# PHILIPPINE NATIONAL STANDARD

**PNS/BAFS 418:2025**
**ICS 65.060.01**

# Forage Chopper — Specifications

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## Foreword

The Department of Agriculture (DA) – Bureau of Agricultural and Fisheries Engineering (BAFE), through Review Committee Resolution No. 001, Series of 2022, endorsed to the DA – Bureau of Agriculture and Fisheries Standards (BAFS) the development of the Philippine National Standard (PNS) on Forage Chopper — Specifications (PNS/BAFS 418:2025) and Methods of Test (PNS/BAFS 419:2004). This development of PNS aimed to update the provisions of the existing standards in response to the evolving demands and practices within the agricultural and fisheries mechanization sector ensuring the standards remain practical, relevant, and aligned with current industry conditions.

In 2022, one of the key issues identified was the failure to meet the 5% maximum variation in the performance requirement. The test data of the University of the Philippines Los Baños – Agricultural Machinery Testing and Evaluation Center (UPLB-AMTEC), from 2017 to 2021, revealed that only 2% (1 out of 45) of the forage choppers tested met this criterion. This low compliance rate posed significant challenges for the DA-Regional Field Offices (RFOs) and stakeholders in implementing the standard. Due to the limited available data, the standardization work for CY 2024 was deferred and re-evaluated, prompting its commencement in the following year.

As part of the standards development process, the proposed amendment of the PNS on Forage Chopper was presented to the Philippine Council for Agriculture and Fisheries – Committee on Agricultural and Fisheries Mechanization (PCAF-CAFMech) during its Regular Meeting on April 12, 2025. The Task Force agreed to prioritize the revision of the Philippine Agricultural Engineering Standard (PAES) for Forage Chopper – Specifications (PAES 218:2004) and Forage Chopper – Methods of Test (PNS/BAFS 219:2004) to the DA-BAFS. This endorsement was formalized through PCAF-CAFMech Resolution No. 14, Series of 2024. The new standard is intended to establish attainable and practical minimum requirements for forage choppers, taking into account the operational realities of stakeholders in the agricultural and fishery machinery sector, including manufacturers, fabricators, assemblers, dealers, distributors, importers, and exporters (MFADDIEs).

A Technical Working Group (TWG) was created to amend the PNS under Special Order No. 745, series of 2025 (Composition of Technical Working Groups (TWG) and Project Management Team (PMT) for the Development of the PNS for Agricultural and Fishery Products and Machinery). The TWG was composed of representatives from relevant government agencies, academe/research institutions, Civil Society Organization (CSO), and private sector organizations. The draft PNS underwent an extensive series of TWG meetings and stakeholder consultations, facilitated through physical and online platforms, from February 2025 to October 2025 before their finalization and endorsement to the DA Secretary for approval. The PNS was approved on November 21, 2025.

This standard includes the following significant changes compared to the PAES on Forage Chopper — Specifications (PAES 218:2004):

1. Modifications on the terms and definitions and inclusion of belt-conveyor, input capacity, and variation of cut;
2. Modification of the classifications by including the variation of cut and quality of cut;
3. Modifications on the manufacturing requirements and inclusion of material hardness;
4. Deletion of variation of cut in the performance requirements and inclusion of the allowable percentage for the quality of cut and material recovery under the performance requirements;
5. Modifications on the safety, workmanship, and finish;
6. Inclusion of requirement for safety in accordance with PNS/BAFS 330:2022 (Technical means for ensuring safety – Guidelines);
7. Inclusion of operator's manual through PNS/BAFS 390:2024 (Operator's manual for agricultural and biosystems power and machinery — Guidelines);
8. Inclusion of sampling through PNS/BAFS 391:2024 (Methods of sampling for agricultural and biosystems power and machinery — Guidelines);
9. Inclusion of after-sales service requirements in conformance with PNS/BAFS 192:2024 (After-sales service — Guidelines); and
10. Modifications of markings and labeling.

This document cancels and replaces PAES 218: 2004 (Forage Chopper — Specifications) which has been technically revised. This document was written in accordance with the formatting and editorial rules of the Standardization Guide (SG) No. 1 (Writing the PNS) and SG No. 5 (Writing the PNS for Agricultural and Fishery Machinery and Infrastructures) developed by the Standards Development Division (SDD) of the BAFS-DA.

## Table of Contents

## 1 Scope

This Standard specifies the requirements for the manufacture and performance of a stationary forage chopper.

## 2 Normative References

The following documents are referred to in the text in such a way that some or all their contents constitute the requirement of this document. The latest edition of the referenced documents (including any amendments) applies.

Bureau of Agriculture and Fisheries Standards (BAFS)-Department of Agriculture (DA). (2022). Technical means for ensuring safety — Guidelines (PNS/BAFS 330:2g022). https://drive.google.com/file/d/1PCAFvIuBpDKi3KJ_E7PLIS8yScCvfRGM/view

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Occupational Safety and Health Center (OSHC)-Department of Labor and Employment (DOLE). (2020). Occupational safety and health standards.https://oshc.dole.gov.ph/wp-content/uploads/2020/02/OSH-Standards-2020-Edition.pdf

## 3 Terms and Definitions

For the purpose of this Standard, the following definitions below apply. The preferred terms are written in bold type after the Clause number while admitted

terms are listed in italicized type after the definition, which could be interchangeably used in interpreting the provisions of this Standard:

**3.1**
**belt-conveyor**
consist of a flat continuous belt in tension that is positioned rollers driven by pulleys with intermittently spaced idlers for support (DA-BAFS, 2019)

**3.2**
**blade holder**
part of the machine to which the cutting blades are fastened, which also serve as a flywheel to store rotational energy (Agricultural Machinery Testing and Evaluation Center [AMTEC]-University of the Philippines Los Baños [UPLB], 2004)

**3.3**
**blow-up type**
discharge mechanism of forage chopper where the cut forage crops are blown up through the discharge chute (AMTEC-UPLB, 2004, *modified*)

**3.4**
**clear-cut**
characterized by uniform length, smooth cut ends, and minimal material damage (Heinrich, 2000, *modified).* Sharp blades are used in cutting to produce a smooth and uniform cross-section of the material *(*Miu et al., 2006, *modified)*

**3.5**
**cutterhead**
devices intended to cut the forage crop into short lengths with reasonable consistency within a range of optional settings (AMTEC-UPLB, 2004)
admitted term*: cutting rotor*

**3.6**
**cylinder cutterhead**
chopping mechanism that uses blades on cylindrical mountings such that the cutting edges of the blades are essentially parallel to the axis of rotation (AMTEC-UPLB, 2004, *modified*)

**NOTE** See Figure 1.

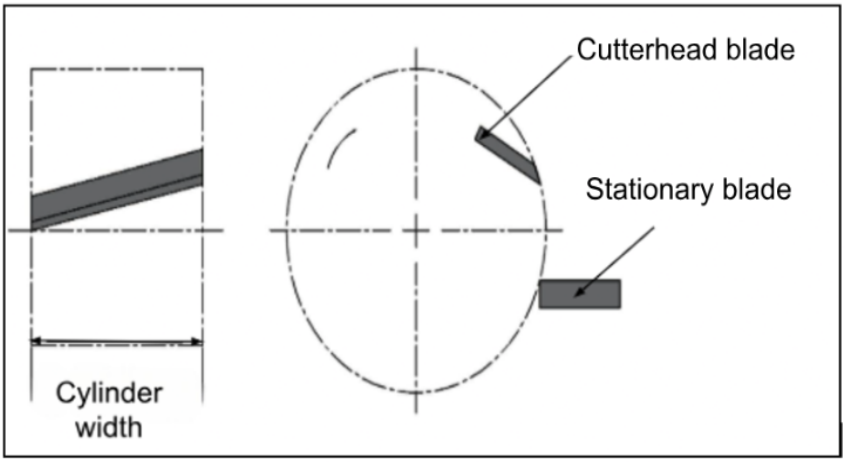


**Figure 1.** Cutterhead (AMTEC-UPLB, 2004)

**3.7**
**feed roll**
cylindrical roll generally with protrusions or flutes, used to gather, compress and advance the crop into the cutterhead (AMTEC-UPLB, 2004)

**NOTE** See Figure 2.

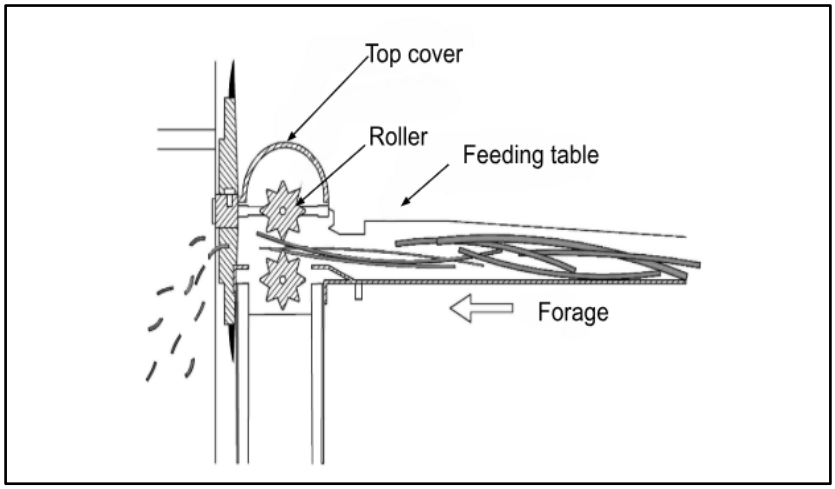


**Figure 2.** Feed roller (AMTEC-UPLB, 2004)

**3.8**
**flywheel cutterhead**
chopping mechanism that uses blades mounted essentially radially with the cutting edges describing a plane perpendicular to the axis of rotation (AMTEC-UPLB, 2004, *modified)*

**NOTE** See Figure 3.

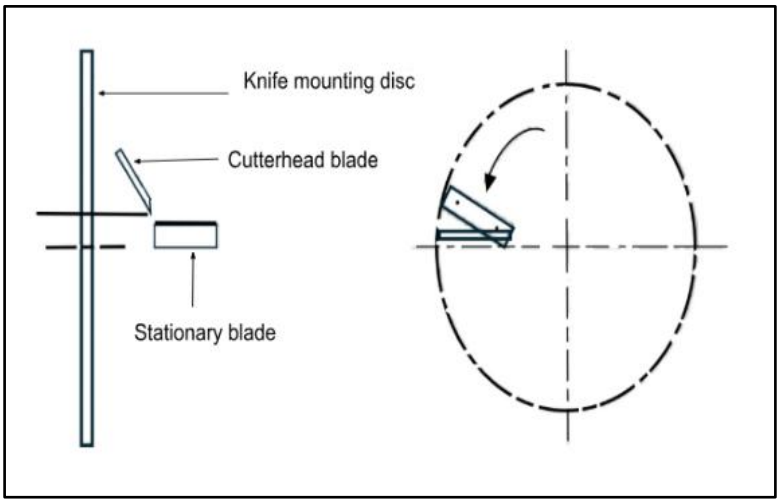


**Figure 3.** Flywheel cutterhead (AMTEC-UPLB, 2004)

**3.9**
**forage chopper**
machine used to cut crops and crop residues into shorter parallel lengths for livestock feed (AMTEC-UPLB, 2004, *modified*)

**NOTE** See Figure 4.

**Note 1 to entry:** The crop residues may refer to rice straws, grass, maize, legumes, row crops, and fodders.

**Note 2 to entry:** The cut length is shorter than the initial length of the forage.

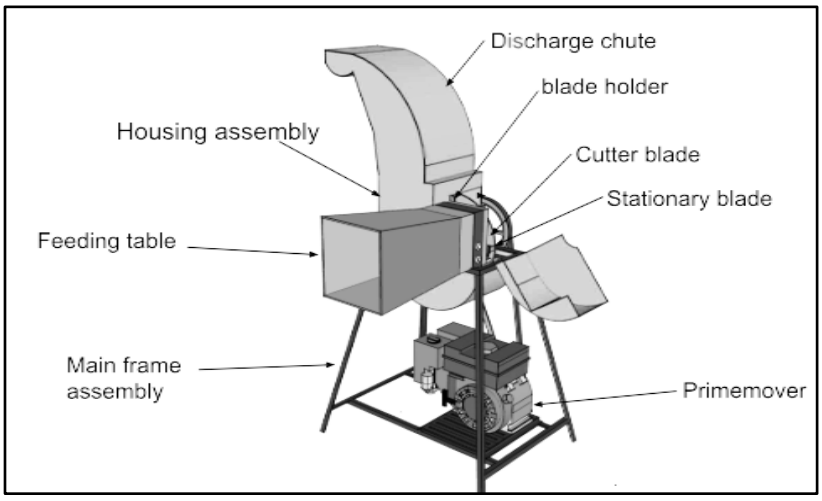


**Figure 4.** Typical design of forage chopper (adapted from AMTEC-UPLB, 2004)

**3.10**
**input capacity**
weight of input material processed per unit time, expressed in kilogram per hour, kg/h

**3.10**
**let-fall type**
discharge mechanism of forage chopper where the cut forage crops are discharged in the bottom part of the machine (AMTEC-UPLB, 2004, *modified*)

**3.11**
**precision-cut forage chopper**
forage chopper which obtains a variation of cut equal to or less than 10%

**NOTE** This type of forage chopper is capable of producing the shortest and most uniformly cut materials.

**3.12**
**random-cut forage chopper**
forage chopper which obtains a variation of cut greater than 35%

**NOTE** This type of forage chopper usually produces the longest mean cut lengths, and the least uniformly cut materials.

**3.13**
**semi-precision cut forage chopper**
forage chopper that obtains a variation of cut of 10 to 35%

**NOTE** Mean cut lengths and cut uniformity are intermediate between those obtained with precision cut and random-cut forage choppers.

**3.14**
**shredded cut**
characterized by rough edges, a fiber-like or stringy appearance, and uneven cut lengths (Lisowski et al., 2012; Shinners, 2003, *modified*)
*admitted term: rough cut*

**NOTE** This typically results from shredding action due to the condition of the blades, distance of cutting parts, or misaligned components.

**3.15**
**stationary blade**
fixed plate providing a stationary edge against which the cutterhead blades shear the crop (AMTEC-UPLB, 2004)
*admitted term: shear bar*

**3.16**
**throw-away type**
discharge mechanism of forage chopper where the cut crop materials are thrown away to the front area of the machine (AMTEC-UPLB, 2004, *modified*)

**3.17**
**variation of cut**
a percentage of deviation from the average length of cut, expressed in percent, %

## 4 Classifications

The classification of forage chopper shall be based according to the following:

### 4.1 Based on the feeding mechanism

#### 4.1.1 Manual feed chopper

The forage crops to be chopped are placed in the feeding table through handheld operation.

#### 4.1.2 Mechanically (conveyed) feed chopper

The use of mechanical or conveying mechanisms (e.g., conveyor belt, roller-feed system) to feed the forage crops into the feeding table.

#### 4.1.3 Automatic feed (self-feed) chopper

The use of a mechanized system to deliver the forage crops in the feeding table automatically.

### 4.2 Based on the variation of cut

#### 4.2.1 Precision-cut

This type of forage chopper obtains a variation of cut equal to or less than 10%. It may use four or more feed rolls as part of the feeding mechanism to partially orient and advance the crop at a consistent rate into the cutting mechanism as shown in Figure 5.

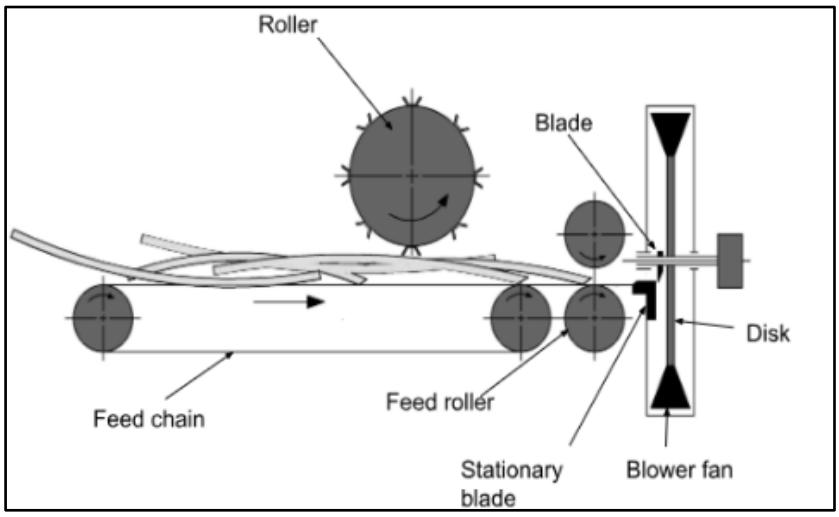


**Figure 5**. Precision-cut forage chopper (adapted from Tingshuang et al., 2001)

### 4.2.2 Semi-precision cut

This type of forage chopper obtains a variation of cut of 10 to 35%. It may use two feed rolls, or other means such as an auger as part of the feeding mechanism, to advance the crop to the cutting mechanism as shown in Figures 6 and 7.

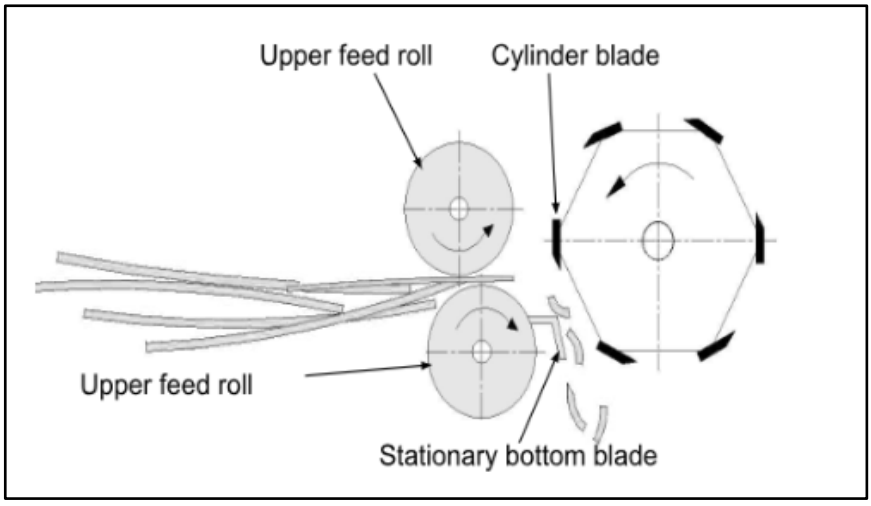


**Figure 6**. Semi precision-cut forage chopper (adapted from Tingshuang et al., 2001)

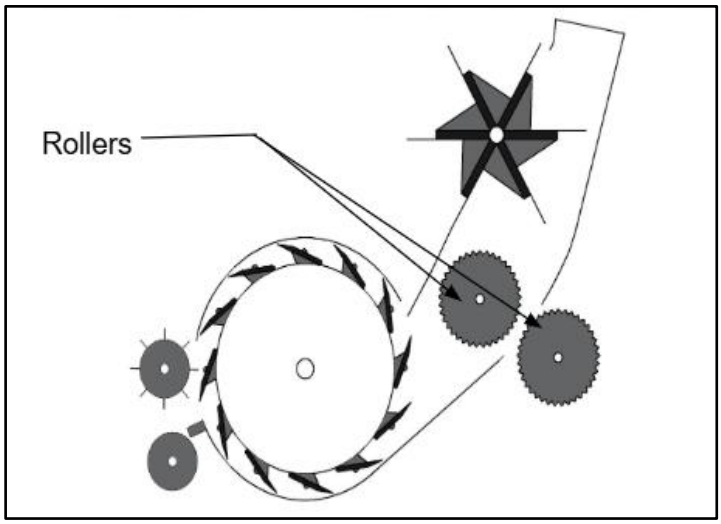


**Figure 7.** Semi precision-cut forage chopper (adapted from Belov, 2019)

### 4.2.3 Random-cut

This type of forage chopper obtains a variation of cut greater than 35%. It generally does not have a distinct feeding mechanism and chop crops directly into shorter pieces as shown in Figure 8.

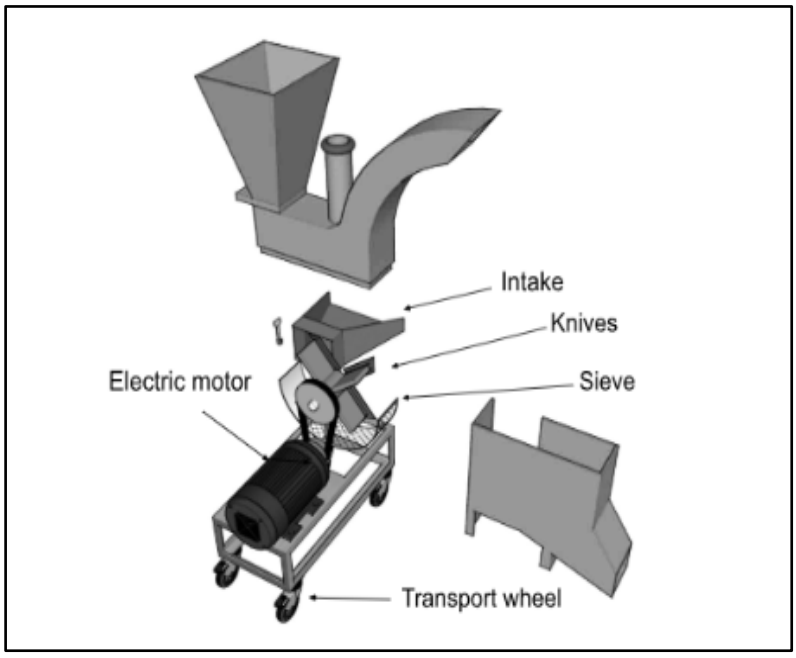


**Figure 8.** Random-cut forage chopper (adapted from El Ghobashy et al., 2023)

### 4.3 Based on the chopping mechanism

#### 4.3.1 Cylinder cutterhead

The type of forage chopper with a chopping mechanism using a cylinder cutterhead.

**NOTE** See Figure 1.

#### 4.3.2 Flywheel cutterhead

The type of forage chopper with a chopping mechanism using a flywheel cutterhead.

**NOTE** See Figure 3.

### 4.4 Based on the discharging mechanism

#### 4.4.1 Blow-up type

The blow-up type forage chopper uses a crop accelerator for forage throwing through a discharge spout. Feed rolls press the crop and push it through an open throat on a shearbar and into a cutterhead. Paddles of the crop accelerator capture forage and throw materials of crop into a discharge spout (Belov, 2019, *modified*) as shown in Figure 9.

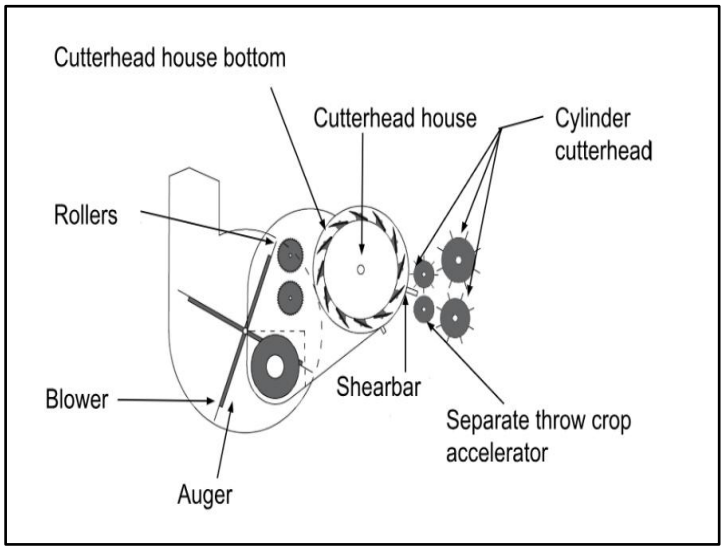


**Figure 9**. Blow-up type forage chopper (adapted from Belov, 2019)

### 4.4.2 Throw-away type

Feed rolls press the crop and push it through an open throat on a shearbar and into a cutterhead. Blades of a cylinder cutterhead cut the crop at the high positioned shearbar and throw it directly into the spout without any friction between crop materials and a cutterhead house walls as shown in Figure 10.

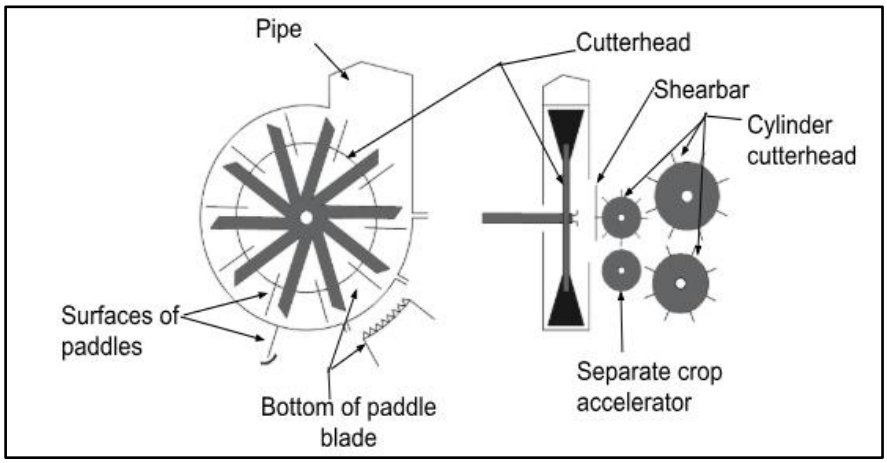


**Figure 10.** Throw-away type forage chopper (adapted from Belov, 2019)

### 4.4.3 Let-fall type

The cut forage crop is dropped down to the bottom of the cutting chamber as shown in Figures 11 and 12.

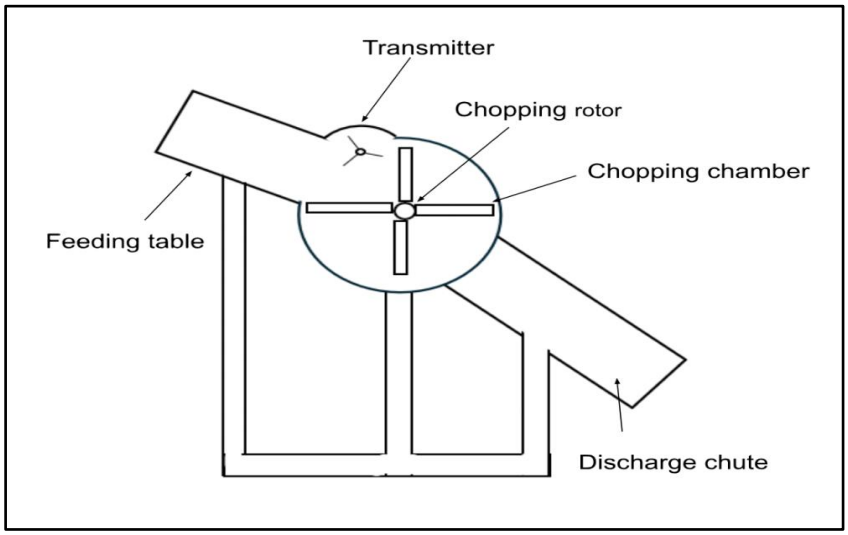


**Figure 11**. Let-fall type forage chopper (adapted from Gapparov & Karshiev, 2020)

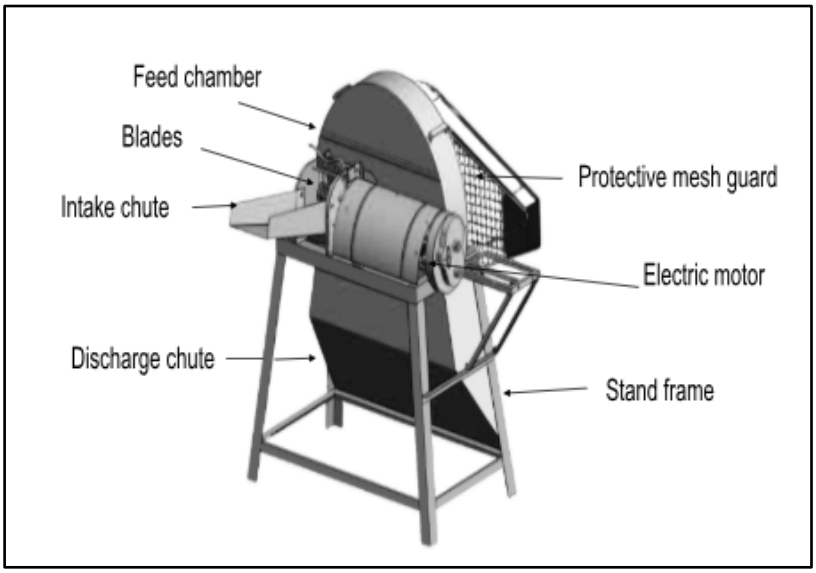


**Figure 12**. Let-fall type forage chopper (Balram, 2019)

### 4.5 Based on the quality of cut

#### 4.5.1 Clear-cut

Clean edges with uniform lengths showing no fraying or tearing as shown in Figure 13.

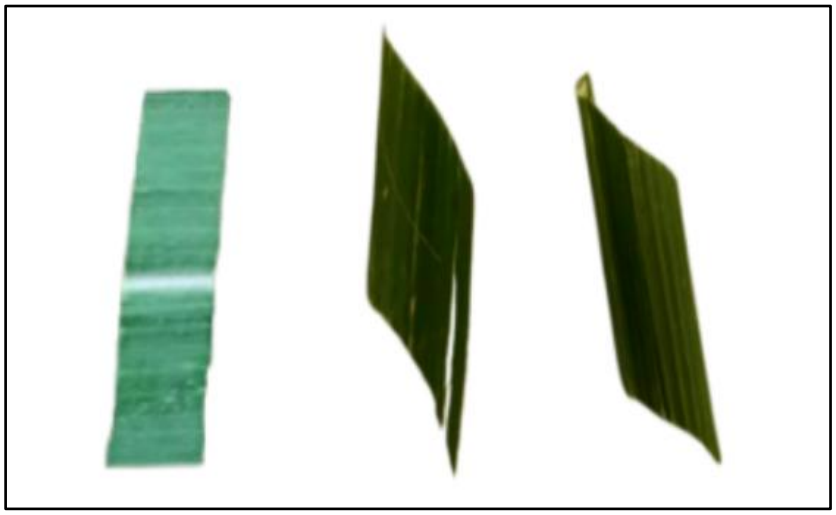

**Figure 13.** Clear cut forage material (AMTEC-UPLB & CLSU, n.d.)

### 4.5.2 Shredded cut

The shredded cut is shown in Figure 14.

**Figure 14.** Shredded cut forage material (AMTEC-UPLB & CLSU, n.d.)

## 5 Manufacturing Requirements

**5.1** Blades should be made of at least 0.80% carbon content (e.g AISI 1080 or its ISO equivalent) and other better materials.

**5.2** Bolts, nuts, fasteners and screws to be used should conform with the requirements of Engineering materials — Bolts and nuts — Specifications (PAES 311:2001) and Engineering materials — Screws for agricultural machines — Specifications and Applications (PAES 313: 2001).

**5.3** Intake, discharge chutes, and all parts in contact with the materials except for blades shall be coated with paint and or any equivalent corrosion resistant materials.

**5.4** Steel bars and sheet metals shall be generally used for the machine.

**5.5** The edge of the cutting blade should be case hardened at Rockwell C Scale (RC) 46 to RC 52 for AISI 1080 to AISI 1085. The non-hardened cutting blades should have hardness within the range of RC 25 to RC 27.

## 6 Performance Requirements

**6.1** The input capacity shall meet the specifications of the manufacturer.

**6.2** The length of cut of precision-cut and semi-precision cut forage choppers shall be adjustable.

**6.3** At least 95% of the chopped material produced by the forage chopper should exhibit clear-cut characteristics.

**6.4** The forage chopper shall obtain a minimum material recovery of 95%.

## 7 Safety, Workmanship, and Finish

**7.1** The forage chopper shall be free from manufacturing defects that may be detrimental to its operation and shall be free from sharp edges and surfaces that may harm the operator. All metal parts should be machine bent, pressed and cut, and all rough surfaces should be machine finished and smoothed.

**7.2** Safety signs and warning notices shall be provided in conformance with PNS/BAFS 330:2022 (Technical means for ensuring safety — Guidelines).

**7.3** The use of forage choppers in terms of operator's exposure on permissible noise level shall conform to Annex A (Occupational safety and health standard [Rule 1074.01– 1074.03]).

**7.4** If the machine exceeds the noise level of 92 dB(A), an ear protective device shall be provided by the manufacturer.

**7.5** The cutting mechanism shall be accessible and blades shall be individually replaceable and can be easily sharpened.

**7.6** For a random cut forage chopper, the length of the feeding table shall be more than 850 mm.

**7.7** The base of the forage chopper shall be stable during operation.

**7.8** All components should be dynamically balanced for stable running with low noise level.

**7.9** Any uncoated metallic surfaces shall be free from rust and shall be painted properly.

**7.10** Belt cover or guard and provisions for belt tightening and adjustments shall be provided.

**7.11** Mechanism for immediate load disengagement between primemover and forage chopper shall be provided to protect primemover from overloading and the operator in case of accident.

## 8 After-sales Service Requirements

Requirements for after-sales services shall be in conformance with PNS/BAFS 192:2024 (After-sales service — Guidelines).

## 9 Maintenance and Operation

**9.1** Each unit of the forage chopper shall be provided with a set of standard tools for operation and basic maintenance as prescribed by the manufacturer.

**9.2** An operator's manual for the forage chopper shall be provided in conformance with PNS/BAFS 390:2024 (Operator's manual for agricultural and biosystems power and machinery — Guidelines). The operator's manual shall include emphasis on the safety and health hazards especially the use of basic personal protective equipment.

## 10 Sampling

The forage chopper shall be sampled for testing in conformance with PNS/BAFS 391:2024 (Methods of sampling for agricultural and biosystems power and machinery — Guidelines) or other suitable method of selection validated by the testing authority.

## 11 Testing

The sampled forage chopper shall be tested in conformance with PNS/BAFS 419:2025 (Forage Chopper— Methods of test).

## 12 Markings and Labeling

**12.1** Each unit of forage chopper shall be engraved or embossed with the following information, either on the body or on a metal nameplate/s permanently attached at the most conspicuous place:

a) Registered trademark of the manufacturer;
b) Brand;
c) Model;
d) Serial Number;
e) Date of manufacture; and
f) Country of manufacture/origin (if imported) / "Made in the Philippines" (if manufactured in the country)

**12.2** Other markings and labeling shall comply with the applicable regulations set by the competent authority

**Annex A**
(Informative)

**Occupational safety and health standards (Rule 1074.01–1074.03)**

## A.1 Threshold limit values for noise

**A.1.1** The threshold limit values refer to sound pressure that represents conditions under which it is believed that nearly all workers may be repeatedly exposed without adverse effect on their ability to hear and understand normal speech.

**A.1.2** Feasible administrative or engineering controls shall be utilized when workers are exposed to sound levels exceeding those specified in Table A.1 hereof when measured on a scale of a standard sound level meter at slow response. If such controls fail to reduce sound within the specified levels, ear protective devices capable of bringing the sound level to permissible noise exposure shall be provided by the employer and used by the worker.

**Table A.1.** Permissible noise exposure (OSHC-DOLE, 2020)

| Duration per day, h | Sound levels (slow response), dB(A) |
|---|---|
| 8 | 90 |
| 6 | 92 |
| 4 | 95 |
| 3 | 97 |
| 2 | 100 |
| 1½ | 102 |
| 1 | 105 |
| ½ | 110 |
| ¼ | 115 |

## A.2 Permissible noise exposure

**A.2.1** The values specified in Table A.1 apply to total time of exposure per working day regardless of whether this is one continuous exposure or a number of short-term exposures but does not apply to impact or impulsive type of noise.

**A.2.2** If the variation in noise level involves maximum intervals of one second or less, it shall be considered as continuous. If the interval is over one second, it becomes impulse or impact noise.

**A.2.3** When the daily noise exposure is composed of two or more periods of noise exposure of different levels, their combined effect should be considered rather than the effect of each.

**A.2.4** If the sum of the fraction in Equation 1 exceeds one, then the mixed exposure should be considered to exceed the threshold limit value. C indicates the total time exposure at a specified noise level, and T indicates the total time of exposure permitted at the level. However, the permissible levels indicated in Table A.1 shall not be exceeded for the corresponding number of hours per day allowed. Noise exposures of less than 90 dB(A) are not covered by Equation 1.

$$X = \frac{C_1}{T_1} + \frac{C_2}{T_2} + \frac{C_3}{T_3} + \cdots + \frac{C_n}{T_n}$$

where:

$X$ is the sum of the ratios of C and T
$C$ is the total time of exposure at a specified noise level
$T$ is the total time of exposure permitted at the level

**A.2.5** Exposures to impulsive or impact noise shall not exceed 140 dB(A) peak sound pressure level (ceiling value).

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