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Member Secretary: Ms. Tashi Choden

BHUTAN STANDARD FOR ANIMAL FEED, FEED MILL AND RAW MATERIALS

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Contents

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To update the Table of Contents please select it and press "F9".

Foreword	iii
Introduction	iv
1.1 Scope	1
1.2 Normative References	1
1.3 Terms and Definitions	1
2.1 Raw Material Production For Animal Feed	3
3.1 Feed Production (Feed Manufacturing)	4
4.1 Quality Control.....	7
5.1 Complaints, Product Recall And Advice	7
6.1 Nutrient Requirement Specifications Of Animal Feeds.....	7
Annexure I	8
Annexure II	8
Annexure III	9
Annexure IV	9
Annexure V	10
Annexure VI.....	10
Annexure VII.....	11
Annexure VIII.....	11
Annexure IX.....	12
Annexure X.....	12

Foreword

This Bhutan Standard for animal feed, feed mill and raw materials was adopted by Bhutan Standards Bureau after the draft finalization by the Food and Agriculture Technical Committee had been approved by the Standardization Council and endorsed by BSB Board.

Introduction

The demand for livestock products is increasing with better national economy and higher disposable income for Bhutanese citizens. Accordingly, the production has to respond to demand resulting intensive productions systems with domestically processed as well as imported inputs. Bhutan already has five domestic feed mills with annual production capacity of 57,000 tons. Additionally, some eight (8) Indian feed companies are registered with BAFRA for the import of livestock feeds. In order to ensure that the feeds fed to animals are safe, hygienically processed and meets the minimum nutrient requirements, this Bhutan Standards for Animals feed, Feed mills and Raw materials is timely and a necessary document.

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BHUTAN STANDARD FOR ANIMAL FEED, FEED MILL AND RAW MATERIALS

1.1 Scope

The Bhutan standard for animal feed, feed mill and raw materials covers and defines the minimum requirements and specifications for raw material production and processing, feed production and processing, products (feeds); and roles and responsibilities of different stakeholders in feed throughout the livestock production chain. The document is intended for reference and adherence by all raw material producers and suppliers, feed manufacturers/feed millers, feed importers, feed sale agents, feed users (farmers, farms and livestock producers), feed transporters and government agencies involved in feed production and quality control for animal feeds.

1.2 Normative References

The following documents are indispensable for application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including amendments) applies.

1. Singh, S.B. (2003). 'Basics of Animal Nutrition and Feed formulation using solver program', Training program for livestock officials in NRTI, Lobesa, 25-31 September, 2003.
2. Singh, S.B. and Gyeltshen, J. (2006). 'Feeds and Feeding Strategies for Bhutan'. Project Consultation report on Feed and Fodder, NFFDP, DoL.

1.3 Terms and Definitions

For the purpose of this standard the following definitions shall apply

1.3.1 Agronomists: an expert in soil management and field-crop production

1.3.2 Animal/Livestock: Refers to pig, poultry, cattle, sheep, goat, equine, fish, buffalo, yaks, other aquatic cultures and pets (dogs, cats, rabbits etc)

1.3.3 Conduits: a passage (a pipe or tunnel) through which water or electric wires can pass

1.3.4 Contamination: state of being contaminated

1.3.5 Crates: a rugged box (usually made of wood)

1.3.6 Contagious diseases: any disease easily transmitted by contact

1.3.7 Competent authority: refers to Department of Livestock, MoAF

1.3.8 Disinfect: destroy microorganisms or pathogens by cleansing

1.3.9 Disinfectants: an agent that destroys microorganism that carry disease

1.3.10 Detergents: a cleansing agent

1.3.11 Disinfection: treatment to destroy harmful microorganism

1.3.12 Errors: a wrong action attributable to a bad judgment

1.3.13 Feed Mill: Refers to the establishment having facilities to produce or manufacture animal feeds

1.3.14 Genetically modifies seeds: Non natural (manipulated using technologies)

1.3.15 Hazards: an unknown and unpredictable phenomenon that causes an even to result one way rather than another

1.3.16 Implications: something that is inferred

1.3.17 Litter: rubbish carelessly dropped or left about

1.3.18 Mycotoxin: a toxin produced by a fungus

1.3.19 Moulds: a fungus that produces a superficial growth on various kinds of damp or decaying organic matter

1.3.20 Mouldy: covered with or smelling of mold

1.3.21 Prohibited: excluded from use or mention

1.3.22 Pest: any unwanted and destructive insect / rodents

1.3.23 Potable: any liquid suitable for drinking

1.3.24 Raw Materials: Refers to materials used in feed production and processing (feed ingredients).
Eg. Maize, rice bran, vitamins, minerals etc.

1.3.25 Sewage: waste water carried away in sewers or drains

1.3.26 Sanitizing: make sanitary by cleansing or sterilizing

1.3.27 Potable: any liquid suitable for drinking

1.3.28 Zoonoses: an animal disease that can be transmitted to human

2.1 Raw Material Production For Animal Feed

Definition: Raw materials for animal feed production refer to those products / produces which are used in compounding/ manufacturing complete animal feeds.

2.1.1 Types of raw materials

Raw materials for animal feed production are grouped broadly into two (2) categories namely bulk ingredients and feed additives based on their functions and the quantity of use in the feed. Accordingly, the bulk feed ingredients can be grouped into:

- a) Energy feeds** which provide energy to the diet of animals such as maize, wheat, barley, oat, and other cereals and molasses etc;
 - b) Protein feeds** which provide protein to the diet namely rice bran, soybean meal, fish meal, mustard oil cakes, peanut cakes, sunflower oil cakes etc;
 - c) Minerals (macro-minerals)** mainly calcium, phosphorus and potassium.
- Similarly, the feed additives are **a) Vitamins** (A, D, E, K, B vitamins etc); **b) Enzymes**, **c) Trace minerals**, **d) Toxin Binders**, **e) Antioxidants**.

2.1.2 Conditions for Raw material production:

Raw material producers (individual farmers, farmers' groups, companies, entrepreneurs) for animal feed shall ensure that the raw materials are produced following the good management practices in their farms, factories and plants. Emphasis should be given to prevent, eliminate or minimize hazards during subsequent processing (feed production) that would further have the potential to compromise feed safety and quality. Guides to good manufacturing practices shall include appropriate information on hazards arising in raw material production and actions to control hazards such as:

- a) the control of contamination of heavy metals and radioactive materials;
- b) the use of water, organic waste and fertilizers;
- c) the correct and appropriate use of plant protection products and biocides and their traceability;
- d) protective measures to prevent the introduction of contagious diseases transmissible to animals and humans through raw materials and any obligation to notify the competent authority;
- e) Measures to control contamination arising from the air, soil, water, fertilizers, plant protection products, biocides, veterinary medicinal products and handling and disposal of waste.

2.1.3 Storage and transport of Raw materials

Raw material producers shall ensure that the raw materials are produced hygienically, cleaned and packed appropriately to avoid contamination and spoilage during storage and transportation. Raw materials should be stored in cool and dry place free of rodents and other pests.

Raw materials shall be transported to the feed factories / feed mills with utmost care avoiding damage on the way.

2.1.4 Import of Raw Materials

The import of raw materials for use in feed production will require certification by appropriate authority/confirmatory accreditation body for import.

3.1 Feed Production (Feed Manufacturing)

Definition: Feed milling refers to the process involved in blending /compounding different feed raw materials into a complete diet containing a prescribed set of nutrients for a particular category and animal species. For instance, a layer ration is a complete diet containing all required nutrients for egg laying.

3.1.1 Location of feed plant / feed mill

The feed manufacturing plant / feed mill should be located at least 200 m away from the populated human settlement / town to avoid for bio-security reasons. However, it shall be accessible by road for transportation of raw materials and finished feeds. The plant shall have adequate space to facilitate adequate movement of vehicles.

3.1.2 Infrastructure requirement

A feed plant shall have a mill house and store for raw materials and finished feeds according to the capacity of the plant. A separate office building is required along with attached in-house laboratory facilities where possible. The lay-out and design of the mill house construction should be done in a manner that facilitates efficient and convenient working system whereby the raw materials go in from one side and finished feeds come out from the other side. The structure should also have the appropriate loading and unloading ramps to facilitate loading and unloading of raw materials and finished feeds. Other requirements for feed plants are as given below:

- a. The buildings must have adequate natural and/or artificial lighting.
- b. Drainage facilities must be adequate for the purpose intended; they must be designed and constructed to avoid the risk of contamination of animal feeds.
- c. Water used in feed manufacture shall be of potable quality for animals; the conduits for water shall be of an inert nature.
- d. Sewage, waste and rainwater shall be disposed off in a manner which ensures that equipment, the safety and quality of feed is not affected. Spoilage and dust shall be controlled to prevent pest invasion.
- e. Windows and other openings must, where necessary, be fitted with pest-proof netted screens. Doors must be close-fitting and pest-proof when closed.
- f. Where necessary, ceilings and overhead fixtures must be designed, constructed and finished to prevent the accumulation of dirt and to reduce condensation, the growth of undesirable moulds and the shedding of particles that can affect the safety and quality of feed.
- g. The immediate surroundings of the feed plant shall be kept clean, and effective pest control program implemented.

3.1.3 Machineries and accessories

The feed processing machineries include grinders, mixers, storage bins, conveyors, pre-mixers, boilers, steamers, pelleting machines, and silos for raw materials. The accessories consist of weighing scales of various capacities for weighing bulk feed ingredients, feed additives and finished feeds, trolleys, bag sewing machines and other tools. The feed producer/ feed miller shall ensure that the following measures are taken for the smooth functioning of the plant, minimize contamination and the safety of the workers.

- a) Machineries, equipment and tools used for manufacturing feed shall undergo appropriate and regular checks for the safety of the workers and the smooth functioning in accordance with written procedures pre-established by the feed plant.
- b) All scales and metering devices used in the manufacture of feeds should be appropriate for the range of weights or volumes to be measured and tested for accuracy regularly.
- c) All machineries and equipment used in the manufacture of feeds including storage facilities, containers, crates, and vehicles shall be cleaned and disinfected regularly to minimize contamination.

3.1.4 Human Resource

Feed businesses must have sufficient staff possessing the skills and qualifications necessary for the manufacture of the animal feed.

- a) An Animal Nutritionist or a qualified person responsible for production must be designated for all technical advice related to feed production. However, if the feed mill does not have their own Nutritionist, a Nutritionist or a competent personal in the Government agency or a private organization can be consulted for technical advice on animal feeds.
- b) An organization chart setting out the qualifications (e.g. diplomas, professional experience) and responsibilities of the supervisory staff must be drawn up and made available to the competent authorities responsible for inspection.
- c) All the staff must be informed clearly in writing of their duties, responsibilities and powers, especially when any change is made, in such a way as to avoid any deviation on feed quality.
- d) Other persons, such as veterinarians, agronomists and farm technicians, may assist the feed millers with the keeping of records relevant to the activities they carry out in the farm.

3.1.5 Feed Production

Feed millers must ensure that the different stages of production are carried out according to pre-established written procedures and instructions aimed at defining, checking and mastering the critical points in the manufacturing process.

- a) The Feed millers shall manufacture the feeds for different categories and species of animals as per the nutrient requirement specification provided by the Department of Livestock which are subject to change according to the breeds, species, sex, stage of production etc as given in the Annexure I-X.
- b) Technical or organizational measures must be taken to avoid or minimize, as necessary, any cross-contamination and errors. There must be sufficient and appropriate means of carrying out checks in the course of manufacture.
- c) Waste and un-saleable materials should be isolated and identified. Any such materials containing hazardous levels of veterinary drugs, contaminants or other hazards shall be disposed off in an appropriate way and not used in feed production.

3.1.6 Use of Antibiotics, Steroids and Coccidiostats in feeds

The use of antibiotics and steroids in animal feeds shall not be allowed in Bhutan to minimize the risk (development of antimicrobial resistance, AMR) in humans and animals. This shall be monitored regularly by the concerned government agencies of the Ministry of Agriculture and Forests and Ministry of Health.

For, the use of certain growth promoters such as coccidiostats, the concerned feed producers shall seek the advice and approval from competent technical authority.

3.1.7 Packing, Storage and Transport

The feed mill should be designed in such a way to facilitate separate storage of raw materials and processed feeds. Processed feeds shall be separated from unprocessed raw materials in order to avoid any cross-contamination of the processed feed. The feed mill shall adhere to and abide by the following conditions:

- a) Appropriate packaging materials shall be used with adequate labels indicating the quantity, nutrient content, date of manufacture, type and category of feed.
- b) Feeds shall be stored in dry and cool conditions using appropriate stacks and support. Those feeds which are processed first shall be dispatched first.
- c) Micro-ingredients namely vitamins, trace minerals, amino acids and other feed additives, shall be stored separately from other raw materials under cool and dry conditions.
- d) Feeds shall be transported in suitable containers to avoid any cross-contamination and prevent deterioration. The transporter shall also take the full responsibility to deliver the feeds safely to the destinations.
- e) Any spoilage shall be minimized and kept under control to reduce pest invasion.
- f) Facilities should be provided to maintain low temperatures as possible to avoid condensation and spoilage.

3.1.8 Bio-Security

Bio-security is quite crucial to prevent cross contamination of feeds and spread of zoonotic infections to and from the feed plant. The feed millers shall enforce appropriate bio-security measures by restricting the outsiders from getting inside the feed plant and provide dipping vats, disinfectant shower of vehicles and foot dips for vehicles and people getting inside the feed plant.

- a) The feed mills shall also ensure that all containers and equipment used for transport, storage, conveying, handling and weighing are kept clean all the time. Further, the feed millers shall take adequate measures, as appropriate:
- b) to keep clean and, where necessary after cleaning, to disinfect in an appropriate manner facilities, equipment, containers, crates and vehicles used for producing, preparing, grading, packing, storing and transporting raw materials;
- c) to prevent, as far as possible, animals and pests from causing contamination;
- d) to store and handle wastes and hazardous substances, separately and securely, so as to prevent contamination;
- e) to ensure that packaging materials are not a source of contamination for feed;
- f) to take account of the results of any relevant analyses carried out on samples taken from raw materials or other samples relevant to feed safety.

3.1.9 Record Keeping

Feed manufacturers / millers, except those who function as dealers/suppliers shall maintain the records on:

- i) Raw materials and feed additives indicating type, source, and quantity;
- ii) Processed feed indicating type, category and quantity with manufacturing and dispatch dates;
- iii) Quality control system including the tests and their results;
- iv) Measures put in place to control hazards in an appropriate manner;
- v) SOPs of the feed plant.
- vi) use of genetically modified seeds and products such as grains;

- vii) any occurrence of pests or diseases that may affect the safety of feeds;
This set of documents must be kept so that it is possible to trace the manufacturing history of each batch of feed and raw materials to establish responsibility if complaints arise. These set of relevant information contained in these records must be made available to the competent authority when required.
- viii) All feed importers and suppliers shall keep in registers records of relevant data comprising purchase, production and sales of feeds for effective tracing from source to the final destination.

4.1 Quality Control

- 4.1.1** A qualified person responsible for quality control must be designated.
- 4.1.2** Feed millers must, as part of a quality assurance scheme, have access to a laboratory with adequate staff and equipment to guarantee and check the quality of feeds as per the standards set by the competent authority.
- 4.1.3** A quality control plan must be drawn up in writing and implemented, to include, in particular, checks on the critical points in the manufacturing process, sampling procedures and frequencies, methods of analysis and their frequency, compliance with the specifications.
- 4.1.4** Samples of feed ingredients and each batch of feed produced shall be tested in authorized nutrition laboratories as required and retained in order to ensure traceability. The samples must be sealed and labeled for ease of identification; they must be stored under conditions which prevent any abnormal change in the composition of the sample or any adulteration. They must be kept at the disposal of the competent authorities for a period appropriate for the use to which the feed is placed in the market.
- 4.1.5** Any feed imported from outside shall also conform to the standard specifications given by the competent authority. The imported feed shall be tested in the laboratories for various parameters as required and shall be allowed only after meeting all the requirements as prescribed by the competent authority.

5.1 Complaints, Product Recall And Advice

- 5.1.1** Feed millers and suppliers shall implement a system for registering and processing complaints.
- 5.1.2** They shall be in a position to introduce, where necessary, a system for the prompt recall of products in the distribution network. They shall define by means of written procedures the destination of any recalled products, and before such products are put back into circulation they must undergo a quality-control reassessment and adopt corrective measures and preventive actions (CAPA).
- 5.1.3** The feed millers / suppliers should provide necessary advice on the proper handling, feeding, storage and transportation of the feeds. This can be supplemented with advice on good management of the herd, flock and animals.

6.1 Nutrient Requirement Specifications Of Animal Feeds

The nutrient requirement specifications for different categories of livestock, poultry and fishes are governed by the species, sex and stage of growth and production. Further, the nutrient requirement specifications are also given by the companies based on their experience with the particular breed, strains etc. For instance, the nutrient requirement for hyline silver brown (HSB) layer is provided by the Australian company which supplied this particular breed/strain

to Bhutan. The nutrient requirement specifications for different categories of livestock, poultry and fishes areas given in the following (Annexure I – X):

Annexure I

Nutrient Requirement Standard for Layers

Nutrients in Feed	Chick Starter	Chick Grower	Pre-layer	Layer
ME (Kcal/kg)	2750	2900	2735	2780
CP %	19	16	16	17
Lysine (%)	1.10	0.90	0.77	0.93
Meth (%)	0.45	0.40	0.37	0.45
Ca (%)	1.00	1.00	2.50	4.00
Available P (%)	0.45	0.40	0.48	0.44

Annexure II

Nutrient Requirement Standard For Broiler

Nutrients in Feed	Broiler Starter	Broiler Grower	Broiler Finisher
ME (Kcal/kg)	2900	2700	3000
CP %	20	16	18.7
Lysine (%)	1.15	1.00	0.90
Meth (%)	0.48	0.38	0.37
Ca (%)	1.00	1.25	1.00
Available P (%)	0.50	0.35	0.50

Annexure III

Nutrient Requirement For Pigs

Nutrients	Creep	Starter	Grower	Finisher	Breeding gilts	Sow Ration	Boar
DE (kcal/kg)	3500	3300	3300	3300	3450	3300	3400
CP (%)	20	16	14	13	12	13	12
Lysine (%)	0.96	0.70	0.61	0.57	0.43	0.58	0.43
Meth (%)	0.56	0.51	0.40	0.30	0.23	0.36	0.23
Ca (%)	0.80	0.60	0.55	0.50	0.75	0.75	0.75
Available P %	0.60	0.50	0.45	0.40	0.60	0.50	0.60

Annexure IV

Nutrient Requirement Standards For Dairy

Nutrients	< 8 l/day	8-13 l/day	13-18 l/day	>18 l/day	Dry pregnant	Heifer/ bulls	Calf
CP (%)	13	14	15	16	11	12	16
ME (kcal/kg)	2360	2530	2710	2890	2230	2230	3120
TDN (%)	63	67	71	75	60	60	80
Ca (%)	0.43	0.48	0.54	0.60	0.37	0.40	0.60
P (%)	0.31	0.34	0.38	0.40	0.26	0.26	0.43

Annexure V
Nutrient Requirement Standard For Turkey

Nutrients	Pre-Starter	Starter	Developer	Breeder
ME (Kcal/kg)	2800	2900	3000	2900
CP (%)	28	26	19	14
Lysine (%)	1.60	1.50	1.00	0.60
Meth (%)	0.50	0.45	0.33	0.20
Ca (%)	1.20	1.00	0.75	2.25
Available P (%)	0.70	0.60	0.50	0.60

Annexure VI
Nutrient Requirement Standard For Goats

Nutrients	Doelings	Pregnant Does	Lactating Does	Mature Does	Bucks
CP (%)	15	11	5.7	6.8	6.5
TDN (%)	68	65.10	53	53	60
Ca (%)	0.43	0.48	0.54	0.50	0.37
P (%)	0.25	0.34	0.38	0.30	0.26

Annexure VII
Nutrient Requirement Standard For Rainbow Trout

Nutrient	Fry	Fingerling	Production
DE (kcal/kg)	3600	3400	3200
CP (%)	50	47	45
Lysine (%)	2.96	2.78	2.66
Meth (%)	0.96	0.90	0.87
Ca (%)	2.5	2.00	2.00
Available P (%)	1.0	0.80	0.70

Annexure VIII
Nutrient Requirement Standard For Carp And Masheer

Nutrient	Fry	Fingerling	Grower	Brood stock
DE (kcal/kg)	3200	3100	3000	3000
CP (%)	45	40	35	30
Lysine (%)	1.74	1.50	1.4	1.30
Meth (%)	0.9	0.80	0.7	0.66
Ca (%)	1.5	1.00	1.00	0.80
Available P (%)	0.6	0.5	0.45	0.40

Annexure IX Feed Additives

Feed additives	Unit	Permissible limits
Vitamins (ABDEK)	gm/ton	500
Trace minerals	gm/ton	1000
Antioxidants	gm/ton	200
Toxin binders	gm/ton	500
Enzymes	gm/ton	400
Choline Chloride	gm/100 kg	200

Annexure X Mycotoxin

Aflatoxin	Unit	Permissible limits
Cattle Feeds	ppb (parts per billion)	50
Poultry Feeds	ppb (parts per billion)	20
Pig feeds	ppb (parts per billion)	20

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