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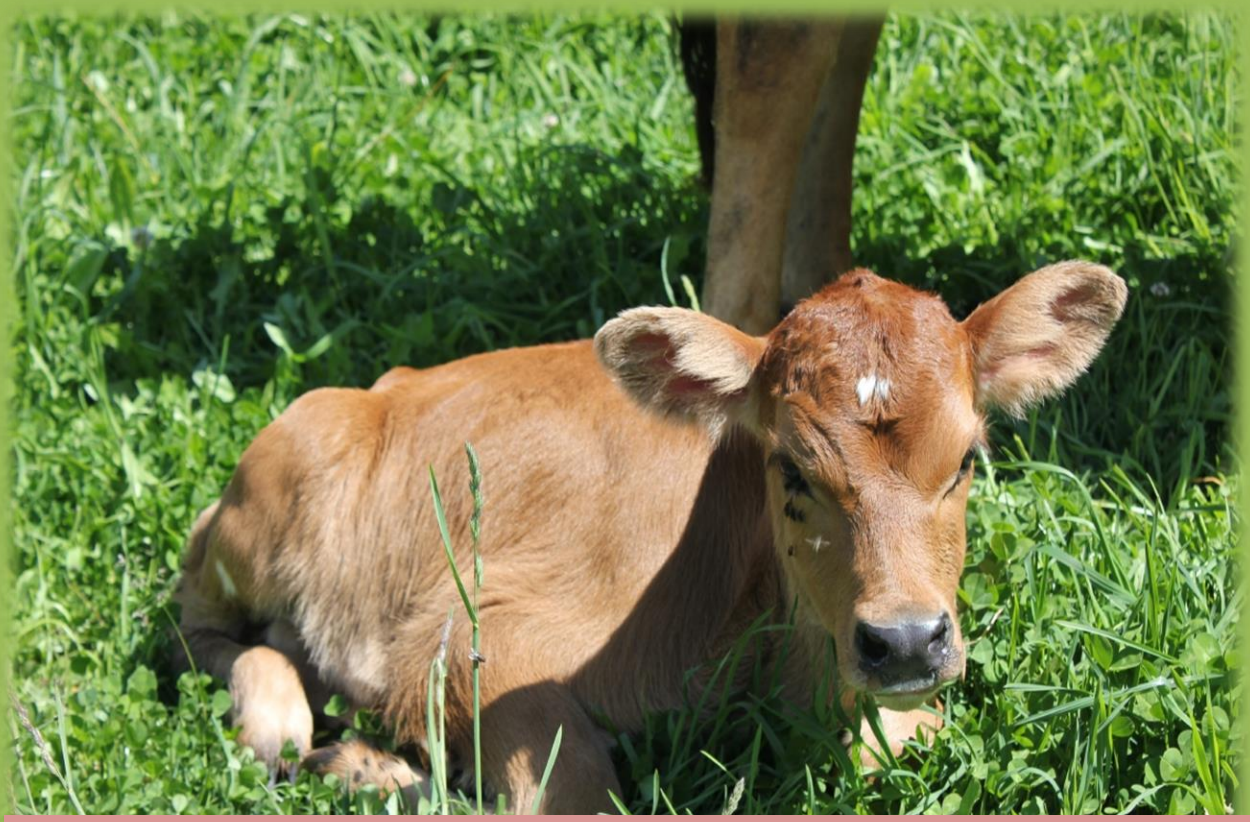
NATIONAL DAIRY RESEARCH & DEVELOPMENT CENTRE
DEPARTMENT OF LIVESTOCK
MINISTRY OF AGRICULTURE & FORESTS
YUSIPANG, THIMPHU

COST OF PRODUCTION OF DAIRY INPUTS

NDRDC publication series 2021 (#16)



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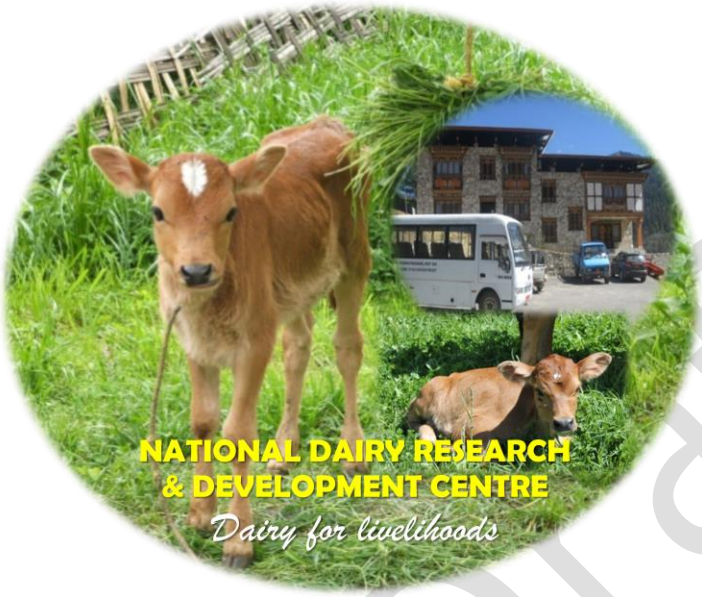

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EXECUTIVE SUMMARY

In light of graduation of Bhutan from Least Developed Country category post 2023, diminishing production support to dairy farmers is foreseen. In such a scenario, Cost of Production (CoP) of dairy related items is likely to fluctuate. Hence to enable farmers to develop resilience to changing situations, a near accurate costing/derivation of Cost of Production per unit of dairy inputs is needed. The CoP derived can help farmers' to understand how much it costs to produce a unit and accordingly guide them to set price for marketing of products.

The Cost of Production of different items related to dairy inputs derived is as follows:

Sl no	Particulars	Cost of Production/Services (Nu.)				
		Govt. nucleus farm/Research Station	Farmers' field	Semen types		
				Sexed semen	Conventional semen	Pedigree semen
1	Cost of service for one artificial insemination			2077	1234	1120
2	Cost of production of a calf from AI services			8972	5517	5212
3	Cost of Production of a calf from Natural Services		3354			
4	Cost of Production of a liter of milk (Nu.)		26.85			
5	Cost of Production of a kg Butter (Nu./kg) Cheese (Nu./kg)	444 247				
6	Cost of production of a dose of frozen semen	117				
7	Cost of production of a liter of Liquid Nitrogen	38				
8	Cost of production of Jersey cow (1st lactation)	79,110	56,895			
9	Cost of production of a Heifer/Bulls (18 months of age)	53,370	38.175			

With the above Cost of Production for dairy related items, it is hoped that dairy entrepreneurs/farmers will be able to make informed decisions to carry out the dairy farming activities profitably.

However, the Cost of Production is not static and has to evolve with the changing time, differences in location/farming environment as well as resource costs and other economic factors. Thus the actual Cost of Production for any enterprise is likely to be different between farms and between divergent geographical areas of Bhutan.

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INTRODUCTION

In economics, the Cost of Production (CoP) is defined as "*the expenditures incurred to obtain the factors of production such as labor, land, and capital, that are needed in the production process of a product*" (Corporate Finance Institute-CFI, 2021).

The following are fundamental reasons for calculating cost of production for dairy inputs are:

- For better marketing decisions, selling any items for less than it costs will result in losses, hence knowing cost of production per unit can greatly improve decisions about what, when and how much to produce and sell
- Detailed costing is invaluable to plan farming activities such as buying new machinery, or leasing in additional land and so on
- Knowing the costs of production can help to rationalize farm input purchases

The CoP in the document can be understood as the total cost incurred by a dairy enterprise to produce a specific quantity of essential dairy inputs (dairy breeding stock and Artificial Insemination (AI) related items). Production costs includes: investment cost such as housing, cattle crates, AI and other equipment; cost of labor/service charges, feed/forage for feeding animals and other consumable supplies. Different types of costs that are taken into consideration to derive average CoP include the following:

Fixed costs

Fixed costs includes capital investment for depreciation of housing, interest on loan if availed, equipment procured for operating dairy enterprise and related items. Expenses of these items are not expected to change much with the amount of output produced.

Variable costs

Variable costs include mainly cost of cost related to artificial insemination (Frozen semen and Liquid Nitrogen), feeding costs and wages/service charges that can change with the changes in the level of production.

Total cost

Total cost encompasses both variable and fixed costs added up. It takes into account all the costs incurred in the production process or when offering a service.

Average cost of production

The average cost of production in this document refers to the total cost of production divided by the number of units (progenies, semen doses, quantity of LN2 in litres etc) produced (refer formula below). This average cost of production can be used to make decisions about pricing products for maximum revenue generation or profit.

$$\textbf{Cost of production per unit} = \frac{\textbf{Fixed costs+ Variable costs}}{\textbf{Total No./Qty of items produced}}$$

COST OF PRODUCTION: ESSENTIAL DAIRY INPUTS/SERVICES

Cost of production of various dairy related items /inputs and services is presented in Annex I to XI as follows:

ANNEX I: COST OF SERVICES FOR ONE ARTIFICIAL INSEMINATION (AI)

Particulars	**Sexed Semen**	**Conventional Semen**	**Pedigree Semen**
Cost of semen	1073.1	229.95	117
Cost of LN2 (1 litre/insemination @38/litre	38	38	38
AI accessories sheath/gloves	54.2	54.2	54.2
AT Technician service charge inclusive of transportation and equipment lump sum	911.8	911.8	911.1
Cost per Insemination	**2077**	**1234**	**1120**

Note: *AI Technician includes both CAIT or Govt AI Technician*

Sexed semen USD 14 per dose @76.65 (7 dec 2021)=Nu.1073.1, Conventional Semen @ USD 3/dose
AI Technical charges including equipment per year = Nu. 161.8
Total for service charges Nu 750(DSA+ mileage for AIT/CAIT)+Nu161.8)=Nu.911.8

Items cost 2021		
AI gun	*1650*	
Portable container	*10000*	
Total cost	*11650*	
Number of AI per year	*72*	
Average cost per year	*161.8*	*Total cost divided by No of AI*

ANNEX II: COST OF PRODUCTION OF CALF FROM ARTIFICIAL INSEMINATION

	Sexed semen			Conventional semen			Pedgree semen		
	Cost of semen/ dose	Sex semen dose/yr	Total semen cost/Depr-eciation	Cost of semen/ dose	conv semen doses/yr	Total semen cost/Depr-eciation	Cost of semen /dose	conv semen doses/yr	Total semen cost/Depr-eciation
Fixed cost									
Depreciated value/yr AI crate worth Nu. 30,000			1250			1250			1250
Depreciated value/Yr LN2 cans @ Nu.60336			5534			5534			5534
Depreciated value/yr (AI gun/other equip			160			160			160
Total fixed cost			**6944**			**6944**			**6944**
Variable cost									
Semen cost /yr	1073.1	36	38631.6	229.95	36	8,278	117	36	4,212
Cost of LN2;(1L/AI*36)	36	38	1,368	36	38	1,368	36	38	1,368
AI Service delivery cost half DSA Nu 625	625	36	22,500	625	36	22,500	625	36	22,500
AI accessories sheath/gloves/yr	161.8	1	162	161.8	1	162	161.8	1	162
Transport cost to reach LN2/L to AI Centre	13	369	4,797	13	369	4,797	13	369	4,797
Travel cost: LN2 delivery to field	2,500	9	22,500	2,500	9	22,500	2,500	9	22,500
Total variable cost			**89,958**			**59,605**			**55,539**
Total fixed +variable costs			**96,902**			**73,493**			**69,427**
Total progeny born(30% CR sexed 37% conv/pedigree)			11			13			13
Cost of calf at birth(M+F) ***= total cost / total calf***			**8972**			**5517**			**5212**

***Note**:Sexed semen= $14/ dose &conventional semen $3/dose, Pedgree semen CoP Nu 117/dose: total 72AI/yr /AI Centre(36sexed, 36 conv or Pedegree semen under mixed mating strategy). 1US$=76.65 (7 dec 2021); Cost of LN2: 1L/AIC/day (369L LN2 reqd /AIC/yr),CoP Nu.38/L LN2; LN2 transportation from Yusipang /Kanglung to Dz/Geog estimated to cover 400km/trip x 9 trips (every 42- 45 days)i.e fuel +maintenance of vehicle; 13 calves born with each semen type (conception rate 30% sexed, 37% conv semen): 90% female birth for sexed and 55% conv semen, mortality= 5% of progeny born, DSA:Daily sustainance allowance i.e Nu.1250/day.*

ANNEX III: COST OF PRODUCTION OF CALF BORN-NATURAL SERVICES

Particulars	**Purchase Cost**	**Salvage Value**	**Annual total amount depreciated value(Nu/Yr)**
Fixed cost			
Cost of breeding bull@COP Nu.53370			53370
Shed & silo pit construction cost	30000	5000	1667
Shed maintenance (10% of cost)	3000		3000
Variable cost			
Cost of feeding roughage 30kg@Nu.3/kg (Nu 90/day)	90		32850
Cost of concentrate 2kg/day (Nu26/kg)	52		18980
Cost of minerals	0.3		110
Miscellaneous cost (rope etc)	2		730
Cost of bull attendant 2hrs/day@Nu 317/day or Nu 39.5/hr	79		28835
Total cost involved (Nu)/yr			139541.5
Number services per year one service/week (average)	52		
Number calves born/ year (80% conception rate average)	42		
Cost per calf			**3354**

ANNEX IV: COST OF PRODUCTION OF RAW MILK IN BHUTAN

To determine the cost of production per litre of milk following steps were taken::

- A simple cost-benefit analysis was carried out in the selected cattle rearing districts representing four Agro-Ecological Zones. In each AEZ, two Dzongkhags (two Gewog from each Dzongkhag) that accounts to eight district and 16 sub-districts were selected for the study. A total of 320 dairy units, 80 each from four AEZs were randomly sampled.
- The overall average annual capital investment per dairy unit under smallholder farming system in Bhutan was Nu. 27,258.The highest investment cost was accounted for cow purchase of 38%, followed by 33.63% on farm machinery and equipment.
- The overall, annual average variable cost recorded was Nu. 2, 14,052 per dairy unit, with labour constituting the highest cost of 65%, followed by feed cost of 31%.
- The overall average cost of production (CoP), farm gate price and profit margin recorded for litre of milk were **Nu. 26.85, 38.7 and 11.9**, respectively. The CoP was higher in cooler (Nu. 38.9 / litre) and dryer zones (Nu 31/litre) as compared to that of warmer and wetter zones (Table 1).

Table 1: Average milk production costs (Nu/litre) and profitability of dairy units in different AEZs

Items	Cool temperate	Warm temperate	Dry Subtropical	Wet Subtropical	Total
Cost of Production	38.9	19.8	31	17.9	26.85
Farm gate price	41.8	35.5	38.6	38.9	38.71
Profit margin	2.9	15.6	7.6	21.0	11.87

Further, CoP also significantly differed between the herd sizes ($p<0.05$), where the CoP of smaller herd size (1-5 milking cows) was almost three times higher than the bigger herd size of 6-10 milking cows. However, CoP was not affected by location of the dairy units (table2).

Table 2: Comparison of average milk production costs by herd size and location of dairy units

Variable	Category	N	Mean ± SE	Sig. (2-tailed)
Herd size	1-5 cows	290	28.28±2.51	0.04
	6-10 cows	26	20.92±1.86	
Location of dairy unit	Near the market	202	25.83±3.04	0.56
	Distant from the market	114	28.65±3.54	

Source: Choden *et al*, 2021. Determining cost of milk production in Bhutan, *Bhutan Journal of Animal Science*, Vol. 5(1):9-18(2021)

ANNEX V: COST OF PRODUCTION: ONE KG BUTTER/HEESE (*Datshi*)

Milk (liters)	Cream Output (Kgs)		
100	8.90		
Kg Cream	Kg Butter		
2	1.00		
Milk (liters)	Kg Butter		
100	4.45		
Skim Milk (liters)	Kg Datshi		
20	1.60		
Kg Datshi	Liter Whey		
1	9.00		
Fixed Cost			
Particulars	Cost in Nu.		
Butter Churner 60LPH	95,000.00		
Cream Separator 325LPH	60,000.00		
SS Buckets	1,000.00		
Gas Stove	2,000.00		
Aluminimum Pot	1,500.00		
Freezer	35,000.00		
Total Cost	194,500.00		
Salvage Value	15,000.00		
Depreciable Value	179,500.00		
Life in Years	10.00		
Depreciation (Yearly)	17,950.00		
Depreciation (Monthly)	1,495.83		
Recurring Cost (monthly)			
	Milk Volume	Rate Milk	Total Cost
Raw Milk	30,000.00	39.00	1,170,000
Recurring Shared Cost (monthly)			
Labor Cost	10,000.00		
Electricity	1,000.00		
Water	250.00		
Gas Cylinder	530.00		
Packaging Material	1,000.00		
Total Recurring Cost	12,780.00		
Total Cost	1,184,275.83		
Butter yield (Kgs)	1,335.00		
Datshi Yield (Kgs)	2,400.00		
COP Butter	443.55	Cost of Production = (Fixed Cost + Variable Cost)/Number of Units	
COP Datshi	246.72		

Note: Rate of raw milk based on Farm Gate Price as calculated in CoP

ANNEX VI: COST OF PRODUCTION FROZEN SEMEN AT NDRDC YUSIPANG

Fixed cost		Depreciation %	Remarks 3.5% RGoB PMM
Building cost			
LN2plant building	1225000	42875	3.5% RGoB PMM
Bull shed	400000	14000	
Equipments cost			
Microspcope	951500		
CASA	3285000		
Straw Printer	3223225		
Filling sealing machine	3200000		
Cooling chamber	897683		
Autofreeser with supply tank	1285700		
Total equipment cost	**12,843,108**	**1,333,329**	
Animal Cost	12000*10	120000	
Staff cost			
Thinley Dorji	23920* 12	287040	
Nima	13600*12	163200	
Bull Attendent cost	12000*12	284000	
Variable cost			
Feed cost	226800	226800	3kg/bull for 365days@21/kg
Miscellaneous cost, electricity, water	30000	30000	
Diluent and chemicals	400000	400000	
Medicine, vaccines	20000	20000	
Total Cost		**2921243.66**	
Semen production (average)		**24967**	Average 2017,18,19
Cost of pdn /dose (Nu)		**117**	

***Note** :Total building cost= Nu. 49,00,000.00, one fourth is used for housing semen station, apportioned cost is Nu. 12,25,000.00, Depreciation vlaue= assets cost-salvage value divided by useful life*

ANNEX VII: COST OF PRODUCTION LN2/LITRE AT NDRDC YUSIPANG

Cost calculation of Liquid Nitrogen (LN_2) per litre			
Fixed cost	Cost (Nu.)	Depreciation	**Remarks**
Building cost			
LN2plant building	1,225,000.00	42875	3.5% RGoB PMM
Equipments cost			
LN_2 Plant cost	15,000,000.00	488,775	
scarp value	34.83%		
Useful life	20.00		
Staff cost			
Phub Dorji	23920* 12	325960	salary+EL+LTC
Variable cost			
AMC cost	207000	207000	
Spare parts	300000	30000	10% RGoB PMM
Electricity cost	480000	480000	
Total Cost		1574610	
LN_2produced		41158.5	Mean 2017,2018,2019
Cost of pdn /litre		38.26	**Nu.38 per litre of LN2**

***Note**: Total building cost= Nu.4900000, one fourth is used for housing LN2 Plant=Nu.1225,000(apportioned cost)*

ANNEX VIII: COP JERSEY HEIFERS/BULLS TILL 18 MONTH OF AGE AT FARMERS' FIELD

1. Milk feeding cost of a calf (0 - 90 days) [3 months]

Period of feeding (days)	Quantity feeding (liters)/day	Total quantity fed (litres)	Amount (Nu)
0-5 (colostrums)	Ad-lib	Ad-lib	Nil
14	2	28	1083.9
14	2.5	35	1354.9
14	3	42	1625.8
14	2.5	35	1354.9
28	2	56	2167.8
84	12	196	**7587.2**

Note: Selling price of milk per litre is @ 38.71/ L as per its CoP (Choden et al, 2021)

2. Feeding cost for a yong calf* (3 - 6 Months) [3 months]

Types of feed	Quantity of feed (Kg/day)	Feed required for 3 months	Rate/Kg (Nu)	Amount
Calf starter	1	90	27.7	2493.0
Hay	1	90	5	450.0
Silage	2	180	3	540.0
Green fodder	3	270	2	540.0
Total				**4023.0**

** Avg weight of young calf=80 kg*

3. Feeding cost of an adult calf* (6 - 10 months) [4 months].

Types of feed	Quantity of feed (Kg/day)	Feed reqd. for 4 months	Rate/Kg (Nu)	Amount
Core concentrate	1	120	26	3120
Hay	1	120	5	600
Silage	3	360	3	1080
Green fodder	4	480	2	960
Total cost				**5760**

** Avg weight of adult calf=120kg*

4. Feeding cost for one heifer/ young bull* (10 - 18 months) [8 months].

Types of feed	Quantity of feed (Kg/day)	Feed reqd. for 8 months	Rate/Kg (Nu)	Amount
Core concentrate	1	240	26	6240
Hay	1.5	360	5	1800
Silage	4	960	3	2880
Green fodder	8	1920	2	3840
Total cost				**14760**

** Average weight of Heifer=200kg*

5. Cost of animal attendant per animal [until 18 months].

Labor cost	Animals*	Monthly salary (Nu)	Full day cost (Nu)	Actual cost (Nu)
1 Livestock Attendant	5 calves/ heifers/ young bulls	9500	5700	**1425**

** equates to 15 LU all time @1LU=3 calves & 0.7 heifers*

6. Cost of Vaccination, De-worming & Medication [until 18 months]

Particulars	Types & frequency	Dose rate	Rate (Nu)	Amount (Nu)
Vaccination	FMD x 2/year	2 ml	12	36
	HS & BQ x 1/year	3 ml	22.5	45
	Anthrax x 1/year	1 ml	2	4
Deworming	Albendazole x 1/year	7.5 gm/kg bwt.	23.4	46.8
	Fenbendazole x 1/year	5 gm/kg bwt.	12	24
	Rafoxanide & Levamisole x 1/year	7.5 mg/kg bwt.	8.24	16.48
	Piperazine	10-20 ml/30 kg bwt.	56.25	112.5
Curatives	General medicines	As required	500	1000
Total				**1284.78**

7. A.I. Cost for one animal

Inputs of Artificial Insemination	Quantity (as per AI index)	Rate	Total Nu
Frozen semen (2.5 AI/conception)	2.5	229.95	574.875
AI gloves (1150 for 100 pcs)	2.5	11.5	28.75
A.I. Sheath (235 for 50 pcs)	2.5	4.7	11.75
Liquid nitrogen (LN2) (369L/centre/year)	2.5	38	95
Total			**710.4**

8. Housing cost per animal for 18 months

Average cost per animal (Nu.)	Durability (years)	Depreciation value after 30 years (15%)	Actual value (Nu.)	Amount (Nu.)
50000	30	7500	42500	**2125**

9. Miscellaneous cost per animal

Miscellaneous costs	Total Nu
Farm supplies tools & equipment	**500**

Summary of total expenditure incurred to produce one heifer / young bull of 18 months of age.

Sl.No.	Particulars	Total Nu.
1	Cost of milk feeding for one calf (0-90 days)	7587.16
2	Feeding cost for one calf (90 days-6 months)	4023.00
3	Feeding cost for one adult calf (6-10 months)	5760.00
4	Feeding cost for one heifer/bull (10-18 months)	14760.00
5	Cost of one animal attendant	1425.00
6	Cost of vaccinations & de-wormings	1284.78
7	Cost of A.I. for one animal	710.38
8	Housing cost	2125.00
9	Miscellaneous cost	500.00
CoP of one heifer/bull at Farmers' field		**38,175.32**

Note:
The cost of heifer at farmers' field may vary from the standard CoP calculated depending on type of management provided that is directly proportional to health of animal, exotic inheritance and buying/ bargaining capacity of buyer.

ANNEX IX: COP JERSEY HEIFERS/BULL TILL 18 MONTHS OF AGE AT NUCLEUS FARM

1. Milk feeding cost of a calf (0 - 90 days) [3 months]

Period of feeding (days)	Quantity feeding (liters)/day	Total quantity fed (litres)	Amount (Nu)
0-5 (colustrum)	Ad-lib	Ad-lib	Nil
14	2	28	1083.9
14	2.5	35	1354.9
14	3	42	1625.8
14	2.5	35	1354.9
28	2	56	2167.8
84	12	196	**7587.2**

Note: Selling price of milk per litre is @ 38.71/ L as per its CoP (Choden et al, 2021)

2. Feeding cost for a yong calf* (3 - 6 Months) [3 months]

Types of feed	Quantity of feed (Kg/day)	Feed required for 3 months	Rate/Kg (Nu)	Amount
Calf starter	1	90	27.7	2493.0
Hay	1	90	5	450.0
Silage	2	180	3	540.0
Green fodder	3	270	2	540.0
Total				**4023.0**

** Avg weight of young calf=80 kg*

3. Feeding cost of an adult calf (6 - 10 months) [4 months].

Types of feed	Quantity of feed (Kg/day)	Feed reqd. for 4 months	Rate/Kg (Nu)	Amount
Core concentrate	1	120	26	3120
Hay	1	120	5	600
Silage	3	360	3	1080
Green fodder	4	480	2	960
Total cost				**5760**

** Avg weight of adult calf=120kg*

4. Feeding cost for one heifer/ young bull* (10 - 18 months) [8 months].

Types of feed	Quantity of feed (Kg/day)	Feed reqd. for 8 months	Rate/Kg (Nu)	Amount
Core concentrate	1	240	26	6240
Hay	1.5	360	5	1800
Silage	4	960	3	2880
Green fodder	8	1920	2	3840
Total cost				**14760**

* Average weight of Heifer=200kg

5. Cost of animal attendant per animal [until 18 months].

Labor cost	Animals*	Monthly salary (Nu)	Amount (Nu)
1 Livestock Attendant	30 calves/ heifers/ young bulls	9500	**5700**

* equates to 15 LU all time @1LU=3 calves & 0.7 heifers

6. Cost of technical staff [until 18 months].

Staff	Animals	Monthly salary (Nu)	Amount (Nu)
Technical staff (S3-S1)	30 calves/ heifers/ young bulls	18200	**10920**

7. Cost of Vaccination, De-worming & Medication [until 18 months]

Particulars	Types & frequency	Dose rate	Rate (Nu)	Amount (Nu)
Vaccination	FMD x 2/year	2 ml	12	36
	HS & BQ x 1/year	3 ml	22.5	45
	Anthrax x 1/year	1 ml	2	4
Deworming	Albendazole x 1/year	7.5 gm/kg bwt.	23.4	46.8
	Fenbendazole x 1/year	5 gm/kg bwt.	12	24
	Rafoxanide & Levamisole x 1/year	7.5 mg/kg bwt.	8.24	16.48
	Piperazine	10-20 ml/30 kg bwt.	56.25	112.5
Curatives	General medicines	As required	500	1000
Total				**1284.78**

8. A.I. Cost for one animal

Inputs of Artificial Insemination	Quantity (as per AI index)	Rate	Total Nu
Frozen semen (2.5 AI/conception)	2.5	229.95	574.875
AI gloves (1150 for 100 pcs)	2.5	11.5	28.75
A.I. Sheath (235 for 50 pcs)	2.5	4.7	11.75
Liquid nitrogen (LN2) (369L/centre/year)	2.5	38	95
Total			**710.4**

9. Housing cost per animal for 18 months

Average cost per animal (Nu.)	Durability (years)	Depreciation value after 30 years (15%)	Actual value (Nu.)	Amount (Nu.)
50000	30	7500	42500	**2125**

10. Miscellaneous cost per animal

Miscellaneous costs	Total Nu
Stationeries, Ropes, electricity, utensils, farm tools & equipment (Nu.8000/12/125)	**500**

Summary of total expenditure incurred to produce one heifer / young bull of 18 months of age

Sl.No.	Particulars	Total Nu.
1	Cost of milk feeding for one calf (0-90 days)	7587.16
2	Feeding cost for one calf (90 days-6 months)	4023.00
3	Feeding cost for one adult calf (6-10 months)	5760.00
4	Feeding cost for one heifer/bull (10-18 months)	14760.00
5	Cost of one animal attendant	5700.00
6	Cost of one technical staff cost	10920.00
7	Cost of vaccinations & de-wormings	1284.78
8	Cost of A.I. for one animal	710.38
9	Housing cost	2125.00
10	Miscellaneous cost	500.00
CoP of one heifer/bull at Govt. farm		**53,370.32**

ANNEX X: COST OF PRODUCTION FOR JERSEY COW 1st LACTATION AT FARMER'S FIELD

1. Milk feeding cost of a calf (0 - 90 days) [3 months]

Period of feeding (days)	Quantity feeding (liters)/day	Total quantity fed (litres)	Amount (Nu)
0-5 (colustrum)	Ad-lib	Ad-lib	Nil
14	2	28	1083.9
14	2.5	35	1354.9
14	3	42	1625.8
14	2.5	35	1354.9
28	2	56	2167.8
84	12	196	**7587.2**

Note: Selling price of milk per litre is @ 38.71/ L as per its CoP (Choden et al, 2021)

2. Feeding cost for a yong calf (3 - 6 Months) [3 months]

Types of feed	Quantity of feed (Kg/day)	Feed required for 3 months	Rate/Kg (Nu)	Amount
Calf starter	1	90	27.7	2493.0
Hay	1	90	5	450.0
Silage	2	180	3	540.0
Green fodder	3	270	2	540.0
Total				**4023.0**

3. Feeding cost of an adult calf (6 - 10 months) [4 months].

Types of feed	Quantity of feed (Kg/day)	Feed reqd. for 4 months	Rate/Kg (Nu)	Amount
Core concentrate	1	120	26	3120
Hay	1	120	5	600
Silage	3	360	3	1080
Green fodder	4	480	2	960
Total cost				**5760**

4. Feeding cost for one heifer/ young bull (10 - 18 months) [8 months].

Types of feed	Quantity of feed (Kg/day)	Feed reqd. for 8 months	Rate/Kg (Nu)	Amount
Core concentrate	1	240	26	6240
Hay	1.6	384	5	1920
Silage	4	960	3	2880
Green fodder	5	1200	2	2400
Total cost				**13440**

5. Feeding cost for one pregnant heifer* (18 month - Calving) [+9 months].

Types of feed	Quantity of feed (Kg/day)	Feed reqd. for 9 months	Rate/Kg (Nu)	Amount
Core concentrate	1	240	26	6240
Hay	2.5	600	5	3000
Silage	5	1200	3	3600
Green fodder	15	3600	2	7200
Total cost				**20040**

**Average weight of pregnant heifer=300kg*

6. Cost of animal attendant per animal [until 18 months].

Labor cost	Animals*	Monthly salary (Nu)	Full day cost (Nu)	Actual cost(Nu)
1 Livestock Attendant	5 calves/ heifers/ young bulls	9500	5700	**1425**

** equates to 15 LU all time @1LU=3 calves & 0.7 heifers*

7. Cost of Vaccination, De-worming & Medication [until 18 months]

Particulars	Types & frequency	Dose rate	Rate (Nu)	Amount (Nu)
Vaccination	FMD x 2/year	2 ml	12	36
	HS & BQ x 1/year	3 ml	22.5	45
	Anthrax x 1/year	1 ml	2	4
Deworming	Albendazole x 1/year	7.5 gm/kg bwt.	23.4	46.8
	Fenbendazole x 1/year	5 gm/kg bwt.	12	24
	Rafoxanide & Levamisole x 1/year	7.5 mg/kg bwt.	8.24	16.48
	Piperazine	10-20 ml/30 kg bwt.	56.25	112.5
Curatives	General medicines	As required	500	1000
Total				**1284.78**

8. A.I. Cost for one animal

Inputs of Artificial Insemination	Quantity (as per AI index)	Rate	Total Nu
Frozen semen (2.5 AI/conception)	2.5	229.95	574.875
AI gloves (1150 for 100 pcs)	2.5	11.5	28.75
A.I. Sheath (235 for 50 pcs)	2.5	4.7	11.75
Liquid nitrogen (LN2) (369L/centre/year)	2.5	38	95
Total			**710.4**

9. Housing cost per animal

Average cost per animal (Nu.)	Durability (years)	Depreciation value after 30 years (15%)	Actual value (Nu.)	Amount (Nu.)
50000	30	7500	42500	**2125**

10. Miscellaneous cost per animal

Miscellaneous costs	Total Nu
Stationeries, Ropes, electricity, utensils, farm tools & equipment	**500**

Summary of total expenditure incurred to produce one heifer / young bull of 18 months of age.

Sl.No.	**Particulars**	**Total Nu.**
1	Cost of milk feeding for one calf (0-90 days)	7587.16
2	Feeding cost for one calf (90 days-6 months)	4023.00
3	Feeding cost for one adult calf (6-10 months)	5760.00
4	Feeding cost for one heifer/bull (10-18 months)	13440.00
5	Feeding cost for one pregnant heifer* (18 month - Calving) [+9 months].	20040
6	Cost of one animal attendant	1425.00
7	Cost of vaccinations & de-wormings	1284.78
8	Cost of A.I. for one animal	710.38
9	Housing cost	2125.00
10	Miscellaneous cost	500.00
CoP of a 1st lactation cow at Farmers' field		**56,895.32**

Note: The cost of 1st lactation cow at farmers' field may vary from the standard CoP calculated depending on type of management provided that is directly proportional to health of animal, exotic inheritance and buying/bargaining capacity of buyer.

ANNEX XI: COP FOR JERSEY COW 1ST LACTATION AT NUCLEUS FARM

1. Milk feeding cost of a calf (0 - 90 days) [3 months]

Period of feeding (days)	Quantity feeding (liters)/day	Total quantity fed (litres)	Amount (Nu)
0-5 (colustrum)	Ad-lib	Ad-lib	Nil
14	2	28	1083.9
14	2.5	35	1354.9
14	3	42	1625.8
14	2.5	35	1354.9
28	2	56	2167.8
84	12	196	**7587.2**

Note: Selling price of milk per litre is @ 38.71/ L as per its CoP (Choden et al, 2021)

2. Feeding cost for a yong calf* (3 - 6 Months) [3 months]

Types of feed	Quantity of feed (Kg/day)	Feed required for 3 months	Rate/Kg (Nu)	Amount
Calf starter	1	90	27.7	2493.0
Hay	1	90	5	450.0
Silage	2	180	3	540.0
Green fodder	3	270	2	540.0
Total				**4023.0**

** Avg weight of young calf=80 kg*

3. Feeding cost of an adult calf* (6 - 10 months) [4 months].

Types of feed	Quantity of feed (Kg/day)	Feed reqd. for 4 months	Rate/Kg (Nu)	Amount
Core concentrate	1	120	26	3120
Hay	1	120	5	600
Silage	3	360	3	1080
Green fodder	4	480	2	960
Total cost				**5760**

* Avg weight of adult calf=120kg

4. Feeding cost for one heifer/ young bull* (10 - 18 months) [8 months].

Types of feed	Quantity of feed (Kg/day)	Feed reqd. for 8 months	Rate/Kg (Nu)	Amount
Core concentrate	1	240	26	6240
Hay	1.5	360	5	1800
Silage	4	960	3	2880
Green fodder	8	1920	2	3840
Total cost				**14760**

** Average weight of 200kg*

5. Feeding cost for one pregnant heifer* (18 month - Calving) [+9 months].

Types of feed	Quantity of feed (Kg/day)	Feed reqd. for 9 months	Rate/Kg (Nu)	Amount
Core concentrate	1	240	26	6240
Hay	2.5	600	5	3000
Silage	5	1200	3	3600
Green fodder	15	3600	2	7200
Total cost				**20040**

**Average weight of pregnant heifer=300kg*

6. Cost of animal attendant per animal [until 18 months].

Labor cost	Animals*	Monthly salary (Nu)	Amount (Nu)
1 Livestock Attendant	30 calves/ heifers/ young bulls	9500	**5700**

** equates to 15 LU all time @1LU=3 calves & 0.7 heifers*

7. Cost of animal attendant per animal until until Calving [+ 9 months].

Labor cost	Animals*	Monthly salary (Nu)	Amount (Nu)
1 Livestock Attendant	30 maiden heifers	9500	**5700**

** equates to 15 LU all time @1LU=3 calves & 0.7 heifers*

8. Cost of technical staff [until 18 months].

Staff	Animals	Monthly salary (Nu)	Amount (Nu)
Technical staff (S3-S1)	30 calves/ heifers/ young bulls	18200	**10920**

9. Cost of Vaccination, De-worming & Medication [until 18 months]

Particulars	Types & frequency	Dose rate	Rate (Nu)	Amount (Nu)
Vaccination	FMD x 2/year	2 ml	12	36
	HS & BQ x 1/year	3 ml	22.5	45
	Anthrax x 1/year	1 ml	2	4
Deworming	Albendazole x 1/year	7.5 gm/kg bwt.	23.4	46.8
	Fenbendazole x 1/year	5 gm/kg bwt.	12	24
	Rafoxanide & Levamisole x 1/year	7.5 mg/kg bwt.	8.24	16.48
	Piperazine	10-20 ml/30 kg bwt.	56.25	112.5
Curatives	General medicines	As required	500	1000
Total				**1284.78**

10. A.I. Cost for one animal

Inputs of Artificial Insemination	Quantity (as per AI index)	Rate	Total Nu
Frozen semen (2.5 AI/conception)	2.5	229.95	574.875
AI gloves (1150 for 100 pcs)	2.5	11.5	28.75
A.I. Sheath (235 for 50 pcs)	2.5	4.7	11.75
Liquid nitrogen (LN2) (369L/centre/year)	2.5	38	95
Total			**710.4**

11. Housing cost per animal

Average cost per animal (Nu.)	Durability (years)	Depreciation value after 30 years (15%)	Actual value (Nu.)	Amount (Nu.)
50000	30	7500	42500	**2125**

12. Miscellaneous cost per animal

Miscellaneous costs	Total Nu
Stationeries, Ropes, electricity, utensils, farm tools & equipment (Nu.8000/12/125)	**500**

Summary of total expenditure incurred to produce one heifer / young bull of 18 months of age.

Sl.No.	Particulars	Total Nu.
1	Cost of milk feeding for one calf (0-90 days)	7587.16
2	Feeding cost for one calf (90 days-6 months)	4023.00
3	Feeding cost for one adult calf (6-10 months)	5760.00
4	Feeding cost for one heifer/bull (10-18 months)	14760.00
5	Feeding cost for a maiden heifer (18 month - Calving) [+9 months].	**20040**

6	Cost of one animal attendant	5700.00
7	Cost of animal attendant per animal until until Calving [+ 9 months].	**5700**
8	Cost of one technical staff cost	10920.00
9	Cost of vaccinations & de-wormings	1284.78
10	Cost of A.I. for one animal	710.38
11	Housing cost	2125.00
12	Miscellaneous cost	500.00
CoP of a 1st lactation cow at Govt. farm		**79,110.32**

CONCLUSION

The "Cost of Production" is a term that is commonly used to describe the average cost of producing one unit of output. It is equivalent to the concept of average cost in production and it equates the break-even price.

The Cost of Production is calculated by dividing the total cost per production unit by the estimated yield/unit produced/progeny born. This cost derivation is intended to form guidelines to help farmers/entrepreneurs to set price for marketing of products because only if prevailing market price is above the cost of production, a business or enterprise is earning profit.

The cost of production however will vary in different location/farming environment because of differences in resource costs, exotic blood level of cattle and milk yield. Thus the actual cost of production for any enterprise is likely to be different in various geographical locations and can evolve with time.

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