserves of Nowgong, Kamrup and Darrang for the purpose of distribution of lands in proportion to needs of different communities' and 'opening up of surplus reserves in all the submontane areas, and in Sibsagar and Lakhimpur, for settlement of landless'. Such policies chronologically opened the way for cultivators from the erstwhile East Bengal and began to cross over to Assam in large numbers since the early nineteen-twenties. They not only filled up the riverine area of Brahmaputra valley but also gradually filled PGRs in the

vicinity. The policy of coalition government by their Resolution of November 5, 1939, for evicting all encroachers from PGRs and VGRs was reverted by the Saadulla Ministry with the introduction by a resolution on June 21, 1940, what is known as 'Development Scheme' (Guha, 1977).

Thus, the conclusion can be drawn that both prior to and after the partition of the country, the absence of a well calibrated, coherent approach in regard to PGRs and VGRs is noticeable in the various policy decisions of the Governments. 'That perhaps explains why the Estimates Committee of the Assam Legislative Assembly, 1960-61, under the Chairmanship of Siddhinath Sarma, which went into the whole gamut of encroachment, reported that during 1960 alone, there were as many as 14,023 cases of encroachment in PGRs and VGRs (Sarma, 1960-61) and in the year 1981 suggested that 'Unless a strict supervision is kept over the PGRs and Village Grazing Grounds, in no time would these lands be encroached upon and no Professional Grazing Reserve and Village Grazing Grounds left.' (Sarma, 1960-61).

Twenty years after the Sarma report, the Land Reforms Commission has again observed, 'owing to lack of vigilance on the part of land records staff, the Professional Grazing Reserves and the Village Grazing Reserves have become a merry ground for encroachment which has resulted in the further curtailment of their areas. It is time that the Government to take firm measures to evict the encroachers from the Village Grazing Reserves and Professional Grazing Reserves.' (Govt.of Assam, 1981)But the problem of encroachment did not stop.

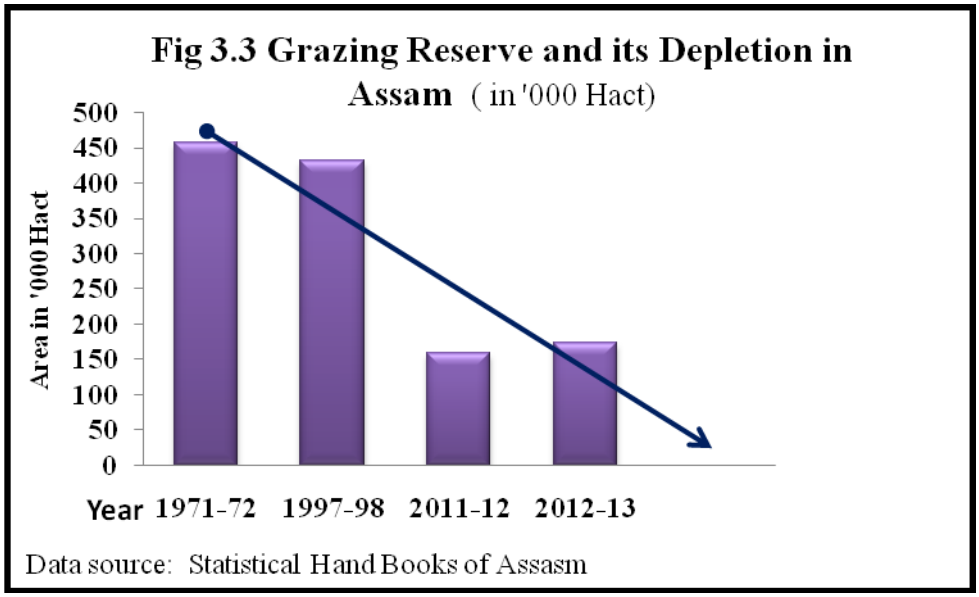
Table 3.3 Grazing Land in Assam

Year	Area in '000hectares
1971-72	456.900
1997-98	432.883
2011-12	159.668
2012-13	173.367

Source: Statistical Handbook of Assam, 2015

The grazing had decreased from 456.900 thousand hectares in 1971-72 to 173.367 hectare in 2012-13.

Figure 3.3 Grazing Reserve and its Depletion in Assam



The figure (3.3) clearly depicts that with the time the grazing land has been depleting in Assam. With the depletion of such land the natural facilities for cattle ranching, grazing or farming has been going down. Due to the non-availability of profitable farming facilities in official grazing reserves of Piedmont or submontane as well as wasteland or *Char* areas has pushed the dairy farmers towards the peri-urban areas; compelling them to keep up the farming as at present. The process of depletion in Grazing ground is almost continued till date.

3.4.3 Support Services for dairy farming- Government veterinary facilities and finance

In Assam, attention to enhancing the support services for dairy cattle farming had been paid since British rule. 'The Veterinary Department was created in 1905 for East Bengal and Assam. The Assam portion was looked after by a Veterinary Inspector located at Jorhat' (Bujarbaruah, 2011). In the same year, the first Veterinary Dispensary was established at Chenikuthi, Guwahati (Government of Assam,2017). However, the creation of the post of Deputy Director Agriculture (Live-stock) on 1st April 1934 in Assam by converting the former post of 'Live-stock, and Dairy Expert' could be termed as the first formal

initiation for the generation of modernised support services through departmental effort for dairying and milk production after the allotment of VGR and PGR by Assam Land Revenue Act 1886. During the 1930s 'a centre was started near Palasbari in the Kamrup District and a post of Agricultural Inspector (Live-stock) was sanctioned for the Surma Valley'. 'At the Khanapara and Sylhet Farms, herds of local cattle were graded up by the use of Sindhi bulls and herds of pure Sindhi cattle were maintained to provide acclimatized Sindhi bulls. In these farms, small herds of buffaloes were also graded up by Hurrah (Punjab) bulls'. 'At the Jorhat Farm, a herd of Grey Behari and Maurangia cattle was graded up by the use of selected bulls. The Khanapara and Sylhet Farms and the cattle section of the Jorhat Farm were carried on purely for breeding and experimental purposes, and the general breeding plan. 'The attempt to keep a herd of Sindhi at Upper Shillong was abandoned at the end of the year' 1935 and the breeding of Friesian cattle had been introduced, and excellent results were obtained, which is the first generation of Friesian cattle in the Northeast region. (Provincial Government, 1936). Thus, the support service for higher productivity was initiated during the British period. 'This department was divided into two zones. Jorhat was considered as upper Assam Circle and Guwahati as Lower Assam Circle. Till 1940, it was headed by the Veterinary Inspector[6]'. Even after independence, the department had run with the earlier set up having 'Veterinary Assistant Surgeons and Supervisory Field Assistants used to work in the dispensaries under the Veterinary Inspector'. The present setup of Animal Husbandry and Veterinary Department, Assam came into effect in the year 1950. 'To strengthen cattle breeding operations, the department had launched the Key Village Scheme in 1952-53 for cattle development and introduced for the first time artificial insemination in cattle' and 'the use of Frozen Semen Technology in cattle breeding was introduced in 1976'. (Bujarbaruah, 2011). Later several frozen semen centres and ten numbers of Intensive Cattle Development Project(ICDP) were established along with merging the Key Village Schemes into ICDP in different places of the state during the period of 1967-1980.

[6]Our History | Directorate Of Ah & Veterinary | Government ... (n.d.). Retrieved from https://veterinary.assam.gov.in/about-us/our-history-2

3.4.4 The present scenario of veterinary facilities in Assam

In Assam until February 1982, Animal Husbandry & Veterinary Department had the sole authority not only in animal husbandry but also dairy, poultry, and other all-round technicalities thereof. The responsibility of dairy development had been carried out by the Directorate of Animal Husbandry & Veterinary Department of Assam. Considering the importance of all the developmental activities of Dairy in the state, the decision for a separate Directorate of Dairy Development was taken in the year 1982. However, this had been executed in the year 1990 and subsequently; the Government notified it as a permanent department in 2004. On the other side, Assam Livestock Development Agency (ALDA) started functioning in the state from the year 2004, and Assam Livestock and Poultry Corporation (ALPCo) a Public Sector Undertaking of Government of Assam was incorporated as a Company registered under Companies Act, 1956 *vide* Registration No.2135 of 1983-84. As such, the Government of Assam is rendering support services dividing the department into four types of institutional categories as follows:

a. Directorate of Animal Husbandry & Veterinary
b. Directorate of Dairy Development
c. Assam Livestock Development Agency (ALDA)
d. Assam Livestock and Poultry Corporation Ltd (ALPCo)

3.4.4.1 Directorate of Animal Husbandry & Veterinary

The AH & Vety. Department has for the better functioning, adopted eight numbers of objectives as their vision. The following section is devoted to those objectives and vision.

3.4.4.2 Objectives and vision

The objectives of AH and Vety. Department, as stated on their website[7], are as follows:

1. To improve training of Veterinary doctors as well as Para-Vets
2. To improve veterinary research in the state

[7] What We Do | Directorate Of AH& Veterinary | Government ... (n.d.). Retrieved from https://veterinary.assam.gov.in/about-us/what-we-do-2

3. To reduce disease occurrence and mortality of livestock and birds through timely preventive and curative measures.
4. To increase crossbred livestock population through induction and upgradation programme
5. To establish and popularise the backyard farming of poultry and other birds
6. To popularise small ruminants and piggery farming
7. To educate farmers on various aspects of livestock management, including fodder cultivation
8. To render extension services in order to provide self-employment opportunities amongst unemployed youths and underprivileged of the state

For the realisation of the above mentioned objectives, the department has limited veterinary facilities for the farmers in Assam. Table 3.4 shows that there is a total of 1236 centers to look after the animal health of the state. In Hospitals, Dispensaries, Regional Artificial Insemination Centres (RAIC) one or two veterinary doctors are available. Sub-centres, first aid centres and other centres except for Rinderpest (R.P.) Check post, and Bovine Contagious Pleuropneumonia (BCCP) Check post, services have been rendered by Veterinary Field Assistants and non-salaried Gopal Mitras (GMs). However, the total livestock as per Livestock Census, 2012 is 19080304, *i.e.*, approximately 15500 populations are to be facilitated by each unit of the facility.

Table 3.4 Veterinary facilities in Assam

Facilities	Number
Hospitals	22
Dispensaries	337
Sub-Centre/ First Aid Centre/SMC	684
Block Veterinary Dispensaries	99
Key Village Centre	30
Regional Artificial Insemination Centre	31
R.P. Check post	20
BCPP Check post	13
Total	1236

Source: Statistical Handbook of Assam, 2015

3.4.4.3 Assam Livestock Development Agency (ALDA)

The Assam Livestock Development Agency takes care of the Artificial Insemination of animals in the state. ALDA collects and distributes frozen semen for the progeny development of cattle herd of the state. For the purpose at present, there are 24 semen producing bulls having Sire Dam's best lactation yield ranging from 3006 to 11407 kg per lactation at Barapeta farm. Among them, 7 nos. of bulls are of Holstein Friesian (HF) breed, and the rest comprises of Jersey and other Indian indigenous crossbreeds. The semen produced at Barapeta Frozen Semen Bull Station is transported to the Central Frozen Semen Bank at Khanapara, Guwahati and thereafter transported to the 15 Frozen Semen Banks (FSBs) situated at different locations in the state district wise. Table 3.5 shows the district wise distribution of frozen semen in Assam. Thus it is evident that in Assam the initiative for the dam development from the part of the Government is noteworthy, however, not sufficient at per cattle population.

Table 3.5Frozen Semen Bank (FSB) Area covered by Districts

Sl. No.	Frozen Semen Bank	Area Covered
1	Khanapara	Kamrup District(Rural & Metro)
2	Umrangso	Dima Hasao
3	Nagaon	Nagaon and Morigaon
4	Manja	Karbi Anglong
5	Tezpur	Sonitpur
6	Mongaldoi	Darrang and Udalguri
7	North Lakhimpur	Lakhimpur and Dhemaji
8	Howly	Barpeta and Nalbari
9	Abhayapuri	Bongaigaon and Dhubri
10	Balijana	Goalpara district and South Salmara
11	Kokrajhar	Kokrajhar,Chirang and Baksa
12	Jorhat	Jorhat and Golaghat
13	Demow	Sivasagar
14	Tinsukia	Tinsukia and Dibrugarh
15	Silchar	Karimganj and Hailakandi

Source: Department of Animal Husbandry and Veterinary, Assam

ALDA can develop the progeny to the level of farmer's satisfaction by enhancing productivity, one of the ways for bringing down the cost of production of milk.

3.4.4.4 Assam Livestock and Poultry Corporation Ltd

The Assam Livestock And Poultry Corporation (ALPCo) Ltd was incorporated on 06 February 1984 with the objectives[8]:

1. Processing and marketing of livestock and poultry products through different outlets.
2. Employment generation through the adoption of modern climate-resilient animal husbandry practices.

The impact of ALPCo found less active in dairy sector; possibly, it has limited scope to serve the sector. The corporation is active enough in poultry and piggery, with its feed product chicks marketing.

3.4.5 Role of financial institutions in milk production

Morigaon District has twenty nos. of bank fourteen numbers of public sector banks, four private and one each regional rural and cooperative banks. The United Bank of India is the lead bank of the district. Jagiroad Branch of State Bank of India is the most reputed bank branch in our study area.

Table 3.6 Banking facilities in Morigaon District

Category	Bank Nos.	Branches	CSP(Consumer Service Point)
Public sector	14	29	137
Private	4	7	1
Regional rural Bank	1	13	47
Cooperative bank	1	2	0
Total	20	51	185

Source: Primary data

Financial institutions, particularly the commercial banks run with the profit motive. They generally look at the rate of return in the business. The dairy

[8]Assam Livestock and Poultry Corporation (ALPCo) Animal ... (n.d.). Retrieved from https://animalhusbandry.assam.gov.in/about-us/detail/assam-livestock-and-poultry

business, is already observed form our sampling that the rate of return in the current business is around 14 percent only. On the other hand, the sampling data of our study area shows that till date no damage claim has been accepted by any of the insurance companies. As such without having under signature by the financially reliable institution or organisation or Government offices, no banks are found to be ready to extend financial support to the dairy farming. Banks are ready to provide a loan to the dairy farmer when their Estimated Monthly Installments are assured, or subsidy amount from the part of the government is assured. We have observed that 1200 farmers under SJDUSS have availed loan from numbers of bank branches at Jagiroad. Among the beneficiaries, 60 percent availed loan for cattle farming and others have availed loan for piggeries and other farming. During discussions with the bank officials, it was revealed that the CIBIL (Credit Information Bureau of India Limited) score of the farmers availing loan facilities hasn't been up to the mark, with the exception of SJDUSS farmers. This shows that farmers need a cooperative type of organisation for securing help from financial institutions. We have interacted with numbers of farmers associated with cooperative and found that they just had filled the application form for the required financial support and got their loan amount up to Rupees five lakhs transferred to their account without providing any collateral security. Cooperative also holds workshops for disseminating knowledge about dealing with banks. Thus, it is found that the farmer members of cooperatives have an easy excess of financial support.

3.5 The Milch animal scenario in Assam

According to the 19th Livestock Census out of the total 19.08 Million cattle, the total number of animals in milk in the state was 3135112 out of which 1136444 of goats were there producing milk. In the year2012-13, approximately 18.68 million litres of milk was produced in the state by goats, as per report provided by AH & Veterinary Department, Assam. The number of cross breed cows, buffalo and indigenous cows were 112148, 83368 and 1803152 respectively (Table 3.7).

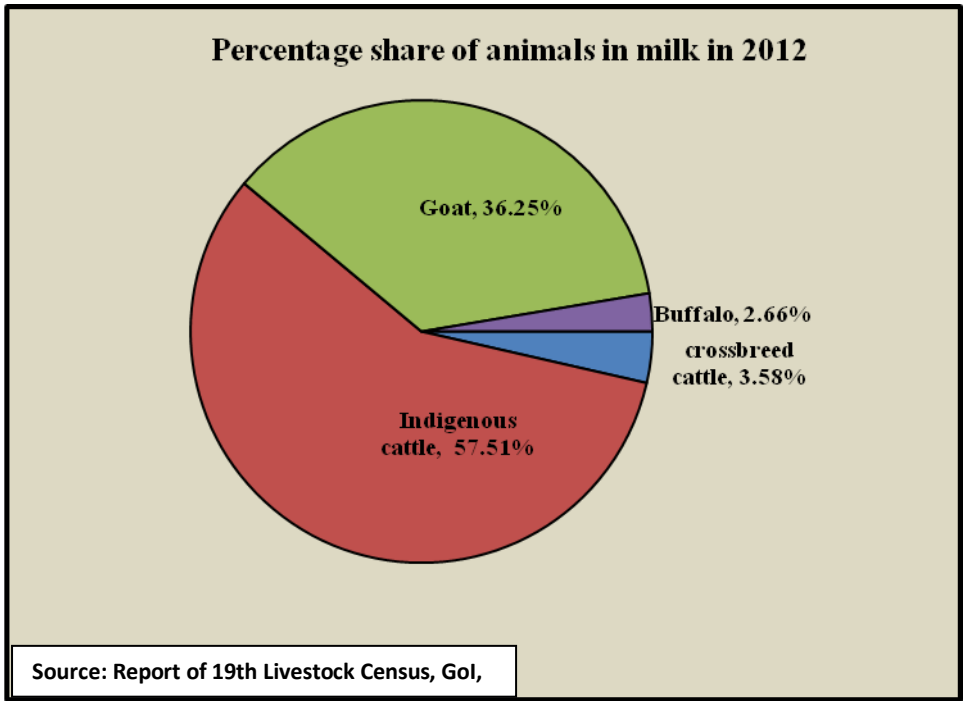
Table 3.7 In-milk animals in Assam, 19th Livestock Census, 2012

Animal Category	Numbers of in-milk animal	Share(% to total)
Crossbreed Cattle	112148	3.58
Indigenous Cattle	1803152	57.51
Buffalo	83368	2.66
Goat	1136444	36.25
Total	3135112	100.00

Source: Animal Husbandry Statistics Division, GOI

Table 3.7 & Figure 3.4 shows the percentage share of a number of animals in milk for three major species cattle, buffalo and goat. Indigenous cattle top the ratio with 57.51 percent, crossbreed cattle and buffalo share the milch animal population of 3.58 percent and 2.66 percent. The Census report shows the share of goat in milk animal was 36.25 percent.

Figure 3.4 percentage share of animals in milk in 2012



The trend of variation in the population of livestock with the possibility of milk shows that except goat the male population comes down in the state. Among the animals the male population of cross breed cattle had decreased by (-) 37.43

percent, followed by buffaloes (-) 22.17 percent and indigenous cattle (-) 10.96 percent. However, the male population of goat increased by 59.34 percent in between 18th (2007) and 19th (2012) Livestock Census. Except for a decrease in the female population of Buffalo, by (-) 5.65 percent female populations of all other species were registered positive growth. The numbers of females of crossbreed cattle had shown the growth rate of 10.8 percent, the female population of indigenous cattle and goat registered the growth by 16.34 percent and 32.77 percent respectively. Therefore, an increase in the total production of milk is registered. Table 3.8 and chart 3.5 clearly depicts all the facts.

Table 3.8 Livestock with milk possibility in Assam 2003 to 2012('000)

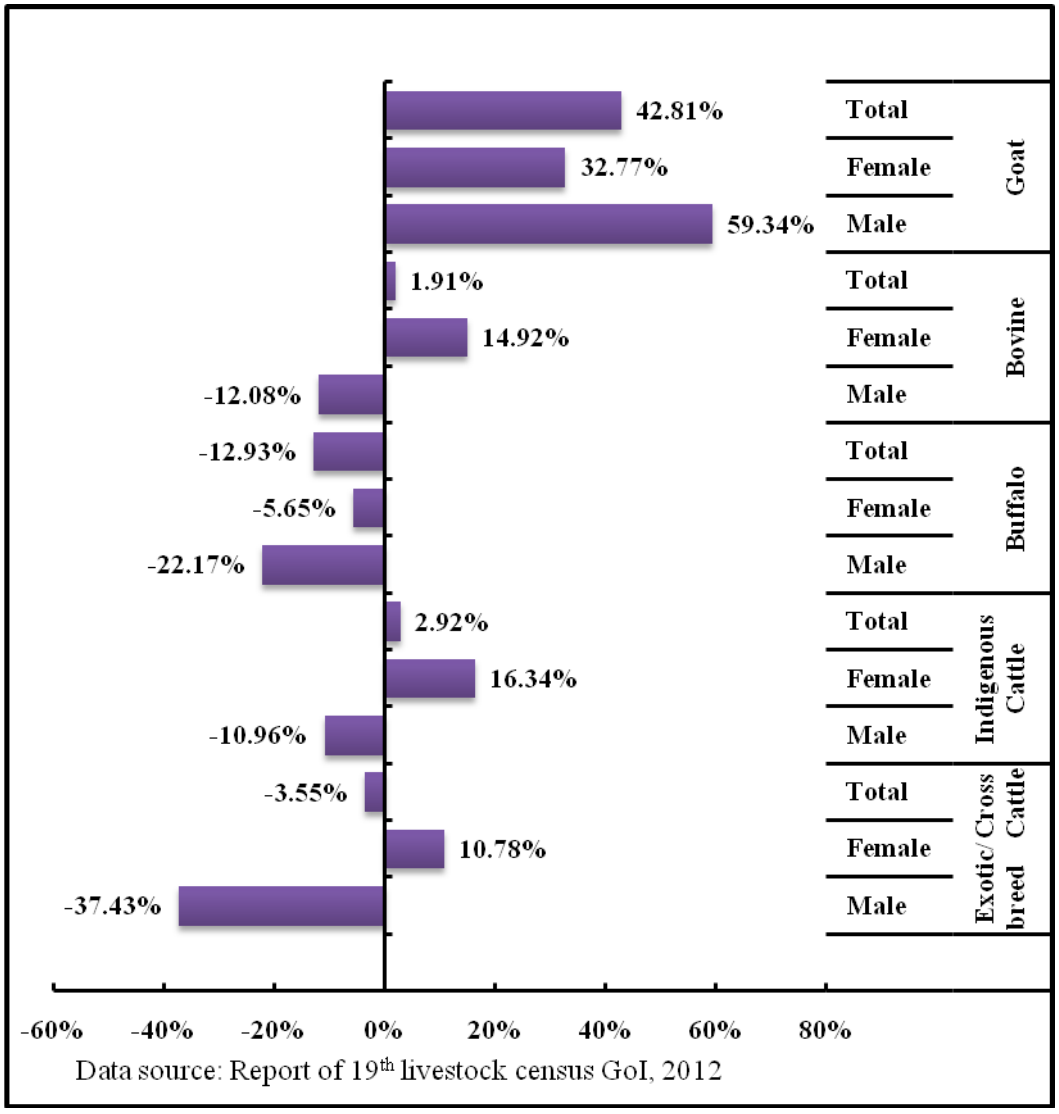
Category	Male/Female/Total	2003	2007	2012	%change from 2007 to 2012
Exotic/ Crossbreed Cattle	Male	122	122	76.33	-37.43
	Female	318	288.48	319.57	10.78
	Total	440	410.48	395.9	-3.55
Indigenous Cattle	Male	3878	4735.3	4216.41	-10.96
	Female	4122	4895.5	5695.39	16.34
	Total	8000	9630.8	9911.8	2.92
Buffalo	Male	307	220.26	171.42	-22.17
	Female	370	279.65	263.85	-5.65
	Total	677	499.91	435.27	-12.93
Bovine	Male	4307	5077.56	4464.16	-12.08
	Female	4810	5463.63	6278.81	14.92
	Total	9117	10541.19	10742.97	1.91
Total Goat	Male	1211	1632	2601	59.34
	Female	1776	2688	3568	32.77
	Total	2987	4320	6169	42.80

Source: Report of 19th Livestock Census

The efforts made for modernisation in the field of agriculture also have an impact on the male population of cattle in the state. The modernisation trend has reduced the use of cattle as draught power, leading a fall in market value. The farmers take insufficient care to the newborn male calf. This attributes to the higher mortality rate of the male calf and a rise in the number of female cattle in

general and in the case of cross breed cattle in particular. On the other hand, in search of employment opportunity, many young, educated unemployed at the fringe of urban and peri-urban areas have been taking up dairying as their opportunity. The entrance of educated segments of the population in dairying and different workshops, sensitising curricula by the department and different Non-Government Organisations (NGO) for farmers also had an impact on the total production in the state. Therefore, in spite of the total negative growth rate of crossbreed cattle by 3.55 percent the aggregate milk production has been increasing slowly.

Figure 3.5 Variation in the population of Cattle, Buffalo and total Bovine in Assam (From 2007 to 2012)



3.5.1 Milk Production in Assam

The milk production in Assam is growing very slowly. The production of milk was 750202013 litre in the year 2001-02, reached the level of 888146889 and 906315804litres in the year 2015-16 and 2016-17 respectively. In the last five years, the production is on an increasing trend. The compounded average growth rate of milk production in Assam is found to be around 1.18 percent in an average. The annual growth rate was highest at 3.07 percent in the year 2002-03 after that better growth rate was reckoned in 2016-17 by 2.05.

Table 3.9 Milk Production in Assam, since 2001-02

Year	Milk production (litres)	Annual Growth rate(%)
2001-02	750202013	--
2002-03	773201599	3.07
2003-04	795583946	2.89
2004-05	812082169	2.07
2005-06	821628173	1.17
2006-07	822722251	0.13
2007-08	824396346	0.20
2008-09	827011834	0.32
2009-10	829862664	0.34
2010-11	832720776	0.34
2011-12	838375290	0.68
2012-13	844895377	0.78
2013-14	857285203	1.47
2014-15	872992133	1.83
2015-16	888146889	1.74
2016-17	906315804	2.05
Compound Annual Growth Rate (CAGR)		1.18

Sources: Animal Husbandry &Veterinary Department, Assam; NDDB

3.5.2 Milk Production in Morigaon District

In the district of Morigaon, cattle rearing are cultural. Milk production was prevalent and had been practiced since long. Until 1936, the bridges over the river Killing, Kopili and other tributaries and *beels*[9] were not constructed and the link

[9]Words commonly used for marshy land

to Guwahati and Nagaon town was not developed. There were no such facilities for carrying milk for business purposes. After having the facilities for transportation, some cattle farmer begun settling their grazing with the basic facility of PGRs of the Khasi Jaintia hills and its piedmont stretched northward. On the 15th March 1835 formal possession of Jaintiapur was taken off by British, and in April the plains territory of the district of Gobha was similarly annexed to Nowgong[10] in Assam **Invalid source specified.**. Subsequently, the area of Gobha, with concentrated cattle culture transferred to the present district of Morigaon in British regime from Jaintiapur.

Table 3.10 Milk Production in Morigaon District from 2001-02 to 2015-16

Year	Production (litres)	Annual growth rate(%)
2001-02	23243718	
2002-03	19071355	-17.95
2003-04	19384465	1.64
2004-05	18019528	-7.04
2005-06	20702183	14.89
2006-07	21846330	5.53
2007-08	22107284	1.19
2008-09	24905736	12.66
2009-10	25044937	0.56
2010-11	26893200	7.37
2011-12	24196900	-10.03
2012-13	28954637	19.66
2013-14	26256624	-9.32
2014-15	29100227	10.83
2015-16	27679583	-4.88
Compounded Annual Growth rate (CAGR)		1.17

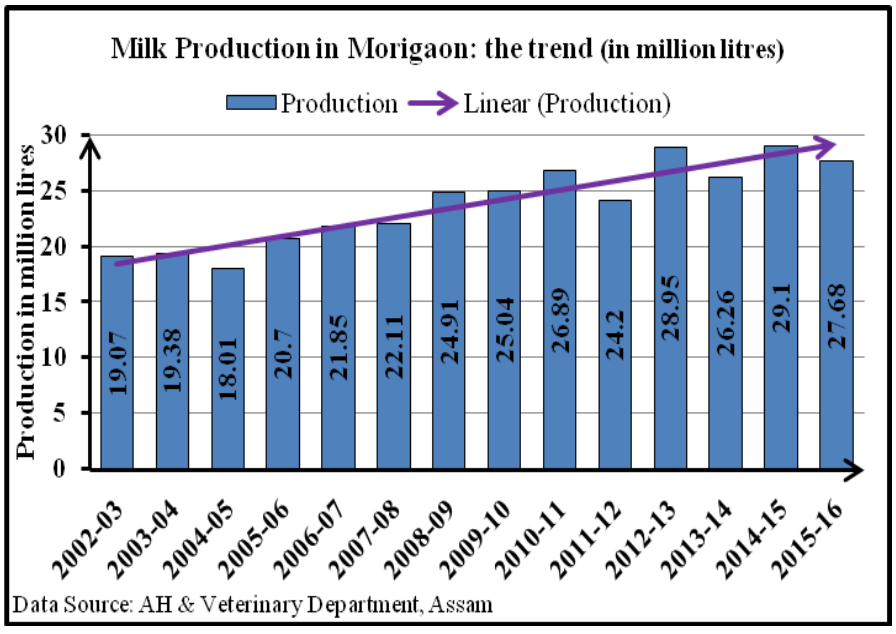
Source: Animal Husbandry & Veterinary Department, Assam

Cattle culture practically begun in hilly terrain with the initiation of Grazing permit system had slowly transited and flourished in the area since 1936 with the beginning of road link to Guwahati and Nagaon. Of course, earlier around the bank of Brahmaputra, the Bhuragaon area had been dominating the

[10]Present Nagaon District was spelt as Nowgong earlier.

production and doing the business of Ghee and *Mawa* only, through the water route to Guwahati and other places. At present, it is not possible to gather the evidence of such activities as the villages with significant cattle production was completely washed away by the great flood, the aftermath of the great quake of 1950 in Assam. After the 1950s, the supremacy of milk production activity in Morigaon district had been shifted to the piedmont areas of Mayong block comprising the areas of Amlighat, Nellie, Jagi Bhakatgaon *etc.* The milk production in Morigaon District was 232243718 litres had reached its lowest to the level of 18019528 litres in the year 2004-05, and after it, the production picked up slowly and reached 29100227litres in the year 2014-15. The production in the year2015-16 reckoned 27679583 litres with a negative growth rate of 4.88 percent. The Compounded annual growth rate (CAGR) found to be 1.17 percent during the period of 2001-02 to 2015-16.

Figure 3.6 Milk Production in Morigaon: the trend



3.6 Milk production in the study area: Income, Employment and Living standard of dairy farmers of the study area.

3.6.1 The income from dairy farming

The income from dairy cattle farming is dependent firstly on milk production and secondly on the business of milk and cattle. The use of milk and cattle is dependent upon the conventionalities and socio-cultural behaviour of society. Further, the level of living standard and employment depends upon income. So long as the level of income from any business inclusive of its nominal and real income remains sufficient to maintain livelihood and living standard the employment remains secured. The income level is always dependent upon the number of cattle, their productivity and production.

The survey data of 171 sampled household show that a total number of cattle were 2456 out of that 2003 were female cattle and only 1042 are found milch cattle. The percentages of milch cattle to total cattle and to total female cattle were 81.56 percent and 42.43 percent respectively. However, the ratio of milch cattle to total female cattle was 0.52. (Table 3.11)

Table 3.11Productivity of cattle of sample households

Category	Unit
Number of total cattle	2456
Number of female cattle	2003 (81.56)
Number of milch cattle	1042 (42.43)
Ratio of milch cattle to female cattle	0.52
Total milk production (LPD)	7727.5
Productivity per milch cattle (LPD)	7.42

Source: Survey Data, LPD- Litres Per Day. (Figures in parenthesis show percent to total)

In the income generation from cattle farming, milk production and productivity of cattle play an important role. The total milk production of sample

households was 7727.5 litres per day (LPD); the annual production was 2820537.5 litres. The average productivity was 7.42 LPD per cattle (Table 3.11). However, the cost of production affects the benefit from production and productivity.

In Mayong Block and in Morigaon, the cost condition faced by the farmers of the cooperative under our study, other cooperatives or any individual farmers were identical. It is because all have to purchase the input material from the same market and at the same price and have to pay the same level of wage. Therefore, the production condition faced by the farmers associated and not associated with cooperatives were the same. Further, the abundance of resources for farming and the environment has an impact on its cost of production. In our study area, the cost fully depends on the cost of feed, green fodder, dry fodder, labour and cost of contingencies and others. Where, contingencies and others comprise the cost of veterinary care, required utensils and cost of capital *etc.*

From the sample data, it is evident that feed and fodder cost comprises a major share of total cost. The composite of feed and fodder cost amounted to 74.53 percent, in the total cost of ₹ 102,132,671, where the share of feed was 53.43 percent, green fodder 8.45 percent and dry fodder comprised 12.65 percent of total cost. The share of labour and contingencies accounted for 17.83 percent and 7.64 percent respectively. In the study area with the annual cost of ₹102,132,671, milk produced annually is 2820537.5 litres. The average cost of milk production, determined by the cost and output is ₹36.21 (Table 3.12). The noteworthy of the feeding practice was that the farmers keep cattle in the stall-feed system and grass was given without chopping. The system of providing feed concentrate was different from other parts of India and world. The concentrates were used to mix with a substantial volume of water and make them drink it. As such, animals might not get the optimum level of water that required for maintaining their body and productivity. Further, a number of farmers were also habituated of providing cooked feed to their cattle. This, in fact, reduces the metabolic capability of animals. On the other part, in the conventional grazing system of cattle providing fodder and feed concentrate in the shelter were almost

absent. This system has an effect on the health of the cattle, as well as the quantity and quality of milk produced.

Table 3.12Production cost of milk in the sample area

Category	Cost in ₹	Percentage of cost to total cost	Milk production (litres)
Feed	54571500	53.43	
Green Fodder	8624621	8.45	
Dry fodder	12924350	12.65	
Labour	18214400	17.83	
Contingences	7797800	7.64	
Total	102132671	100.00	2820537.50
Average cost of production (per litre)	36.21		

Source: Survey Data

During the period of data collection, it is observed that the farm using more green fodder uses less dry fodder. Further, some farms use more labour because the labourers employed at farm household are used to perform a variety of jobs inclusive of collecting green fodder and haying *etc.* The table shows that only 8.45% of the total cost has been attributed to green fodder. Observation also shows that farmers are expending 53.43% of total cost on feed. When this was discussed with Dr. Madhu Mohini Dutta during her visit to Sitajakhala, informed that the feed cost of the area was more than in any part of north India. Again, some farmers also said that they like to rely more on fodder than feed; whereas the situation compels them to expend more on feed. Depleting grazing lands where the early stage of professional dairying was dependent had never been allocated for animal agriculture and a maximum of feed items not only for study area but also for the state itself has been remained items to be imported. The prices of feeds are not even under the control of the Government of Assam. Therefore, the cost of production of milk is higher in the state.

The dairy farmers of our study area have the sole aim of producing milk and earn a livelihood from milk production. In the area, no farm has been able to economically utilise the dung produced except utilizing for household biogas. On

the other hand, neither of them has been observed rearing cattle for dung and animal production. They are devoted to producing milk and to some extent milch animal for the purpose of replacement of herd and capital earnings.

The income from dairy farming basically can be summarized in two typological categories:

a) Income from milk production and

b) Income from dung and animal production.

3.6.2 Income from milk production

In the Indian system of cattle farming, milk production forms a substantial part of the income. Further, it is observed that the income of dairy cattle farmer can be calculated in three parts. First, the regular income from milk production, second the income from dairying total comprising the income from animal production and other by-products like dung *etc.*, thirdly the total income of the farmer, comprising income from dairying total plus income from other sources. In this study too alike other regions in India, it was observed that the major share of incomes come from the production of milk. The survey data covering 171 households' and a total population of 958, with average family size 5.6 (Appendix 3-III) that Gross Value Added of dairy was ₹28607664.00 and per capita Gross Value Added was ₹29861.86. That is, monthly per capita income from dairying total accounted to the tune of ₹ 2488.49. Average family income from dairying was ₹ 13941.36 (Table 3.14). It is to be noted that 'contributory income share of livestock to 'agriculture and allied activities is less than 20 percent in Assam' (GOI, 2012, p. 21)'. In India, 'Milk is the main output of livestock sector accounting for 66.7 percent of the total value of the output of livestock' (GOI, 2012, p. 21). However, it is observed from the primary data that in the value of total net income, the share of income from milk was 41.68 percent and share of income from dairy farming in aggregate was 73.01 percent among the sample households. The contributions of other sources, comprising income from cultivation, other business along with wage and salary earnings were 26.99 percent.

Table 3.13 Income of survey households from different sources

(Production and Income in ₹)

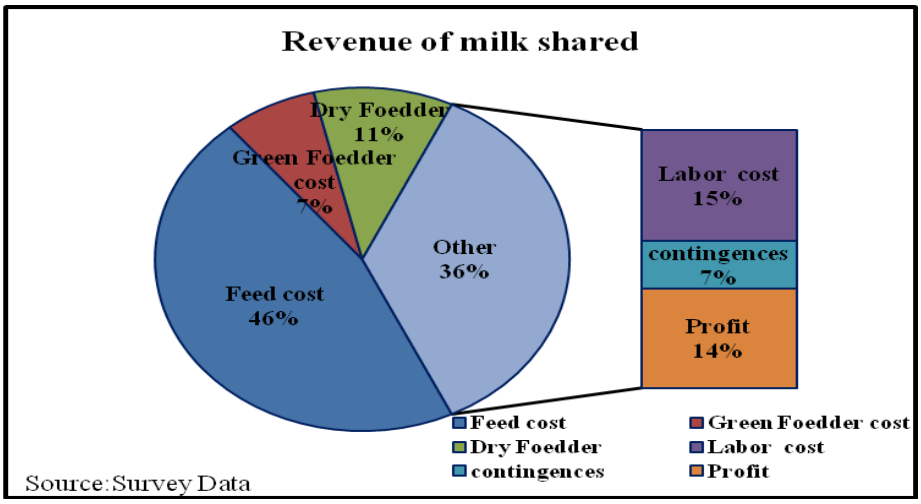
Category of Income	Milk Production	Animal Production	Dairy Farming	Other Sources	Total
1	2	3	4 (2+3)	5	6 (4+5)
Income	16329904	12277760	28607664	10575600	39183264
Per capita income	17045.83	12816.03	29861.86	11039.25	40901.11
Monthly Per capita income	1420.49	1068.00	2488.49	919.94	3408.43
Annual average family income	95496.51	71799.77	167296.28	61845.61	229141.89
Monthly average family income	7958.04	5983.31	13941.36	5153.8	19095.16
Share (percent to Total)	41.68	31.33	73.01	26.99	100

Source: Survey Data

3.6.3 The milk revenue and its share in the study area

The maximum of the milk revenue is shared by the cost of feed and fodder. The feed and fodder cost combined shares 64 percent of the total milk production. 15 percent is the labour cost, and a part of this goes as farmer's income where the farmer rears his cattle without outsourcing of labour. The profit has been found to the tune of 14 percent of the total milk production. The cost of feed and fodder of dairy cattle farming forms the additional income of rural cultivators of the state as well as in our study area. The most prominent of the importance of dairy cattle farming for rural area is that it generates cash and cash transactions twice a day. This keeps farmers out of the depressive psychological situation.

Figure 3.7 Revenue of milk shared by factors



The gross income from milk proper was the highest proportion of income earned by the dairy cattle farmers of the study area. Entrepreneurs, as factors of productions, acquire the residual or profit. The revenue of milk shared among the factors of productions. The total revenue income from milk production proper was ₹118462575. The distributive share among feed cost, green fodder cost, dry fodder cost, labour cost, contingencies and profit of the entrepreneur were ₹ 54571500, ₹8624621, ₹12924350, ₹18214400, ₹7797800 and ₹16329904 respectively (Table 3.14). The chart (Figure 3.7) depicts the approximate percentage share of feed cost, green fodder cost, dry fodder cost, labour cost, contingencies and profit was 46 percent, 7 percent, 11 percent, 15 percent, 7 percent and 14 percent, respectively in the total revenue from milk proper.

Table 3.14 Revenue of milk shared among sample households

Particulars	Cost/Profit in ₹	Percent share of total revenue
Feed cost	54571500	46.06
Green Fodder cost	8624621	7.28
Dry Fodder cost	12924350	10.91
Labour cost	18214400	15.37
Contingences	7797800	6.58
Profit	16329904	13.78
Total Revenue	118462575	100.00

Source: Survey Data

The total revenue earned by the farmers at an average is higher in the long run when the income from animal production and other sources is combined. In the short run, a dairy farmer may result in a loss during the off lactation period of his farm herd. During our study, the farmers have revealed that a farm generally has to bear losses around three to four months a year. Therefore if data collection is done at a certain point in time, there is a possibility of having negative profit data from one-third of the farm being randomly selected. However, in the long run, if a farmer can sustain his farm and family even with a minimal of profit from milk production can make saving or raise living standard with the earning from the animal production and other.

3.6.4 Total revenue of Dairying total and its share

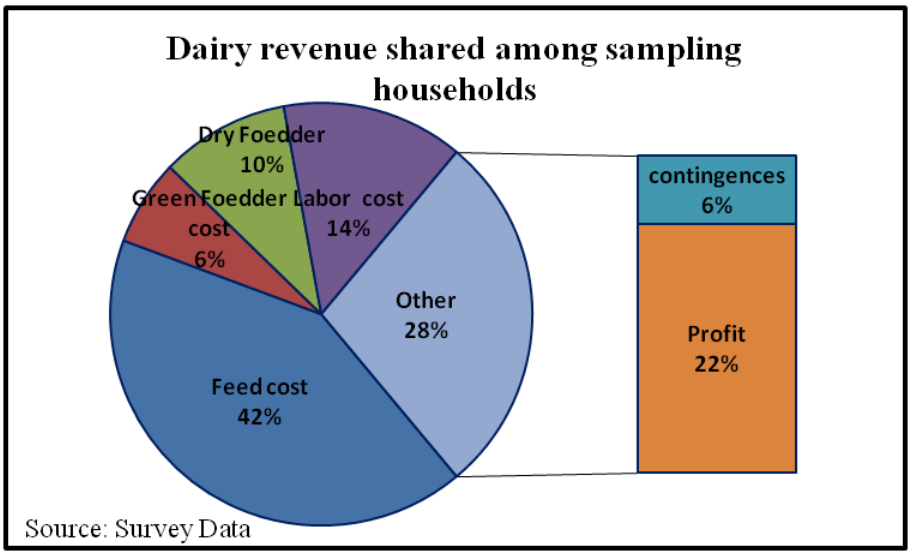
The sale proceeds of cows or calves by dairy farmers form animal production. The revenue of dairying total was the sum of the value of animal production and revenue earnings from milk productions. It is not a regular type of income Dairy farmers get that once or twice in a year. In this study, the income accrued from this source was accounted to be ₹ 12277760. The income summed up with the income from milk, ₹ 16329904 amounted to income of dairying total, ₹ 28607664 (Table 3.13). The income from dairying in total was accounted to be 42.92 percent. After the inclusion of revenue of animal production, the total revenue rises to the tune of ₹ 130740335. (Appendix-3-III). The contribution of animal production raises the entrepreneur share or profit. Moreover, the share of other factors scales down nominally.

Table 3.15 Total Revenue of dairy farming shared

Particulars	Amount	Share (%)	Rounded (%)
Feed Cost	54571500	41.7403	42
Green Fodder	8624621	6.5967	7
Dry fodder	12924350	9.8855	10
Labour Cost	18214400	13.9317	14
Contingencies and Others	7797800	5.9643	6
Profit	28607664	21.8812	22
Total revenue	130740335	100.0000	100

Source: Survey data

Figure 3.8 Dairy revenue shared among sampling households



After the inclusion of animal production on the total revenue it was seen that the total profit amounts to the tune of about 22 percent of total production and feed cost share coming down by 4 percent, from 46 percent to 42 percent and all another cost by 1 percent each. Moreover, the cost of green fodder, dry fodder, and parts of feed cost and contingences provides the prospects of employment avenues through backward linkages

3.6.4.1 Income from dung and animal production

In our study, it is found that the average profit level of milk production is 14 percent of the total cost. The cost incurred on feed and fodder accounts for over 64 percent of the total revenue earned from milk production and 59 percent total revenue earned from dairy farming. The labour cost shares 15 percent of the total milk production. The costs incurred by the farmers are for the purpose of milk production only. The monetised output of other then milk and dung production they receive is animal production. The ratio of animal production accounts for 9.39 percent of the total production. However, this part of monetary earning is very important for generating sustainability of the farmers and is a net gain as psychologically farmers incur expenditure for milk production, not for animal production.

In other parts of India, the dung produced form an important part of income. Unlike other parts of our country in our study area, no households have been

observed using dung cake as fuel. At present, the biogas is getting popularity. Among dairy households, 54.39 percent has the habit of using biogas. It is also observed that the households keeping other facilities of fuel as a precautionary measure for an emergency, since biogas is available as per the capacity of the installed anaerobic digester, and is free of recurring expenditure. As such, expenditure saved is income earned already as stated in the earlier part of this discussion.

However, it is not customary in Assam to rear cattle for animal or meat production. In the study area, we found no farmer has cash earning from selling the hide, skin, and carcasses or even the dung of cattle. The Dairy Policy, Assam (2008) views that for the profitability of dairy farms there is a need to develop livestock market and the market for cow dung based vermicompost and other.

3.6.4.2 Farmer's dissatisfaction over their income level

In the last few years, many farmers have been expressing displeasure over the rate of margin they have.

Therefore, the study has been initiated with the *Hypothesis:*

"High cost and low return from the production of milk creates disincentives in the occupation of dairy cattle farming"

The sample data has been divided into two groups on the basis of the answer:

Group 1 (Y): This group feels that high cost and low return are disincentives to dairy farming.

Group 2 (N): This group feels that high cost and low return are NOT disincentives to dairy farming.

At the time of tabulation, it was found that out of 171 respondent farmer 145 (84.79 %) had expressed that in comparison to the cost of production the price of milk does not return them to the satisfactory level of income. However, 19 (11.11 %) respondents replied that return from the business was satisfactory. On the other hand, 0.04 percent (Table 3.16) farmers had shown ignorance replying 'Don't Know'. This necessitates us to look into the average annual income of the

dairy cattle farmer; as a central theme of this study. We assumed that the farmers showing displeasure over the price and income have a low average income.

Table 3.16 Response on 'whether high-cost low return create disincentive'

YES	NO	DN
145 (84.79)	19 (11.11)	7 (0.04)

Source: Survey data. (Figures in parenthesis show percentage)

The Hypothesis:

$$H_1: \mu_1 < \mu_2$$

There is a significant difference in the average income level between farmers expressing low average income level causes disincentive in dairy cattle farming and expressing a low average income level does not cause disincentive in dairy cattle farming.

Where:

$\boldsymbol{\mu_1}$ = average income of the group 1 farmer and

$\boldsymbol{\mu_2}$ =average income of the group 2 farmer

And the null hypothesis:

$$H_0: \mu_1 \geq \mu_2$$

There is no significant difference in average income level between farmers having the viewpoint, that low-income level causes disincentive, and those having the viewpoint, that low-income level does not cause disincentive.

For comparing the average income level of the farmer groups (group 1 & group 2), with the data of expressed views of the farmers and their respective income level have been analyzed for comparison of means. For the purpose, Independent t-tests have been used because the sample containing cooperative members, and the sample containing non-cooperative members, are composed of different households, the observations are also different, the two samples are independent of each other, and cannot be viewed as paired data.

First, we have observed the following table of Group Statistics that the mean value of the income level of group 1 and group 2 farmers found to be ₹ 176037.68 and ₹ 124934.74 respectively (Table 3.17). The mean value of the income level of group 1 farmers found to be greater than that of the group 2 farmers.

Table 3.17 Independent Samples Test, Group Statistics

High cost and low return from the production of milk creates disincentives in the occupation of dairy cattle farming		N	Mean	Std. Deviation	Std. Error Mean
Total Net Income Sampled	low-income level causes disincentive	145	176037.68	209356.89	17386.14
	low-income level does not cause disincentive	19	124934.74	205840.89	47223.14

Source: Survey data analysed with SPSS

The Levene's Test for Equality of Variances shows that p>0.05 and p =0.425; *i.e.* the variances are not significantly different.

The t-test for Equality of Means for assessing if the t-test is significant (for α = 0.05) shows that p =0.318 and is >0.05; clearly indicating the mean income level does not differ between group 1 and group 2 farmers (Table3.18).

Table 3.18 Independent Samples Test

		Levene's Test for Equality of Variances		**t-test for Equality of Means**						
		F	**Sig.**	**t**	**df**	**Sig.(2-tailed)**	**Mean Difference**	**Std. Error Difference**	**95 percent Confidence Interval of the Difference**	
									Lower	**Upper**
Income level	Equal variances assumed	0.639	0.425	1.002	162	0.318	51102.95	50985.10	-49578.13	151784.02
	Equal variances not assumed			1.016	23.16	0.320	51102.95	50321.99	-52956.90	155162.81

That is, There was not a significant difference in the average or mean income level of group 1 and Group 2 farmers in dairy cattle farming, t(*df* 162)= 1.00, p = 0.318. Thus, 'High cost and low return from the production of milk creates disincentives in the occupation of dairy cattle farming do not bear truth from an economic point of view. That is the hypothesis has been rejected. It has been observed that the displeasure among the dairy farmers have been arisen out of the comparison they made with the cultivators, service holders and other professionals. Cultivators get seasonal leisure; service holders get schedule leisure and different professional can avail leisure on their own will, but a dairy farmer has to work absolutely regular without any holiday. Comparison of net income level with the net earnings of equally educated counterparts in government services found to be the source of their displeasure.

Therefore, beyond the nominal income, to have a clear look over their welfare status through dairy cattle farming, indicators of standard of living have been studied.

3.7 The standard of living of survey households

Income generation always is the prime objective of any kind of productive activity. Generation of income only cannot be the indicator of the state of development of a nation. Similarly only the earning of gross money income by households of a society cannot be the indicator of their standard of living. Therefore, in the study area, the pattern of a dwelling house, use of consumer durables, sanitation standard, an excess of electricity, cooking fuel, availability of drinking water *etc*. were observed. This shows that generated income from dairying whether directly or indirectly has been sufficient to run a household by maintaining a minimum level of living standard. It was seen that the real disposable income was just over 22 percent. However, beginning from the food intake to sanitary standard and use of consumer durables and luxuries shows the real income was able to cover the necessary expenditure. The households with dairying have to work hard and scarcely have time for leisure, but enjoy higher real income situation although nominally their income seems less. It is because a household with dairying regularly gets some facilities like i) cooking fuel ii) milk

and iii) manure for their kitchen garden and other. With the biogas plant itself saves fuel cost approximately ₹1000/- per household if we add up the transportation cost *etc.* for the management of LPG or purchase of firewood for a month. Secondly, the availability of milk and milk product thereof provides food security and practically helps them in maintaining the dietary balance of a part of food intake free of cost. The availability of bio-manure keeps the kitchen gardens green throughout the year reducing the cost of vegetable. These are the extraordinary and exceptional benefits of dairy cattle farming. All these help farmers for keeping the living standard high even with the low nominal profit from milk business making saving easier. With the saving, they are able to go for other consumer durables and luxuries. During the study, maximum households explicitly expressed high cost and low return generating disincentive to dairy cattle farming. Yet, they are not ready to go for another option without having the certainty of better than the present one. This implicitly indicates that gross happiness index seems low, but the total economic welfare has been at a satisfactory level. During our interaction with educated dairy farmers to reveal their make parity expectation on wage, demanded their wage level be assigned equally to the daily salary level of equally qualified counterparts in Government service or other company jobs for the calculation of the cost of production. Therefore, a few indicators of the living standard have been chosen for observation during our study. They are discussed as follows:

3.7.1 Housing pattern

The living standard is also reflected in the housing pattern of sample households. In our study area it is observed that among the households of the farmers associated with cooperative, only 0.63 percent of families have been able to construct RCC house, 79.38 percent has Assam Type house whereas 11.88 percent and 8.31 percent of families have Thatched and Government *Awas Yojana* houses, popularly known as *Indira Awas Yojana* (IAY). On the other hand, 18.18 percent, 36.36 percent and 45.45 percent of the farmers not associated with cooperative respectively have RCC, Assam Type and Thatched Houses respectively. Among the household of cooperative farmers, 15 percent have

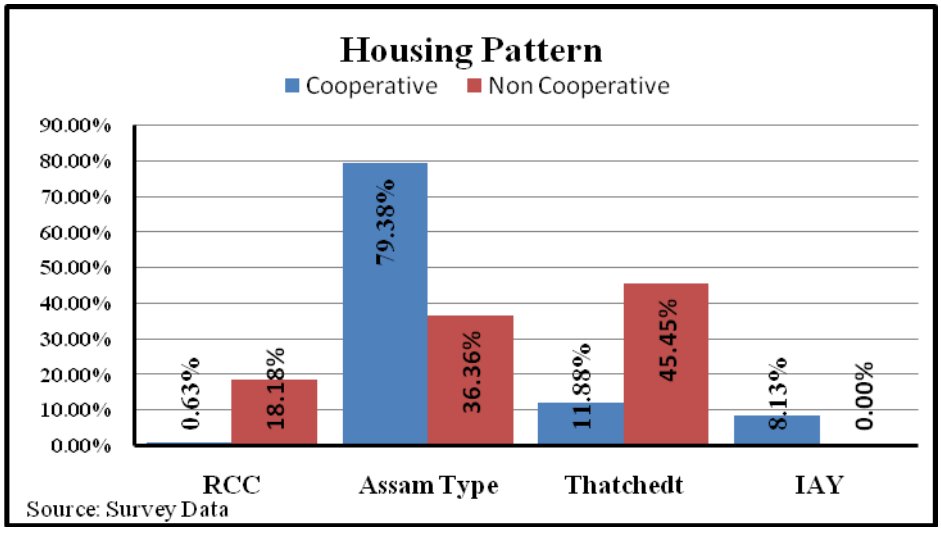
running water facilities (Table 3.19; figure 3.9). This reflects the attraction of the dairy farmers towards modern facilities.

Table 3.19 Dwelling houses of the sample area

Category	Cooperative members	Cooperative Nonmembers
RCC	1(0.63)	2(18.18)
Assam Type	127(79.38)	4(36.36)
Thatched/bamboo wall with roof sheet	19(11.88)	5(45.45)
IAY*	13(8.13)	0(0.00)
Total	160(100)	11(100)

Source: Survey data
(Figures in parenthesis shows percent to total)
*IAY refers to Government's Awas Yojana; constructed under Government scheme of Rural Housing.

Figure 3.9 Housing among Sample Households



3.7.2 Fuel and pattern of use

Fuel used for cooking in a household is not only the concern of the ecosystem but also reflects the living standard of a household. Higher the use of renewable energy is better for the environment. In our study area, 58.12 percent of dairy farmers associated with cooperative and 48.45 percent of the dairy farmer not associated with any cooperative informed us that they are mostly dependent on biogas. During the interaction, they revealed that they are used to keep hearth

as a cultural piece and Liquid Petroleum Gas (LPG) precautionary measure. LPG or firewood hearth/ are used when biogas exhaust. The households also informed that they require only one or two cylinders of LPG to manage festive occasions during a year. As such, we observed that a farmer family with around 5 to 6 cattle gets sufficient dung for biogas. The chart (figure 3.10) and Table (3.20) depicts clearly the availability of cooking fuel in sample households in our study area.

Figure 3.10 Cooking fuel in sample households

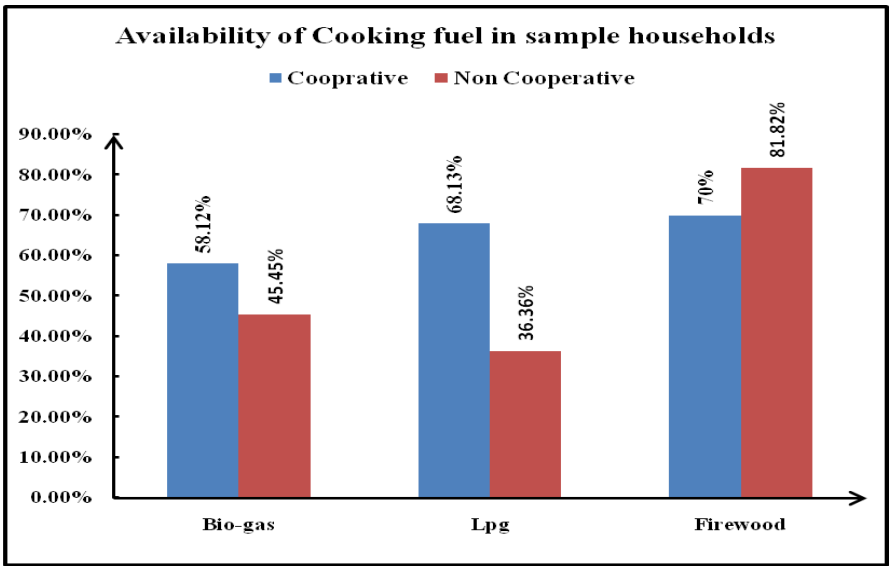


Table 3.20 Availability of cooking fuel among sample households

Category	Bio-gas	LPG	Firewood
Cooperative	93 (58.13)	109 (68.13)	112 (70)
Non cooperative	5 (45.45)	4 (36.36)	9 (81.82)
Total	98 (57.31)	113 (66.08)	121 (70.76)

Source: Primary survey

(The figures in parentheses show percent to total)

3.7.3 Sanitation

The sanitation standard attained by the sample household is one of the important indicators of living standard. Only 1 percent of the sample households

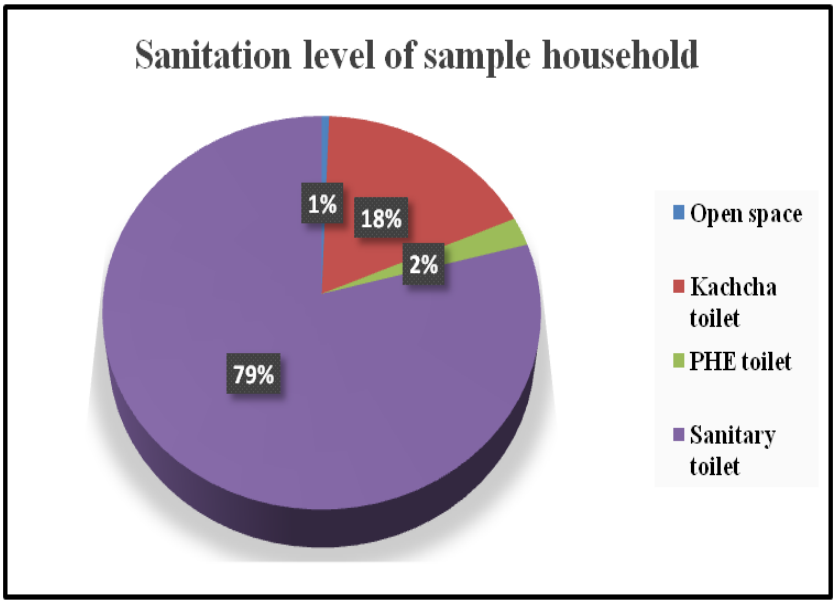
are yet unable to have a proper sanitary standard. 18 percent of households have *Kachcha* toilet, 2 percent has been availing the toilet constructed by government grant through the Public Health Engineering (PHE) department. Table 3.21 and Figure 3.11 depict the scenario clearly.

Table 3.21 Sanitary system among sample households

	Open Space	*Kachcha* Toilet	PHE Toilet	Sanitary Toilet	Total
Cooperative	2 (1.25)	24 (15.00)	3 (1.88)	131 (81.87)	160 (100)
Non Cooperative	0 (0.00)	6 (54.54)	1 (9.10)	4 (36.36)	11 (100)
Grand Total	2 (1.00)	30 (18.00)	4 (2.00)	135 (79.00)	171 (100)

Source: Survey Data
Figures in parenthesis show percent of the total

Figure 3.11 Sanitation among sample households



3.7.4 Use of consumer durables

In our study area for the purpose of investigating the living standard of the dairy farmers data regarding the use of some selective consumer durables such as TV sets, telephone/ mobile phone, two-wheelers, other vehicle, refrigerators and computers had been taken and found that all those articles have been used respectively by 91.88 percent, 97.50 percent, 16.25 percent, 47.50 percent and

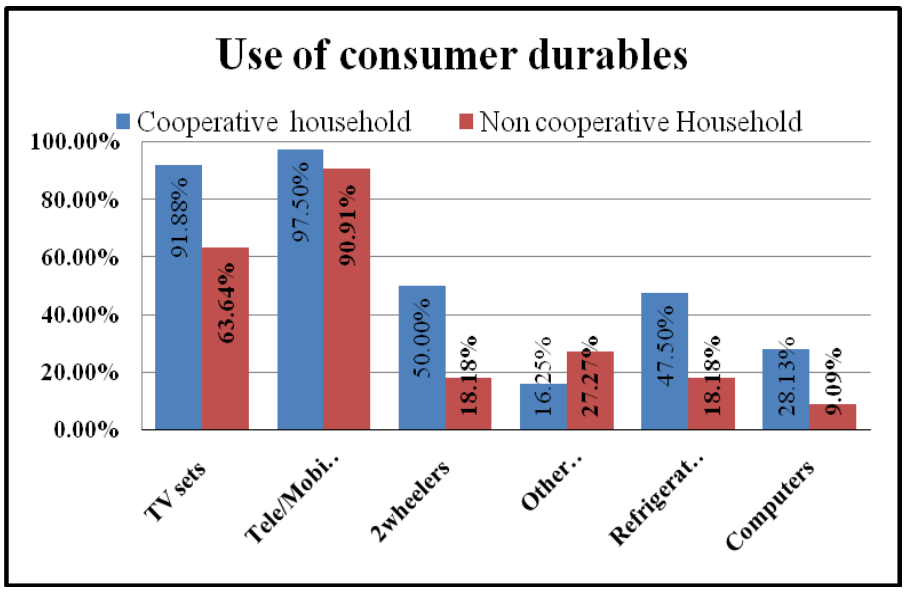
28.13 percent of sample households associated with Cooperative (Table 3.22 & Figure 3.12).

Table 3.22 Use of consumer durables among sampled households

Particulars	Cooperative	Percent of total cooperative Household	Non Cooperative	%of total Non-cooperative Household
TV sets	147	91.88	7	63.64
Telephone/Mobile	156	97.5	10	90.91
2-wheelers	80	50.00	2	18.18
Other Vehicles	26	16.25	3	27.27
Refrigerators	76	47.5	2	18.18
Computers	45	28.13	1	9.09

Source: Primary data

Figure 3.12 Use of consumer durables



3.8 Dairy farming as a tool of employment generation

Dairy farming can be one of the reliable tools for the employment generation in developing countries. In the country like India, the labour supply has been large and will remain larger possibly for a long time to come. It is the employment opportunity that has control over not only on the level of income and living standard but also the nutritional level of the rural masses with a cluster of

an agrarian economy. In areas where chances of success of industrialisation were far away, promoting small entrepreneurship such as dairy farming, horticulture, floriculture *etc.* can play a pivotal role in generating employment and sustainably in regards to income and environment both.

Employment through Dairy cattle farming is generated "on the farm" and "off-farm." Off-farm employment is the outcome of forward and backward linkage of the business.

3.8.1 On-farm and off-farm employment generation through dairy cattle farming: in the study area, Morigaon district and in Assam

The farming activity requires manpower with a certain type and level of knowledge and skill. A conventional farmer learns those skills automatically within their working environment. Other new farmers have to acquire that knowledge through training. Training may be of two kinds, one formal workshop, and other in-service training. In the case of in-service training, the person concerned becomes fully employed and after the training when he takes up a venture of entrepreneurship, can employ others. In the study area, according to our sampling data, number Farm level Employment in the milk production were 656 comprising 171 entrepreneur and 485 labours inclusive of family labour and others. Among the farm worker of 485 the numbers of female labour were 43.92 percent, and among the171 entrepreneurs, 20.47 percent were female (Table 3.23). Entrepreneurs were the claimant of profit from the business. They are fully absorbed in the activities of their respective farms and are fully employed therein. Comprising both entrepreneur and labour, the female share in total employment was 37.80 percent among the surveyed households.

Table 3.23 Farm level Employment in the milk production

Category	Male	Female	Total
Labour	272(56.08)	213(43.92)	485
Entrepreneur	136(79.53)	35(20.47)	171
Total	408(62.20)	248(37.80)	656

Source: Survey data. (Figures in parentheses show percentage to total)

Beyond the surveyed data of this study, no secondary data on employment have been available. This study has no other option then to extrapolating these figures to the district and state level, 'which requires the large assumption that similar employment levels are found per unit of milk across the state, allows some understanding of the level of employment generated' through the similar kind of milk production and marketing in the state **Invalid source specified.**. The survey data shows that in the study area, per litre of milk production has been generating 656/2820538 numbers of employment (Table 3.24).

Employment generated in the forward marketing and processing of output is off-farm employment. The average of per day milk handled by SJDUSS during January/February is 2018 found to be 15000 LPD. The marketing activity of SJDUSS provides engagements to a total of 144 persons comprising its employees, vendors and others.

Table 3.24 Employment generation through production and marketing

Production		Marketing*	
Total employment on farm Nos.	656	Total employment in milk Marketing Nos.	144
Milk produced annually	2820538	Milk handled annually	5475000
Employment generated per litre	656/2820538	Employment generated per litre	144/5475000

Source: Survey Data

*Average milk handled per annum is inflated from the daily average

SJDUSS after procurement adopts various means to market the total milk. It supplies milk to number of vendors, sells directly to consumer through its numbers of selling points locally in the Morigaon district and selling points in Guwahati city, provides milk to private trader and while some of it is processed as packaged milk, another part is converted into different kind of sweets, cream, *paneer*, curd, *etc*. and sells them through its own parlors. It also transports a proportion of milk, for supplying it to processing unit of WAMUL and other at Guwahati. Thus, the cooperative performs all kind of milk marketing activities.

Therefore, to study the employment generated through processing and marketing of milk, the activities of SJDUSS have been considered reliable.

The estimated direct farm level employment in milk production was 5406 in the year 2001-02. This had increased to the level of 6437 in the year 2015-16. As per the data of Animal Husbandry & Veterinary Department, Assam, the milk retained for home consumption was in decreasing trend, thereby increasing the marketable proportion of increased output. Therefore, the growth of employment through milk marketing had been increasing slowly but steadily. The employment generated through milk marketing in the district was 333 nos. in the year 2001-02. It had risen to 495 in the year 2015-16. The Compound Annual Growth Rate of employment in Morigaon District through milk marketing, production and their total has been found to be 2.68 percent, 1.17 percent and 1.27 percent during the period of 2001-02 to 2015-16 (Table 3.25).

Table 3.25 Milk production and level of estimated employment in Morigaon since 2001-02

Year	Milk marketed percent of Total production in Assam	Milk production in litres	Approximate Milk Handle in the market in litres	Employment through Milk Marketing	Number of employment on farm/production activity	Total Employment Generated	Annual rate of growth percent
2001-02	54.40	23243718	12644583	333	5406	5739	
2002-03	52.51	19071355	10014369	264	4436	4700	-22.12
2003-04	53.70	19384465	10409458	274	4508	4782	1.74
2004-05	54.20	18019528	9766584	257	4191	4448	-7.52
2005-06	54.80	20702183	11344796	298	4815	5113	13.01
2006-07	53.70	21846330	11731479	309	5081	5390	5.13
2007-08	54.60	22107284	12070577	317	5142	5459	1.28
2008-09	55.00	24905736	13698155	360	5793	6153	11.27
2009-10	52.00	25044937	13023367	343	5825	6168	0.24

Year	Milk marketed percent of Total production in Assam	Milk production in litres	Approximate Milk Handle in the market in litres	Employment through Milk Marketing	Number of employment on farm/production activity	Total Employment Generated	Annual rate of growth percent
2010-11	62.00	26893200	16673784	439	6255	6694	7.86
2011-12	64.00	22987055	14711715	387	5346	5733	16.75
2012-13	70.00	27506905	19254834	506	6398	6904	16.96
2013-14	65.00	24943793	16213465	426	5801	6227	-10.86
2014-15	68.00	29100227	19788154	520	6768	7288	14.55
2015-16	68.00	27679583	18822116	495	6437	6932	-5.13
Compound Annual Growth Rate				2.68%	1.17%	1.27%	

source: AH & Veterinary, Assam and Survey data

Employment through milk production and marketing has not been rising much satisfactorily. The employment in Assam through dairy cattle in total was found to be 185216 nos. out of the total 10734 nos. are engaged in milk marketing and 174482nos. found the employment on farm activities in the year 2001-02. The employment through milk marketing, on farm activities and the total, has risen to the level of 15840, 205980 and 221820 nos. respectively in the year 2015-16. The Compound Annual Growth Rate found to be of 1.21 percent in total of which milk marketing registered the growth rate 2.63 percent employment growth rate on farm production activities was 1.11 percent (Table 3.26).

Table 3.26 Milk production and level of estimated employment in Assam since 2002-03

Year	Milk marketed percent of Total production in Assam	Milk Production in litres	Milk Handled in market in litres	Approximate Employment through Milk Marketing	number of approximate Employment on production activity, Assam	Total Employment	Annual rate of growth percent
2001-02	54.40	750202013	408109895	10734	174482	185216	
2002-03	52.51	773196544	406005505	10679	179830	190509	2.78
2003-04	53.70	795583946	427228579	11237	185037	196274	2.94
2004-05	54.20	812082119	440148508	11577	188874	200451	2.08
2005-06	54.80	821628173	450252238	11842	191094	202936	1.22
2006-07	53.70	822722246	441801846	11620	191349	202969	0.02
2007-08	54.60	824395846	450120132	11839	191738	203577	0.30
2008-09	55.00	827011834	454856509	11963	192346	204309	0.36
2009-10	52.00	829862664	431528585	11350	193009	204359	0.02
2010-11	62.00	791084740	490472539	12900	183990	196890	-3.79
2011-12	64.00	796456504	509732163	13407	185240	198647	0.88
2012-13	70.00	802650612	561855428	14778	186680	201458	1.40
2013-14	65.00	814515941	529435362	13925	189440	203365	0.94
2014-15	68.00	882972133	600421050	15792	205361	221153	8.04
2015-16*	68.00	885633000	602230440	15840	205980	221820	0.30
Compound Annual Growth Rate				2.63%	1.11%	1.21%	

Source: AH & Veterinary, Assam and Survey data

* Government of India figure approximated to litre from tonnes

On-farm employment is the employment generated due to production activities of dairy cattle farming. However, off-farm employment generation can be of two types a) generation of employment in the forward linkage of marketing

for performing the transportation, processing, and marketing and b) generation of employment through backward linkages for purchasing of input factors.

3.8.2 Forward and Backward linkage

After milk collection, carry forward it to the sellout point of milk or milk product comprises the activity of forward linkage of marketing. Here employment is generated on points like milk collection booths, on transportation to the processing centre, at the processing centre, transportation to the selling points and at the selling point.

The forward linkage of dairying has been associated with the marketing of milk in peri-urban and urban areas. In this process, employment is generated. In the direct marketing under the cooperative system, the number of employment generated is more than the employment that generated when produced or procured milk is supplied to a trader or other processors by the producer or the producers' cooperative.

Employment through backward linkage is generated on the basis of requirement of feed and fodder for milk producing farms. As it has been obvious that in our state dairy farming or business of milk production has been 'generally owned' and hold entrepreneurship by small and 'marginal farmers and landless agricultural labourers' (Government of Assam, 2017) and is thus highly livelihood oriented. The livestock sector is a basic component of production systems and contributes to the sustainable rural agrarian economy. 'It's fast growth is essential not only to achieve higher productivity levels in livestock products but also for income generation of rural households of the State' (Government of Assam, 2017).

However, in most of the interior rural areas of Assam due to the lack of infrastructural facilities particularly the facility of transportation and the absence of optimal localisation of dairy cattle farming in some areas for producing congenial volume for marketing; farmers are still getting milk price less than the average cost of production. In the areas with transportation and marketing facilities, farmers have to face the problems of lack of natural resources like land, forest or grazing areas, and others. In the areas where natural resources are

available, there arises the problem of milk marketing infrastructure. Only the farmers of rurban areas with natural resources though limited in nature have been surviving with limited expansion. These are the reasons attributive towards the slow growth of milk production in the state.

The observation of sample data of milk income shared in the study area shows that substantial part of the income from milk production has been shared by two important inputs feed and fodder, *i.e.,* 64.26 percent of the milk income. Here it is to be observed that feed and fodder both come from agriculture. Higher demand for feed and fodder provides the impetus for a higher level of output in the agricultural sector. Not only in our study area but also throughout the states of Northeast region as well as in the state of Assam the stub of the crops like paddy, mustard, wheat *etc.* use to be burnt to cleanse the agricultural field. However, with the development of animal husbandry, particularly of dairy farming has the credit of changing that wastage of cultivator to be burnt, to a resource of valuable cash earning. In different parts of the state even till date after harvesting, the stub of different crops has been burnt. On the other hand, the values of crops are hardly able to attract the youths to the field. This is the reason why youth from the villages of Assam has been attracted to the states like Kerala, Karnataka, Tamil Nadu, Gujarat, Punjab *etc.* making own state deficient of even the foodstuff required. As such developing of dairying not only provides employment in the sector but also increases the total return from agriculture turning some agricultural wastage into the marketable output on the one hand and on the other hand, it can increase the productivity by supplying eco- friendly manure.

3.9 Conclusion

The living standard as seen in the above analysis depicts that the farmers have been getting ₹ 42.50 and more in the fringe areas of town or city as well in the areas under farmer's cooperative. This is more than the cost of production estimated from survey data. This indicates that the dairying as a means of livelihood is a successful one at least in the urban areas and in the areas where the farmers' cooperatives have control over the business. Whatever the dissatisfaction at the preliminary stage of our study has been observed, which provided the

stimulus for us to go into the deep study, was basically due to the comparison made by some educationally qualified farmer with the equally qualified counterparts in the different services under Central and State Government. Here the expectation level of educated and semi-educated farmers found not satisfied. Dissatisfaction regarding labour in dairy farming was observed even in 1911 by Clarence Eckles (Eckles, 1911), 'The special objections raised to the labour on the dairy farm are the long hours, the steady, regular work, and the nature of the work'.

In Assam, the prospect of dairy cattle farming was well envisaged during British rule itself. The scenario of British rule with the initial step of keeping Grazing Reserves was very much encouraging for dairy cattle farming. However, in Assam, following the implementation of the exploitative policy of Grazing tax and post 1930s Land policies, particularly on VGR & PGR were not favourable for farmers. After independence, 1960's onward government efforts to develop dairy scenario by installing processing plants had been praiseworthy, but the allocation, placement, and management of the milk processing facilities with the keep safe policy under the bureaucratic control, rather than providing them according to the requirement have been hardly serving the purpose envisaged for. As a result, almost all of the processing plants installed by the government of Assam have been lying defunct at present, and the state is in a shortage of milk by around 180 percent in an average of its own output.

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Appendix 3-I State wise milk production in India and growth in percentage during 2012-13 to 2016-17

Sl. No.		Production of milk ('000 tonnes)				Annual Growth rate (%)		
	States/UTs	2013-14	2014-15	2015-16	2016-17	2014-15	2015-16	2016-17
1	Andhra Pradesh	13007.10	9656.15	10816.99	12177.94	-34.70	10.73	11.18
2	Arunachal Pradesh	43.35	46.07	50.13	52.53	5.90	8.10	4.57
3	Assam	814.52	829.47	843.46	861.27	1.80	1.66	2.06
4	Bihar	7197.06	7774.89	8288.42	8711.07	7.43	6.20	4.85
5	Chhattisgarh	1208.61	1231.57	1277.32	1373.55	1.86	3.58	7.01
6	Goa	67.81	66.60	54.34	51.36	-1.82	-22.56	-5.80
7	Gujarat	11112.20	11690.57	12262.35	12784.12	4.95	4.66	4.08
8	Haryana	7441.67	7901.35	8381.33	8974.75	5.82	5.73	6.61
9	Himachal Pradesh	1150.81	1172.16	1282.86	1329.11	1.82	8.63	3.48

Sl. No.		Production of milk ('000 tonnes)				Annual Growth rate (%)		
	States/UTs	**2013-14**	**2014-15**	**2015-16**	**2016-17**	**2014-15**	**2015-16**	**2016-17**
10	Jammu & Kashmir	1614.67	1950.93	2273.35	2376.09	17.24	14.18	4.32
11	Jharkhand	1699.83	1733.72	1812.38	1893.80	1.95	4.34	4.30
12	Karnataka	5997.03	6120.93	6344.01	6562.15	2.02	3.52	3.32
13	Kerala	2654.7	2711.13	2649.82	2520.34	2.08	-2.31	-5.14
14	Madhya Pradesh	9599.20	10779.07	12148.37	13445.32	10.95	11.27	9.65
15	Maharashtra	9089.03	9542.29	10152.61	10402.15	4.75	6.01	2.40
16	Manipur	81.70	82.17	78.97	78.82	0.57	-4.05	-0.19
17	Meghalaya	82.16	82.96	83.95	83.96	0.96	1.18	0.01
18	Mizoram	15.30	20.49	22.00	24.16	25.33	6.86	8.94
19	Nagaland	80.61	75.69	77.00	79.37	-6.50	1.70	2.98
20	Odisha	1861.19	1903.14	1930.47	2003.42	2.20	1.42	3.64
21	Punjab	10011.10	10351.41	10774.20	11282.06	3.29	3.92	4.50
22	Rajasthan*	14573.10	16934.31	18500.08	20849.59	13.94	8.46	11.27
23	Sikkim	45.99	49.99	66.74	54.35	8.00	25.10	22.80
24	Tamil Nadu	7049.19	7132.47	7243.53	7556.35	1.17	1.53	4.14
25	Telangana	-	4207.26	4442.45	4681.09	NA	5.29	5.10
26	Tripura	129.70	141.23	152.23	159.59	8.16	7.23	4.61
27	Uttar Pradesh	24193.90	25198.36	26386.81	27769.74	3.99	4.50	4.98
28	Uttarakhand	1550.15	1565.35	1655.81	1692.42	0.97	5.46	2.16
29	West Bengal	4906.21	4961.00	5038.47	5182.60	1.10	1.54	2.78
30	A&N Islands	14.21	15.56	15.43	16.14	8.68	-0.84	4.40
31	Chandigarh	44.43	44.00	43.18	36.39	-0.98	-1.90	-18.66

Sl. No.	States/UTs	Production of milk ('000 tonnes)				Annual Growth rate (%)		
		2013-14	2014-15	2015-16	2016-17	2014-15	2015-16	2016-17
32	D.& N. Haveli*	11.00	8.52	8.52	7.50	-29.11	0.00	-13.46
33	Daman & Diu	0.82	0.82	0.80	0.62	0.00	-2.50	-29.03
34	Delhi*	284.31	280.06	280.83	279.11	-1.52	0.27	-0.62
35	Lakshadweep	6.07	4.19	3.25	3.24	-44.87	-28.92	-0.31
36	Puducherry	47.25	47.64	48.04	48.31	0.82	0.83	0.56
	All India	137686	146313	155490	165404	5.90	5.90	5.99

Source: Basic Animal Husbandry & Fisheries Statistics 2017, GOI

Appendix 3-II State wise milk production in India and growth in percentage during 2011-12 to2013-14

Sl. No.	States/UTs	Production of milk ('000 tonnes)			Growth rate (%)		
		2011-12	2012-13	2013-14	2011-12	2012-13	2013-14
1	Andhra Pradesh*	12088.00	12761.65	13007.07	7.89	5.57	1.92
2	Arunachal Pradesh	21.93	22.72	43.35	-22.62	3.60	90.80
3	Assam	796.00	799.67	814.52	0.76	0.46	1.86
4	Bihar	6643.00	6844.84	7197.06	1.93	3.04	5.15
5	Chhattisgarh	1119.00	1164.05	1208.61	8.73	4.03	3.83
6	Goa	59.85	61.24	67.81	0.72	2.32	10.72
7	Gujarat	9817.00	10314.63	11112.18	5.32	5.07	7.73

Sl. No.	States/UTs	Production of milk ('000 tonnes)			Growth rate (%)		
		2011-12	2012-13	2013-14	2011-12	2012-13	2013-14
8	Haryana	6661.00	7040.24	7441.67	6.28	5.69	5.70
9	Himachal Pradesh	1120.00	1138.60	1150.81	1.57	1.66	1.07
10	Jammu & Kashmir	1614.43	1630.56	1614.67	0.32	1.00	-0.97
11	Jharkhand	1745.00	1679.00	1699.83	12.22	-3.78	1.24
12	Karnataka	5447.00	5718.22	5997.03	6.52	4.98	4.88
13	Kerala	2716.00	2790.58	2654.70	2.71	2.75	-4.87
14	Madhya Pradesh	8149.00	8837.79	9599.20	8.45	8.45	8.62
15	Maharashtra	8469.00	8733.69	9089.03	5.28	3.13	4.07
16	Manipur	78.61	80.03	81.70	0.78	1.81	2.08
17	Meghalaya	79.69	80.52	82.16	-0.18	1.04	2.04
18	Mizoram	13.91	13.63	15.30	21.70	-2.01	12.29
19	Nagaland	78.00	78.66	80.61	2.59	0.85	2.48
20	Odisha	1721.00	1724.40	1861.19	3.14	0.20	7.93
21	Punjab	9551.00	9724.34	10011.10	1.35	1.81	2.95
22	Rajasthan	13512.00	13945.92	14573.05	2.10	3.21	4.50
23	Sikkim	45.00	42.24	45.99	4.65	-6.13	8.87
24	Tamil Nadu	6968.00	7004.73	7049.19	2.00	0.53	0.63
25	Tripura	111.00	118.04	129.70	5.86	6.34	9.88
26	Uttar Pradesh	22556.00	23329.55	24193.90	7.25	3.43	3.70
27	Uttarakhand	1417.00	1478.38	1550.15	2.42	4.33	4.85
28	West Bengal	4672.00	4859.23	4906.21	4.48	4.01	0.97
29	A&N Islands	26.00	21.45	14.21	2.80	17.50	-33.74

Sl. No.	States/UTs	Production of milk ('000 tonnes)			Growth rate (%)		
		2011-12	2012-13	2013-14	2011-12	2012-13	2013-14
30	Chandigarh	45.09	44.03	44.43	0.38	-2.35	0.91
31	D.& N. Haveli	11.00	11.00	11.00	4.73	0.00	-0.03
32	Daman & Diu	1.00	1.00	0.82	-28.06	0.00	-17.64
33	Delhi	502.00	286.58	284.31	4.66	-42.91	-0.79
34	Lakshadweep	2.38	2.21	6.07	20.20	-7.14	174.64
35	Puducherry	45.09	47.17	47.25	-3.72	4.61	0.18
All India (rounded off)		127904	132430	137685	4.97	3.54	3.97

*includes Telangana State
Source: AHS Unit OM No.26-1-4/2013/ParlM/AHS dated 04.03.2015

Appendix 3-III Summary of survey data

sl. no	Summary of survey data	
1	Number of villages covered	6
2	Total nos. of Household Covered	171
3	Total Population	958
4	Total female population	474
5	female ,Male ratio	0.98
6	SC	18.71%
7	ST	14.62%
8	OBC	14.62%
9	GEN	52.05%
10	Ratio of farmer associated with Cooperative	93.60%
11	Total Cattle nos.	2456
12	Total Female Cattle nos.	2003

sl. no	Summary of survey data	
13	Total Milch Cattle nos.	1042
14	Ratio of milch cattle on Total cattle	42.43%
15	Ratio of milch cattle on Total female cattle	52.02%
16	Marketed Milk Production Daily in litre	7353
17	Household Consumption of milk in litre	376
18	Total milk Production daily in litre	7729
19	Total Annual Milk Production in litre	2820537.5
20	Total Revenue earnings from Milk INR	118462575
21	Total Revenue earnings (Milk+ Animal Production)	130740335
22	Ratio of animal production	9.39%
23	Total Cost INR	102132671
24	Profit from milk INR	16329904
25	Profit percentage of milk production only	14%
26	Total profit (Milk+ Animal Production)	28607664
27	Total profit (Milk+ Animal Production)	22%
28	Daily Average household marketable Production	45.19 litres
29	Daily Average household consumption of milk	2.21
30	Average annual household output INR	764563.36
31	Productivity/Cattle	7.42 Ltres
32	Per capita Consumption of milk	392ml
33	percentage of animal production to total Revenue after replacement cost	9.40%
34	Cost of production of milk per litre	₹ 36.21
35	Direct farm level employment of labour	485
36	Employment as entrepreneur	171
37	total employment	656
38	Average annual output of milk for one unit of labour in litres	4299.6

sl. no	Summary of survey data	
39	Coefficient of farm level direct employment when production level is available annually	0.00023258
40	Average output of milk for one unit of labour in litres	11.78
41	Average producers price of milk with farmer's cooperative	₹ 42.5
42	Average producers price of milk without farmer's cooperative	₹ 35.5
43	Coefficient of farm level direct employment when production level is available on per day	0.0848896

Source: Survey Data