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



GUIDELINES FOR ESTABLISHMENT OF CONTRACT HEIFER AND BULL PRODUCTION PROGRAM



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Table of content	1
Contributions.....	2
Scope.....	3
Criteria for the establishment of CHBPP:.....	3
1 Pre- selection of areas and breedable animals (Cows/Heifers).....	3
2 Final Selection & Identification of animals:	3
3 Responsibilities of different Stakeholders.....	4
4 Conditions for Procurement of male offspring (Bulls)	6
5 Condition for procurement of female offspring (heifers).....	6
6 Fixing of the procurement cost for breeding bulls	7
Annexure 1: Contract Agreement	8
Annexure 2: Details of Cows/Heifers selected for the CHBPP	9
Annexure 3: Milk recording by lactation.....	10
Annexure 4: Calf growth recording	11

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GUIDELINE FOR ESTABLISHMENT OF CONTRACT HEIFER AND BULL PRODUCTION PROGRAM

Scope

The guidelines for establishment of Contract Heifer and Bull Production Program (CHBPP) shall facilitate the establishment, operation and management of the program. The guideline shall provide comprehensive details on the roles and responsibilities of the different stakeholders for effective implementation of the CHBPP.

Criteria for the establishment of CHBPP:

1 Pre- selection of areas and breedable animals (Cows/ Heifers)

- 1.1 The concerned Livestock Extension Officer (LEO) shall identify potential areas and breedable animals to be included in CHBPP and information provided to the concerned Dzongkhag Livestock Sector (DLS) who in turn will provide information to the Regional Livestock Development Centre (RLDC) and National Dairy Research and Development centre (NDRDC, Yusipang).
- 1.2 The areas should be located outside the approved city / municipality limits.
- 1.3 There should be a minimum of 20 members in the particular area to qualify for formation of CHBPP
- 1.4 Each member should have minimum of one breedable cross bred animals (minimum 50% exotic inheritance)

2 Final Selection & Identification of animals:

- 2.1 **Age:** The age of selected animals should be between breedable age to 8th lactation.
- 2.2 **Pedigree / Genotype and Phenotype:** The pedigree of the animal should show inheritance from only one exotic and Nublang bloodlines. The Animal should have phenotypic characteristics/ traits of desired exotic breed and with > 50% exotic blood inheritance.
- 2.3 **Health status:** The animal selected should be free of infectious and contagious diseases and with no past history of repeat breeding and abortion.

-
- 2.4 **Lactation yield:** The lactation yield of cows or dam's yield for breedable heifers should be more than 1800 liters per lactation.
 - 2.5 **New Establishment:** NDRDC, Yusipang shall be responsible for the final selection of the animals for the establishment of new CHBPP.
 - 2.6 **CHBPP Expansion:** Concerned RLDCs shall be responsible for CHBPP expansion (Selection of new cows / heifers to be part of the existing CHBPP), permissible after 2 years from the date of establishment of the CHBPP in that area.
 - 2.7 **Identification of Selected Animals:** The selected animals will be identified with ear tags with National Bovine Identification Number (NBIN) and allotted an Individual Bovine Register.
 - 2.8 **Progeny Identification:** All progeny born under the CHBPP should be ear tagged within one month after birth by the LEO. (A female progeny under the CHBPP is automatically part of the Program provided its dam is part of CHBPP and its Sire is the Progeny Tested/Genomic Selected exotic semen distributed by NDRDC, Yusipang).
 - 2.9 **Membership:** A farmer shall become member of CHBPP upon signing of the contract agreement as annexed in annexure 1 & 2.
 - 2.10 **Removal of animal from the CHBPP:**
 - a) The animal dies or animal is sold to a farmer residing outside CHBPP area.
 - b) The milk production recorded is less than 1800 liters per lactation
 - c) The contract farmer violates provisions under this guideline.

3 Responsibilities of different Stakeholders

- 3.1 **The Contract farmer** shall be responsible for:
 - a) Detect heat of cows / heifers and bring the animal to the AI centre / designated area on time for insemination.
 - b) Ensure cow in heat is kept away from any breeding bull.
 - c) Report death or sale of animals under the CHBPP to LEO.

3.2 The Livestock Extension Officer shall be responsible for:

- a) Perform Artificial Insemination (AI), with Progeny tested / Genomic selected exotic Semen distributed by NDRDC, Yusipang.
- b) Record AI done and its outcome in the AI register and Individual Bovine Register.
- c) Follow up of AI done to identify repeat breeders and/or abortion cases and report to DLO, RLDC / NDRDC.

3.3 Use of progeny tested /genomic selected semen selected semen

- a) Progeny tested / genomic selected semen shall be used shall be used on animals included in the CHBPP (selected & ear tagged animals of the CHBPP).
- b) Record performances of CHBPP animals until farmers are capable of doing so (Annexure 3 & 4).
- c) Train farmers to record test day milk yield once a month for the first ten months. (The test day should be on the same date of the month plus minus one day).
- d) Train farmers to measure growth rate of calves once a month during the test day milk recording for the first 12 months after calving.
- e) Maintain database for the CHBPP.
- f) Carry out preventative and curative health care services on priority to CHBPP animals.

3.4 Dzongkhag Livestock Sector shall be responsible for:

- a) Maintenance of online and offline data base.
- b) Ensure update of monthly milk and calf growth records in the database.
- c) Ensure submission of monthly progress report to the respective RLDC.
- d) Provide technical backstopping to the CHBPP areas.

3.5 Regional Livestock Development Centre shall be responsible for

- a) Technical backstopping of the CHBPP in the region.
- b) Timely distribution of Progeny tested/Genomic selected exotic Semen and other AI inputs in the region.
- c) Submission of quarterly report to NDRDC, Yusipang.

3.6 National Dairy Research & Development Centre shall be responsible for;

- a) Technical backstopping of the program at the national level.
- b) Timely distribution of Progeny tested/Genomic selected exotic Semen and other AI inputs to RLDCs.
- c) Provide feedback on performance of CHBPP to RLDCs, Dzongkhags and Department on an annual basis.

4 Conditions for Procurement of male offspring (Bulls)

The male progenies shall be procured if the following conditions are fulfilled:

- 4.1 The progeny born is from Dam under CHBPP and the Sire is progeny tested/genomic selected semen.
- 4.2 The male progeny is between 18-36 months of age.
- 4.3 Semen evaluation (spermeogram) is done and found fit for breeding.
- 4.4 Phenotypic character of the bull matches with the characteristic of the particular breed.
- 4.5 Bull is vaccinated, dewormed and free from infectious and contagious diseases.
- 4.6 The procurement of bulls shall be done based on demand of breeding bulls from the Dzongkhags.

5 Condition for procurement of female offspring (heifers)

- 5.1 Contract farmers willing to sell the CHBPP heifers (empty/pregnant) should inform the concerned Gewog Livestock Extension Agent
- 5.2 The LEA should compile and submit the list and number of heifers available for sale to the Dzongkhag.
- 5.3 The procurement / selection committee from NDRDC / RLDC and concerned Dzongkhag will explore the market for the contract farmers.

5.4 The heifers for sale should fulfill the following conditions for sustainability and reputation of program;

- a) **Pedigree:** The heifer is born from dam under CHBPP and the Sire is progeny tested/genomic selected semen.
- b) **Records:** The heifer should have clear pedigree and other relevant information recorded in the Individual Bovine Register
- c) **Phenotype & genotype:** The Animal should have phenotypic traits of exotic breed and with > 50% exotic inheritance.
- d) **Age:** The age of heifer should be above 1 year of age.
- e) **Health status:** The animal should be free of infectious and contagious diseases.
- f) **Pregnant heifers:** Pregnant heifers for sale should have proper record of AI with progeny tested/genomic selected semen and pregnancy confirmed by a competent Veterinarian.

6 Fixing of the procurement cost for breeding bulls

- 6.1 The procurement cost for the CHBPP progeny (bulls) payable to farmers shall be as per prevailing approved rates Royal Government of Bhutan.
- 6.2 The criteria for selection of top bulls shall depend on the following conditions;
 - a) Dam's milk yield
 - b) Libido
 - c) Growth rate and its age
 - d) Phenotypic characters
 - e) Health status (BCS)

Annexure 1: Contract Agreement

CONTRACT AGREEMENT

I, _____ bearing Citizenship
ID Card No _____ Thram No. _____
from Village _____ Gewog _____
Dzongkhag _____. enter into the Contract with the
CHBPP for improvement of dairy breeds and production of pure/cross-bred
heifers and bulls as per CHBPP guidelines.

(Affix Legal Stamp)

Farmer Signature _____

Farmers Name _____

RNREC staff Signature & Date _____ Gup Signature & Date _____

RNREC staff Name _____ Gup Name _____

Signature & Date : _____

DLO's NAME _____

RD Signature & Date _____

RLDC Name : _____

Signature & Date _____

Program Director or representative Name _____

Annexure 2: Details of Cows/Heifers selected for the CHBPP

Sl. No.	NBIN of Animal	Age	Breed	Blood label	Name / NBIN of Dam	Name / NBIN of Sire
1						
2						
3						
4						
5						
6						
7						
8						
9						
10						
11						
12						
13						
14						
15						
16						
17						
18						

LEC Staff Name_____

Signature_____

Annexure 3: Milk recording by lactation

ཨོམ་གྱི་སྐོར་བོད་དུ་ MILK RECORD

བོད་ཐེ་ཨང་། LACTATION ^o	
སྐྱེས་པ་དང་མངལ་བཤལ་གྱི་ཆེས་ལྷན་། DATE OF CALVING / ABORTION	
ལྷན་ནང་ལུ་བོད་ཐེ་གྱི་ཨོམ་འཐུང་པའི་ཨང་། NUMBER OF MONTHS THE CALF SUCKLES:	

འཇལ་ཆད་ཨང་། NO OF MEASUREMENT	ཆེས་ལྷན་ལོ་ལྷན་ལོ་། DATE: DD/MM/YY	ཨོམ་གྱི་འཐུན་བསྐྱེད་ཆད་འཇལ་། MILK PRODUCTION MEASUREMENT (L)			མར་གྱི་བརྒྱ་ཆ་། MILK FAT (%)	སྐོར་བོད་མི་གིས་མིང་དང་རྟགས་ལྷན་། NAME AND SIGNATURE OF RECORDER
		བོ་པ་། MORNING	ཕྱི་རྒྱ་། EVENING	སྐོར་ལྷན་། TOTAL		
1						
2						
3						
4						
5						
6						
7						
8						
9						
10						

Production of lactation n^o.....:

Total A = **Total milk harvested (305 days)** = 30,5 x (total 1 + total 2 + total 3....+ total 10) = Total B = **Total milk suckled by calf** = (1,5 L) x (30,5 days) x (n^o months calf suckled) = Total C = Total milk produced by cow = Total A + Total B

Annexure 4: Calf growth recording sheet

གཟུགས་ཡར་མཐུད་ཐོ་བཀོད་ / GROWTH RECORD

སྤྱི་པ་འཛིན་པ། Date of birth	
ཐོ་མོ། sex	

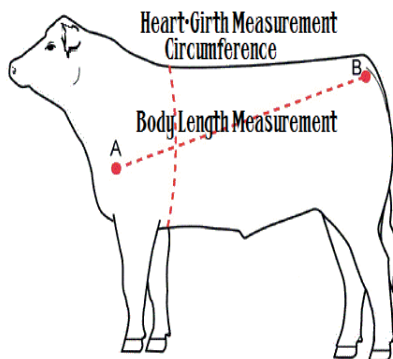
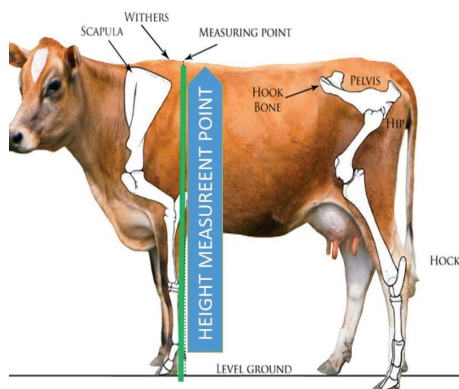
འཇལ་ཚད་གྲངས། No of Measurement	ཚེས་ཉིན་ལོ། Date -dd/mm/ yy	རིང་ཐུང་འཇལ་ཚད། Length Measurement	སྤྱི་ཐར་རིང་ཚད། Wither Height Measurement	གྲུ་འཇལ་ཚད། Girth Measurement	ལྷིང་ཚད་ཕྱིས། Weight Estimate Refer attached *
1					
2					
3					
4					
5					
6					
7					
8					
9					
10					

Body length: From point of shoulder horizontally to pin bone

Height at withers: From wither vertically to the toe

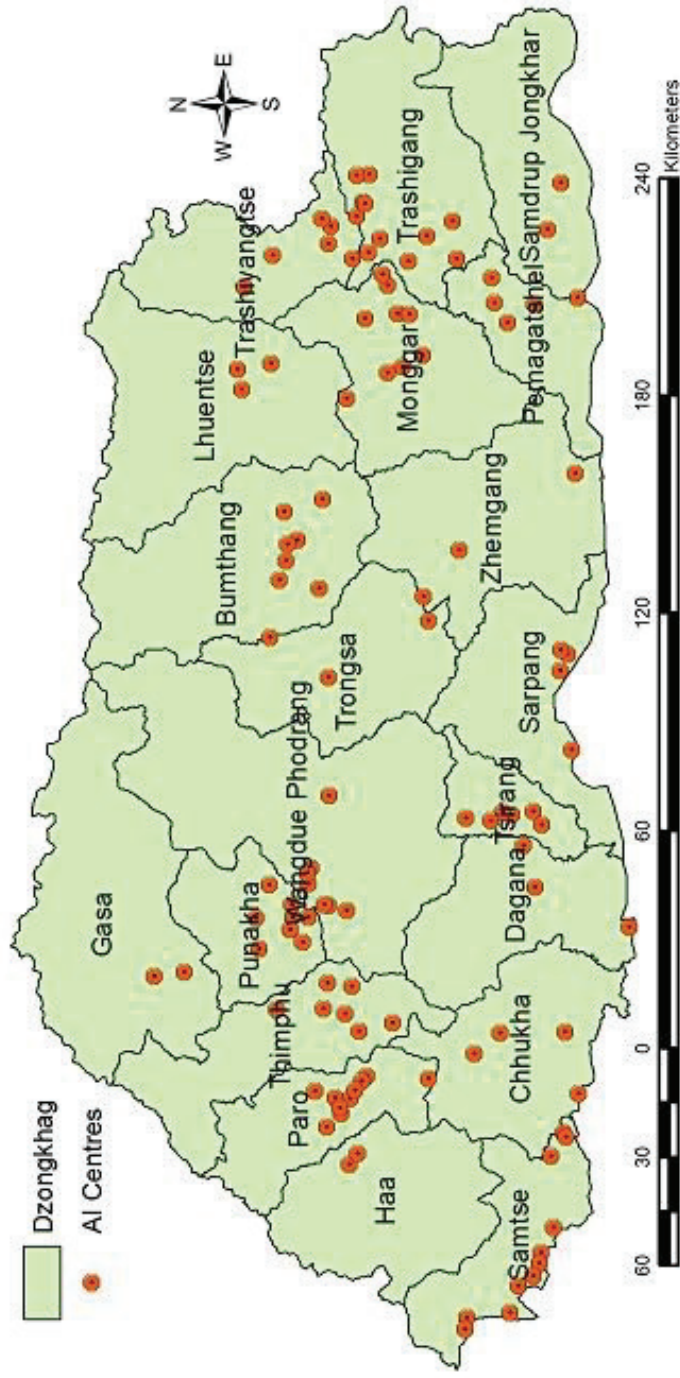
Girth: Chest circumference behind wither close to fore limbs

Calf Recording techniques and reference



Live Weight calculation of calf using measuring tape and its conversion cm to kg

Calves		Heifers		Cows	
Girth size (cm)	Live-weight (kg)	Girth size (cm)	Live-weight (kg)	Girth size (cm)	Live-weight (kg)
45	15	108	112	172	420
47	17	110	118	174	435
49	19	112	124	176	451
51	21	114	130	178	467
53	23	116	137	180	483
55	25	118	143	182	500
57	27	120	150	184	516
59	29	122	158	186	534
61	31	124	166	188	552
63	33	126	174	190	570
65	35	128	182	192	590
67	37	130	190	194	610
69	39	132	198	196	631
71	41	134	206	198	653
73	43	136	214	200	675
75	45	138	222	202	697
77	47	140	230	204	720
79	49	142	240	206	
81	51	144	248	208	
83	55	146	256	210	
85	59	148	264	212	
87	63	150	272	214	
89	67	152	280	216	
91	71	154	290	218	
93	75	156	301	220	
95	79	158	313	222	
97	83	160	325	224	
99	87	162	333	226	
101	92	164	366	228	
103	98	166	378	230	
104	103	168	392	232	
106	106	170	406	234	



AI Outreach Stations spread across the country



YOGURT MANUFACTURE



YOGURT

Yogurt is a dairy product produced by the fermentation of milk using selective bacterial cultures. The bacteria used for the production of yogurt is known as yogurt cultures that ferments lactose into lactic acid and acts upon the milk proteins to produce the characteristic yogurt flavor and texture.

RAW MATERIALS REQUIRED

- Milk of very good quality (low acidity and low microbial count)
- Yogurt Cultures (*Streptococcus thermophilus* and *Lactobacillus delbrueckii subsp. bulgaricus*)
- Skim milk powder or Whey protein powder

Skim milk powder



Yogurt Cultures

DETAILED MANUFACTURING PROCESS

Selection of Raw Materials

The raw milk selected for the product must support good growth of the culture and should be fresh, have normal milk composition, be free from mastitis and other diseases, be free from antibiotics and other inhibitors, be free from off-flavours and have low bacterial count. It is important to conduct all necessary platform tests on the milk supplied and to reject milk that fails the platform tests.

Standardization and pre-treatments

Standardization of milk to meet requirements for fat and SNF (Solids-not-fat) will have to be carried out by the manufacturer. Ideally, good quality set yoghurt is obtained from milk having 13-15% total solids. Milk fat contributes to flavour and richness of the product. About 3% fat is sufficient to have good quality product, while SNF can be increased to 10-12% by supplementation with skim milk powder.

It is important to select ingredients of the highest quality to avoid contamination of milk and ensure a good end product.

Homogenization

Homogenization of the milk at 100 Kg/cm² at 60-70 °C can be carried out as an optional step and is useful to provide uniform mixing of all raw materials, reduce the problem of fat separation in curd and improve gel stability.

However, the homogenizer and the interconnecting pipes can be an additional source of contamination if it is not properly cleaned it may add to the total micro flora of the milk.



Homogenizer

Heat treatment

The heat treatment destroys pathogenic microbes and makes the milk safe for human consumption and is considered as the critical control point (CCP) in HACCP program for yogurt. It is therefore important to ensure that after heat treatment, the milk should not get contaminated by extraneous microorganism. Milk for yogurt manufacture must be heated to and held at one of the following time temperature combinations: 80 °C for 30 minutes or 85 °C for 20 minutes or 90 °C for 10 minutes or 95 °C for 5 minutes

This high heat treatment is also useful for supporting good growth of the culture as it destroys other competing micro flora giving free ground for the starters to proliferate. It also inactivates natural inhibitory substances in milk, produces some growth stimulating agents for starters and denatures whey proteins to improve gel stability



Yogurt Vat



Cream separator

- Poor quality raw milk (high numbers of microbes)
- Contamination with bacteriophage
- Poor hygiene of production personnel
- Lack of Good Manufacturing Practices

EQUIPMENTS REQUIRED

- Yogurt Vat (heating up to 90 - 95°C)
- Cream separator
- Incubation chamber
- Cold storage
- Yogurt cups and lids

CONSTRAINTS FOR PRODUCTION

- Milk with antibiotic/antibiotic residues
- Poor hygiene in plant
- Post production contamination of product
- Poor HACCP control in plant

Incubation

After heating, the milk is cooled to the incubation temperature of 42-45 °C for addition of starter culture. Incubation of starter culture should be carried out as fast as possible to prevent the growth of unwanted microbes. The inoculated milk should be uniformly mixed prior to filling in containers.

The milk is inoculated with active yogurt cultures comprised of *Streptococcus thermophilus* and *Lactobacillus delbrueckii subsp. bulgaricus* at the rate of 2% (v/v) of milk. Usually both the cultures are added in equal proportion (1% each).

Filling in retail packs

The inoculated milk is filled in retail containers before incubation. The packing material must efficiently be treated, sanitized to minimize contamination as risk of mould and bacterial spores decreases shelf-life.

Incubation

Incubation temperature should be kept 42 - 45 °C. The period of incubation varies between 3 - 6 hours depending upon the rate of acid production by the culture in the milk. However, the best end point to stop fermentation is just after the milk sets. Setting takes place at about 0.6% acidity and the remaining acidity required in the product can develop while cooling. During incubation, the milk is very sensitive to mechanical disturbances and other changes. Hence, it should not be disturbed.

Cooling

As soon as the curd sets or desired acidity in the product is achieved, it must be cooled. Cooling is done to reduce the rate of multiplication of starter cultures and stop their growth at the end of cooling. This is essential to avoid over acidification in the product.

The rate of cooling affects the quality characteristics of the product and should be decided according to the per cent lactic acid expected in the final product. Rapid cooling may lead to more contraction of gel and separate more whey, while too slow cooling may sour the product. In yogurt, two stage cooling is preferred, i.e. in first stage cooling from 42°C to 20°C and in the second stage from 20°C to 5°C in cold store.

Storage

The yogurt must be stored at less than 5°C to ensure growth inhibition of starters and non-starter microorganism. Temperature fluctuations or temperature increases during storage will promote the growth of culture as well other microorganisms and will make the product sour or produce other defects. Hence, maintenance of temperature during storage is very important. The distribution of the finished product should always be through cold-chain facilities.

A good quality yogurt has shelf-life of 2-3 weeks at 5°C.

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