



Animal Production

Level II

Learning Guide # 48

**Unit of Competence: Assist Crop Residues Treatment and
Urea Molasses Block Preparation**

**Module Title: Assisting Crop Residues Treatment and
Urea Molasses Block Preparation**

LG Code: AGR APR2 M15 0919 LO1- 48

TTLM Code: AGR APR2 TTLM 0919V1

LO1: Determine the type of crop Residues



Instruction Sheet

Learning Guide # 48

This learning guide is developed to provide you the necessary information regarding the following content coverage and topics –

- Identifying the types of crop residues
- Determining and preparing the amount of crop residues to be treated
- Selecting, maintaining and using Suitable PPE

This guide will also assist you to attain the learning outcome stated in the cover page. Specifically, upon completion of this Learning Guide, you will be able to: –

- identify the types of crop residues
- determine and preparing the amount of crop residues to be treated
- select, maintain and use suitable PPE

Learning Instructions:

1. Read the specific objectives of this Learning Guide.
2. Follow the instructions described below 3 to 6.
3. Read the information written in the information “Sheet 1, Sheet 2 and Sheet 3.
4. Accomplish the “Self-check 1, Self-check 2 and Self-check 3” in **page -6, 10 and 13** respectively.
5. If you earned a satisfactory evaluation from the “Self-check” proceed to “Operation Sheet 1” in **page -14.**
6. Do the “LAP test” in **page – 14** (if you are ready).



Information sheet – 1

Identifying the types of crop residues

1.1. Introduction to crop residues

Crop residues are fibrous materials that are by-products of crop cultivation. Crop residues have low crude protein content in the range of 3–13% of the dry matter. This is a basic limitation in residues such as straw and bagasse with crude protein contents around the border-line level of 6–7% required to create an appropriate rumen environment to promote dry matter digestibility and intake. Most residues are deficient in fermentable energy and minerals. Crop residues have low palatability and digestibility that leads to poor intake, particularly when fed as the sole roughage. The availability of crop residues is closely related to the farming system, the type of crop produced and the intensity of cultivation. Teff, wheat and barley straws are the major residues available in the highlands. Pulse crop residues like chickpeas, haricot beans and lentils are also important. Residues of maize and sorghum form the bulk in the lowlands. The common practice in utilizing crop residues is feeding in the long dry form

In the farming systems of developing countries, animal production is integrated with crop production. However, as the expansion of crop land from time to time, the availability of grazing land decreases thus limiting the scope for increased livestock production. Under such circumstances crop residue play an important role in supplying feed to ruminant animals. Crop residues are fibrous materials that are by-products of crop cultivation of cereals, pulses, oil plants, roots and tubers and represent an important feed resource for smallholder farmers in developing countries. These residues provide fodder at low cost since they are by-products of existing crop production systems. They are important adjuncts to natural pastures and planted forages and are often used to fill feed gaps during periods of acute shortage of other feed resources. On average, crop residues provide 10 to 15 % of the total feed intake and in some exceptional cases this could increase up to 50 %. The contribution of crop residues to the feed resource base is significant. Under the Ethiopian condition, crop residues provide 40 to 50% of the annual livestock feed requirement. In most central highlands of Ethiopia, crop residues account for 27% of the total annual feed supply during the dry periods.



1.2. Types of crop Residues

Crop residues are the fibrous parts of crops that remain after the parts edible by human beings are removed. These feed resources are used as livestock feeds since time immemorial. In arid and semi-arid tropics where natural pastures are only seasonally available because of the shortage of moisture, crop residues assume great importance in decreasing the level of feed deficit. These fibrous agricultural by-products constitute an important and often the major feed resources available and utilized by smallholder farmers in tropical livestock feeding systems. Depending on the type of crop, crop residues may be left on the field either as grazing for ruminants or as mulch, or they may be transported to the homestead for stall feeding or other alternative uses such as fencing, building and roofing materials or as fuel.

1.2.1. Cereal crop residues

Cereal crop residues usually consist of the above ground part of cereal plants after grain removal. Cereal crop residues includes; wheat straw, barley straw, teff straw, rice straw, maize stover, sorghum stover, millet stover and oat straw. Due to their rigid structure and poor palatability, intake of crop residues is low. These constraints are mostly related to their specific cell wall structure and chemical composition, but there are also deficiencies of nutrients essential to rumen micro-organisms, such as nitrogen, sulphur, phosphorus and cobalt.

1.2.2. Legume crop residues

The haulms of legume crops such as; groundnut, chick pea, pea, soybean and the dried stalk materials of such crops. Legume straws or haulms possess a higher feeding value than cereal crop residues.

1.2.3. Other residues

There are other roughage feeds available at specific locations such as; the waste materials from oil palm processing plants, cotton waste, sisal waste, pineapple waste, cocoa pods, coffee hulls, etc. The feeding value of these materials varies, but it is usually low. Sugar beet tops and residues can be an important by-product from agricultural production. The energy content could balance the hay silage feeding (with high content of protein). Often, these residues can be obtained from sugar factories.



Various crop residues have their own nutritional values and are used for different animal species. Sweet potato vines and peanut hay are relatively rich in protein, available energy and vitamins, and are mainly fed to pigs in most rural areas. Wheat straw and rice straw have high contents of cell walls, and are basically used for feeding ruminants. Millet straw and soybean straw, in contrast, are fairly palatable for herbivores, and are mostly used as feed sources for horses, donkeys, mules and rabbits.

1.3. Selecting crop residues for treatment

The utilization of crop residues particularly cereal straw and stover for livestock feeding is constrained by its physical nature and nutritional characteristics. Cereal crop residues includes; wheat straw, barley straw, teff straw, rice straw, maize stover, sorghum stover, millet stover and oat straw. Due to their rigid structure and poor palatability, intake of crop residues is low. These constraints are mostly related to their specific cell wall structure and chemical composition, but there are also deficiencies of nutrients essential to ruminal micro-organisms, such as nitrogen, sulphur, phosphorus and cobalt. Feeding value of cereal straw and Stover is limited by its poor voluntary intake, low digestibility and low nitrogen, mineral and vitamin content. Various strategies such as supplementing crop residues with agro-industrial by-products and/or improving quality of the residues through treatment such as physical and chemical (alkali) treatment were identified to be of considerable advantage in improving the feeding value of these fibrous feeds.



Self-Check-1	Written Test
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Directions: Answer all the questions listed below. Use the Answer sheet provided in the next page:

1. List crop residue that available in highland (3 points)
2. Mention types of crop residues (3 points)
3. Discuss crop residues that categorized under cereal. (4 points)

Note: Satisfactory rating – 6 points unsatisfactory rating –below 6 points

You can ask you teacher for the copy of the correct answers

Answer Sheet

Score: _____
Rating: _____

Name: _____

Date: _____

Short Answer Questions:

1. _____

2. _____

3. _____



Information sheet –2	Determining and preparing the amount of crop residues to be treated
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2.1. Determining the amount of crop residue to be treated

The amount of crop residues to be treated depends on:

- The number of animals
- The daily crop residue intake /consumption/ by the animals
- The duration of feeding period /Number of days/

As a rough estimate it can be said that animal's daily straw intake is 2 to 3 percent of live weight (2% to 3% body weight). Maximum of 3 kg of straw for every 100 kg body weight (3% of body weight=3% BW).

So the amount of straw needed to treat for one animal is:

Amount to treat= No. of days x Daily straw intake (% LBW) x LBW of the animal

For more than one animal it is calculated as:

Amount to treat= No. of days x Daily straw intake (% BW) x total LBW of the animals

Example: 1- In the farm there are 10 cows, 8 heifers, and 2 bulls.

Cow										Heifer								Bull	
1	2	3	4	5	6	7	8	9	10	1	2	3	4	5	6	7	8	1	2
400	360	460	500	380	420	490	550	440	450	320	300	360	290	350	310	240	200	330	600

Determine the amount of crop residues to be treated to feed the animals for 4 weeks taking maximum straw intake of 3% LBW for the above animals listed in the table.

$$\begin{aligned}
 \text{Amount to be treated} &= 28 \text{ days} \times 0.03 \times \text{total weight of the animals} \\
 &= 28 \times 0.03 \times 7,750 \text{ kg} \\
 &= \mathbf{6510 \text{ kg}} \text{ of DM needs to be treated}
 \end{aligned}$$



Example 2- in the farm there are 8 cows, 6 heifers, 2 bulls and 4 sheep. Determine the amount of crop residue to be treated to feed the animals for 4 weeks taking maximum straw intake of 3% BW. The body weight of the animals in kg is shown in the table below.

Cow								Heifer						Bull		Sheep			
1	2	3	4	5	6	7	8	1	2	3	4	5	6	1	2	1	2	3	4
450	500	350	435	384	425	550	410	210	245	300	265	240	340	560	400	40	35	55	64

$$\begin{aligned}
 \text{Amount to treat} &= 28 \text{ days} \times 0.03 \times \text{total weight of the animals} \\
 &= 28 \times 0.03 \times 6258 \text{ kg} \\
 &= \underline{5256.72 \text{ kg}} \text{ of DM need to be treated}
 \end{aligned}$$

2.2. Materials and Equipment's required

1. Crop residues
2. Measuring balance
3. Bridge or suspended balance (to measure the animals)
4. Heart girth tape (incase bridge balance is not available use heart girth tape to measure body weight of the animals)
5. Chopper (manual or mechanical chopper)
6. Calculators
7. Note book

2.3. Preparing crop residues for treatment

- The baled or collected and stacked crop residues should be chopped into pieces to about 2-10 cm long.
- The general principle is that thick and hard crop residues, such as maize and sorghum Stover, should be cut shorter, while soft materials such as teff, wheat and barley straw may be a little bit longer.



Chopping before treatment

- Facilitates easy feeding
- Saves plastic (packaging material)
- Easy for compaction during treatment
- Reduces the danger of puncturing the plastic (packaging material)



Self-Check-2	Written Test
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Directions: Answer all the questions listed below. Use the Answer sheet provided in the next page:

1. List on what amount of crop residue to be treated depends (3 points)
2. Determine the amount of crop residues to be treated to feed the animals for 4 weeks taking maximum straw intake of 3% LBW for the below animals listed in the table (4 points)

Example: - In the farm there are 10 cows, 8 heifers, and 2 bulls.

Cow										Heifer								Bull	
1	2	3	4	5	6	7	8	9	10	1	2	3	4	5	6	7	8	1	2
50	46	46	50	38	42	49	55	44	45	32	30	36	39	35	31	24	20	33	60
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

3. List materials and equipment that required for crop residue treatment (4 points)
4. What are the advantages of chopping before treatment? (5 points)

Note: Satisfactory rating – 10 points unsatisfactory rating –below 10 points

You can ask you teacher for the copy of the correct answers



Answer Sheet

Score: _____
Rating: _____

Name: _____

Date: _____

Short Answer Questions:

1. _____
2. _____
3. _____
4. _____



Information sheet – 3

Selecting, maintaining and using Suitable PPE

Appropriate personal protective clothing and equipment should be selected and used in order to avoid the hazards and risks. The important personal protective clothing and equipment used during crop residue treatments include:

- ✓ Overall
- ✓ Plastic Boots
- ✓ Plastic or leather gloves
- ✓ Respirator
- ✓ Safety goggles



Self-Check-3	Written Test
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Directions: Answer all the questions listed below. Use the Answer sheet provided in the next page:

1. List PPE that used for crop residue (6 points)

Note: Satisfactory rating – 3 points unsatisfactory rating –below 3 points

You can ask you teacher for the copy of the correct answers

Answer Sheet

Score: _____
Rating: _____

Name: _____

Date: _____

Short Answer Questions:

1. _____



Operation sheet -1	Procedures in treating crop residue
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Techniques to select and prepare crop residue treatment as follows:-

Step 1: Identify and prepare crop residue for treatment

Step 2: Identify animals to be fed

Step 3: weigh animals

Step 4: calculate weight of crop residue to be treated

Step 5: Identify materials required for treatment

Step 6: carryout crop residue treatment

Step 7: Feed to livestock depending animal species

LAP Test	Practical Demonstration
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Task. Carryout treatment of cereal crop residue



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