ওয়েভ ফাউন্ডেশন
WAVE FOUNDATION
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DHAN Foundation

NORAD

PERCH METHOD
POTENCY FOR PRODUCTIVENESS

A MANUAL FOR EFFECTIVE GOAT HOUSING AND FEEDING MANAGEMENT AT THE HOUSEHOLD LEVEL

PERCH METHOD: POTENCY FOR PRODUCTIVENESS

A manual for effective goat housing and feeding management at the household level

Project: Small Farming- A Viable Business

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Small farming- A Viable Business. The Project aims at the mutual exchange of the employees between WAVE Foundation, Bangladesh and DHAN Foundation, India to promote improved livelihood by enhancing the knowledge on agriculture and Livestock development.

- **NOREC**- Norwegian Agency for Exchange Cooperation is a governmental body under the Norwegian Ministry of Foreign Affairs. The work of NOREC is based on equity, solidarity and reciprocity. A Norec exchange is a mutual exchange of employees or members between organisations, institutions or companies based in different countries.

- **WAVE Foundation** is a civil society organization established in 1990. WAVE's main thrust is securing rights of the poor and marginalized, good governance, sustainable livelihood development through promoting people's participation at all levels of the state and society, accountability, capacity development and access to resources. A just and prosperous society is the Vision of WAVE foundation

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ABOUT GOAT HOUSING

The success of the goat rearing is completely depends on the goat management. Proper Goat management is needed by considering the natural and artificial distress. Goats need to be protected from extreme changes in climate and also from predator attack. Suitable shelter or housing that matches with climatic conditions, type of production system needs to therefore, be provided if goats are to produce optimally.

This module deals with the issue of housing for the goats in the household level including the need to provide housing, possible types based on the production system and climatic conditions. The information contained in the module is useful for development professionals to train farmers especially marginal and landless farmer's to promote them as an enterprise through scientific goat rearing activity.

CHAPTER 1.1

Introduction to goat housing

An effective goat housing system is very important for goats to ensure the shelter for comfort, safe from adverse weather conditions. In the country context both India and Bangladesh having unpredictable climatic conditions to manage the livestock. The productivity of goat is influenced by the type of shelter provided. There are various housing and floor designs that can be used depending on the production system employed and local climate. Cost of construction, ease of cleaning, proper ventilation and drainage, and adequate lighting are important aspects to be considered in designing a house. Inner pens are needed for large flocks for proper handling and management, particularly controlled breeding. Proper handling of manure needs attention since it has health and economic benefits.

From Figure1 (see next page), The basic requirement of good animal housing should alter or modify the environment for the benefit of animals and also protect them from predation and theft. Animal housing should buffer the animal from climate extremes to reduce stress allowing optimal animal performance in terms of growth, health and reproduction. The main climatic factors from which protection is needed are high and low ambient temperatures, environmental humidity, solar radiation, wind and rain. Additionally, houses are important in protecting feed and equipment from damage, in saving labour, and in aiding effective management, including breeding. Goat housing should meet animal requirements and serve a producer's needs at the lowest possible cost.

In general, the basic requirements for the welfare of goats are:

- Food and water to sustain health and vitality.
- Sufficient space to provide freedom to stand, lies down, stretch and groom themselves.

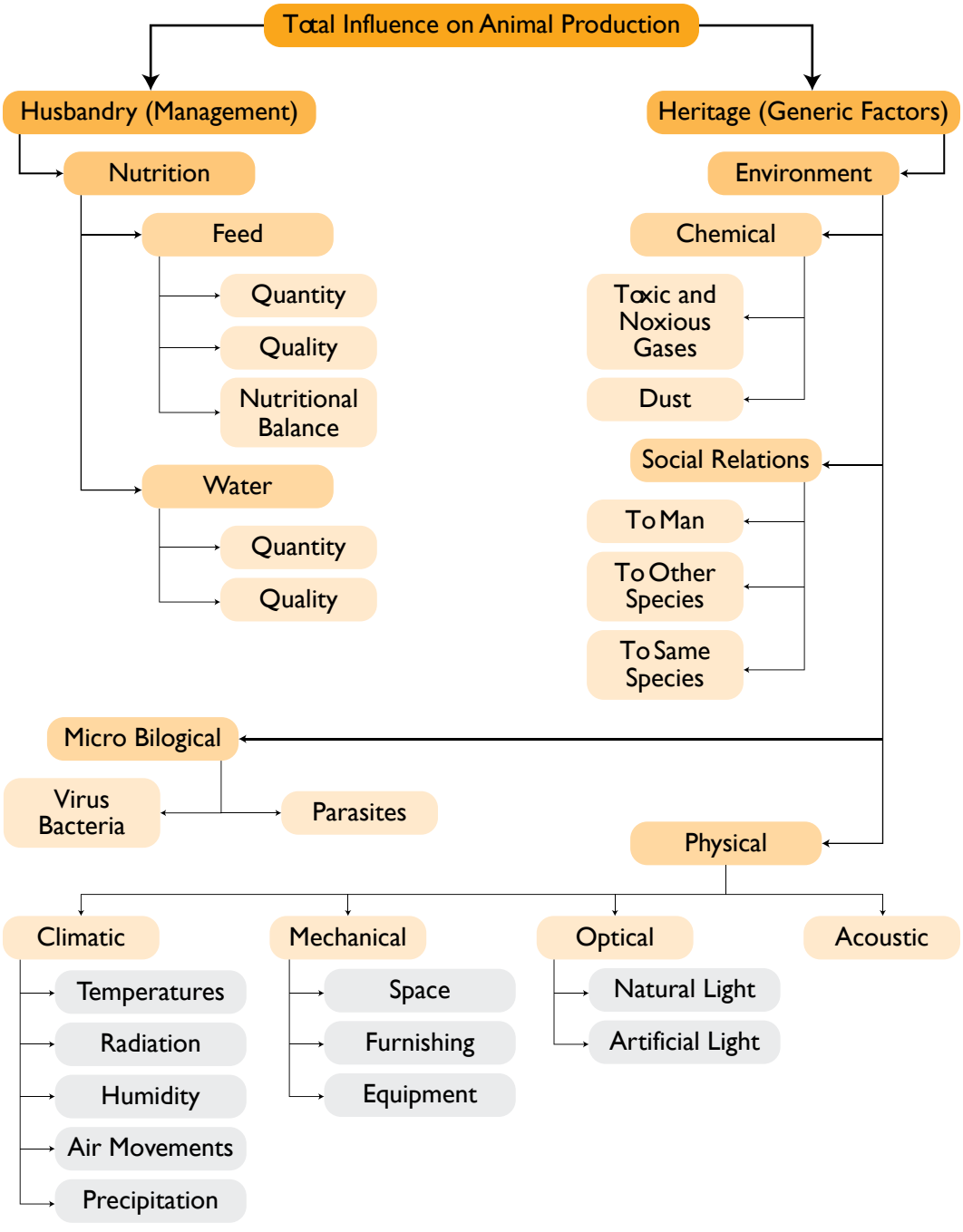


Figure 1: Factors influencing animal production

- Protection from predation.
- Protection from disease, including disease that can be exacerbated by management.
- Protection from extremes of climate during certain phases of their life.
- Protection from unnecessary, unreasonable and unjustifiable pain, suffering and injury.

The better housing addresses the most of requirements of goats and also it makes it as a profitable business for the farmers.

CHAPTER 1.2

Existing Goat housing and rearing approach

Prior to the introduction of Goat rearing in Perch (Macha) method, farmers used to rear goat in the ground at the household level. Traditional goat shelters poorly lit and have inadequate ventilation and drainage. Being an open and unorganized method, it has many disadvantages that contributed largely to discourage farmers in goat rearing.

The unorganized, unhygienic and conventional method of Goat Rearing

1.2.1 Design of Traditional Housing

Traditional goat house is of varying designs and made of various types of locally available materials. Some types of housing include:

Housing at the corner of the main house

An overhang roof of a house

Open yards with no roof

Separate houses with thatched roofs;

Kids are, in some areas, kept in a dome made of bamboo or other locally available materials.

1.2.2 Shortcomings of Traditional Housing

- The conventional method requires more resource involvement to rear and manage goats.
- Rearing goats within the family house can have serious consequences through an outbreak of zoonotic diseases (e.g. anthrax, mange and coccidiosis etc)
- Goats in the close quarter also encourage the spread of external parasites, bacterial and viral infections among animals.
- Feeding management is inefficient and unhygienic in a ground method.
- Attacks of predators are also frequent in an insecure and vulnerable Goat shed.
- Traditional method cause high kid mortality, which has a negative impact on the profitability of goat rearing.
- Reduces the greens in the dry areas

The goat housing also depends on the management system practised. Theoretically, the management system are classified as follows

- Traditional housings: In which rearing a few animals are tethered during the day and put into a floor shelter at night.
- Semi-Intensive perch method: The prime proposition of the method is rearing goat in partial confinement and partial grazing with the best care
- Intensive method: The prime proposition of the method is rearing goat in confinement with completely restricted and no grazing. Feed management plays a major role in the fattening process.

CHAPTER 1.3

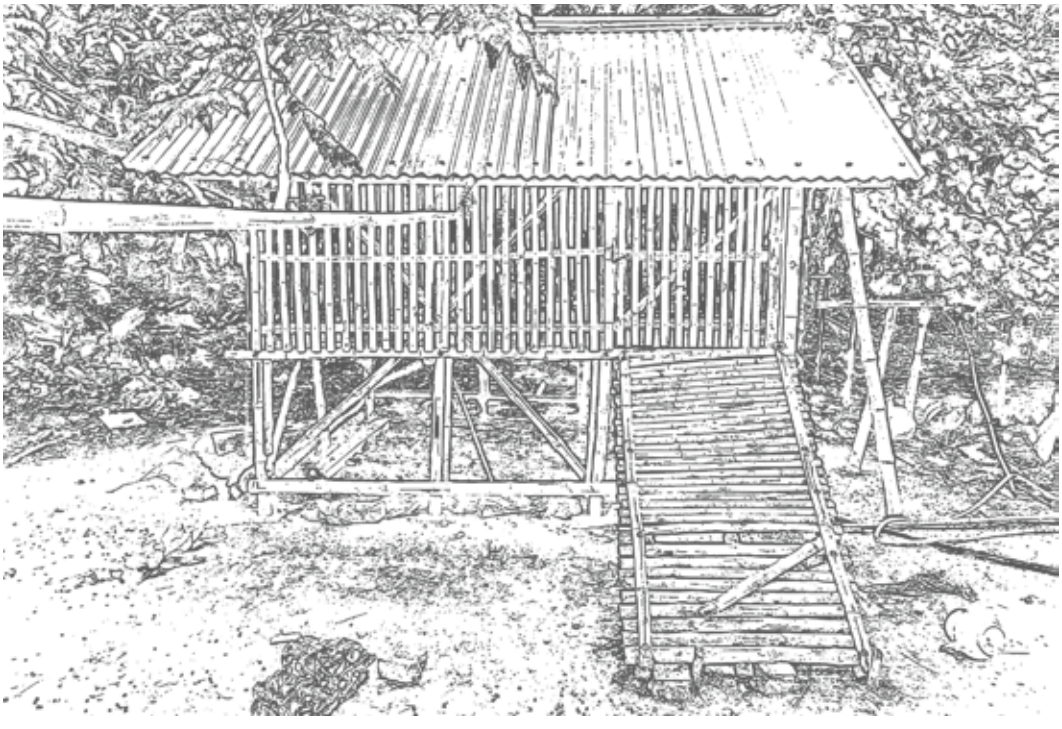
Introduction to Perch method of Housing

Perch or Macha housing is systematic confinement for the goat to ensure safe health and proper feeding. In the combination of both housing method and feeding method

Semi-intensive Perch Method

The prime proposition of the method is rearing goat in partial confinement and partial grazing with the best care. It is an intermediate compromise between extensive and intensive system followed in some flocks having limited grazing.

- It involves extensive management but usually with controlled grazing of fenced pasture.
- It consists of the provision of stall feeding, shelter at night under shed and 3 to 5 hour daily grazing and browsing on pasture and range.



Salient Features of the Semi-intensive Perch method

- Goats prefer places higher than the ground level for proper ventilation and comfortable temperature. Macha renders the comfort and space for Goats.
- There is no need for bedding.

- Allows manure, urine and debris drop through the slatted floor, thus removing a major source of disease and parasite infestation.
- Meeting the nutrient requirement both from grazing and stall feeding.
- Manage medium to the large flock.
- Utilize cultivated forage during the lean period.
- Harvest good crop of kids for both meat and milk.
- Make a profitable gain due to less labour input.
- Requires less labor to clean and maintain.
- Remain relatively dry and clean.
- Reduce space requirements.
- Manure can easily collect for fertilizer use or for sale.
- Allows air to pass through the slats to increase ventilation and comfort in hot weather.
- Secure from the attack of predators.

CHAPTER 1.4

Components of Ideal perch house

The shed which meets all the requirements necessary for proper housing of goat is called an ideal shed. The components of Ideal shed are not only to provide shelter and comfort. It also ensures the scientific way of rearing the goat which ensures the proper nutrients, psychological comfort and Protects from predators, rain and hot sun. It drastically reduces the risks of diseases.

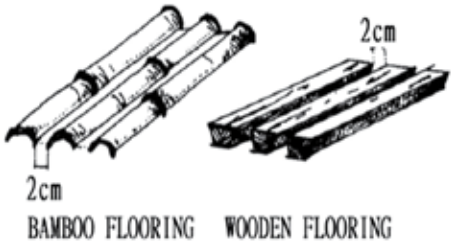
The major Thumb rule for effective goat housing need to:

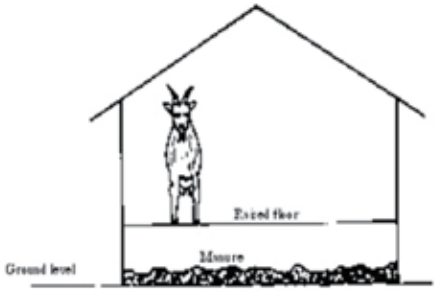
- Be strong enough to last a long time;
- Be large enough for the number of animals to be accommodated comfortably.
- Allow freedom of movement for all animals;
- Be well-drained and easy to clean.
- Be well lighted and ventilated.
- Have suitable isolation pens for sick or injured animals as far away from the main house as possible.

The major components of the Perch method of housing are Slatted Floor, Wall, Roof, Door and excess yard.

Floor

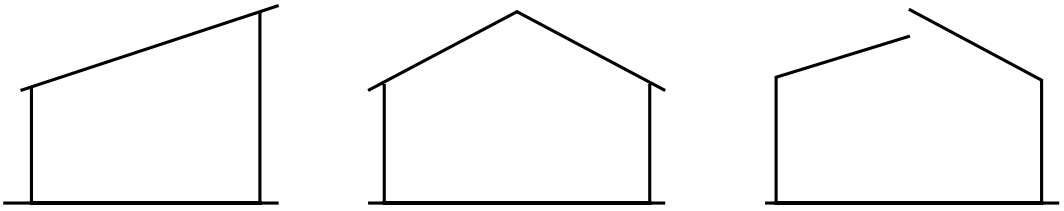
- The floor could either be packed earth, concrete or slatted. Slatted floors should be raised about 3-4 feet above ground level to facilitate easy cleaning and collecting dung and urine. (*Note: Ammonia can spread for 1 feet from the ground)*
- The gap between the slats should be 1.5 to 2 cm to allow easy passage of faecal material and guarantee safe footing for the animals.
- Made with Wood, concrete or slats
- Separate pen(cabin) for newborn kids





Roof

- The roof should be waterproof with sufficient overhang to prevent rain from blowing in.
- The roof will be Gabol type. It is the best method to remove ammonia gas.
- The roof will be extended beyond the wall.
- Adequate ventilation is essential in maintaining good Goat health.
- Roofs can be constructed from grass/bushes, wood, stone/brick, iron sheet or earth depending on a production system, material availability and climate.
- The roof should be sufficient overhang.
- It will have an adequate slope for rainwater drain.
- 7 to 8 feet height from the floor.



Shed Gable Modified Gable

Wall

- The wall should not be completely solid to allow air movement through the house.
- The solid fence of 2.5-3 feet should be above the Macha to avoid direct entrance of wind.

- Air circulation should be above the animals' heads and ventilation openings should be provided
- Constructed with bamboo, wood, concrete
- This wall to be attached with the rolling screen to product animals from the rain and extreme wind season.
- Bamboo Wall provides a congenial atmosphere for Goats

Door

- The door ensures safety and to keep the goat as the group of effective management.
- This would be made up of either steel, wood or any local materials.
- The opening of the door is followed by the Foot Path were animals easily enter into the house.
- Mostly this footpath is to be slope made up of either wooden or concrete slab.

Internal Partition

Generally, animals are separated based on their physiological status So Separate cabins are needed for Buck, Kids, Maternity Pen, and Matured Doe. Partitioning a goat barn has the following advantages:

- It is easier to feed different classes of animals according to their needs.
- It is easier to follow a mating schedule.
- It is easier to control breeding and, thus, prevent inbreeding and mating at a very early age.
- Lactating animals can look after their young better and pregnant animals can give birth in a more relaxed environment.
- Sick animals can be isolated; thus, reducing the risk of disease dissemination.
- Make sure the sufficient Feeder and water trays are available inside the housing.

Excess Yard

This yard is for their physical exercise and psychological freedom. The need for the excess yard is to make the animal move freely. This would be either tree for a shed or any freelance area.

Goat house wall

Goat house door

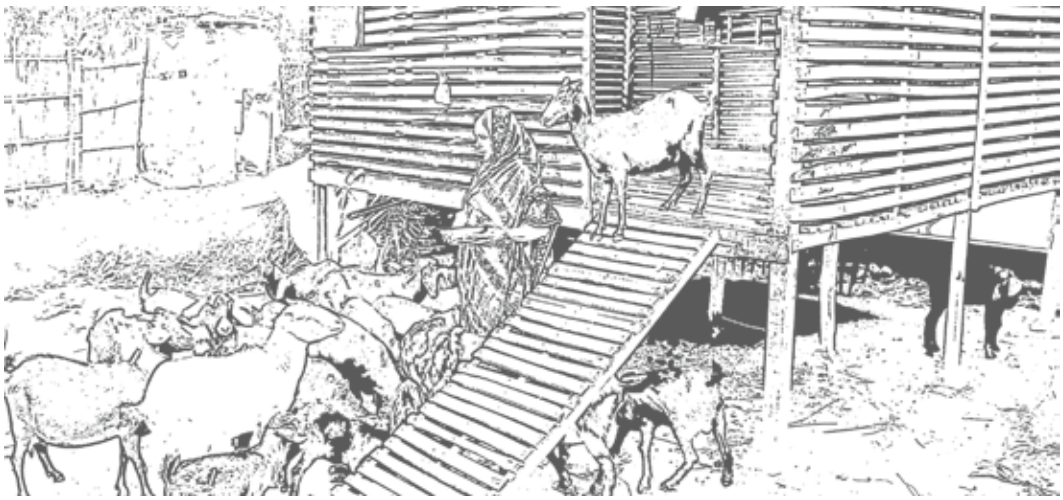
Internal Partition

Proper Shed Maintenance criteria-

1. Ventilation
2. Orientation
3. Lighting
4. Temperature & Humidity
5. Manure disposal & Cleanliness
6. Shed mending
7. Regular spray with antibiotics

Ventilation

- The purpose of ventilation is
  - To provide the desired amount of fresh air, without drafts, to all parts of the shelter;
  - To maintain temperatures within desired limits;
  - To maintain ammonia levels below specified levels.
- The ventilation openings must be placed high enough so that air does not blow directly past the goats.
- In warm climates, where the stalls are open, a low wall of about 1 meter on the side the wind comes from is sufficient.



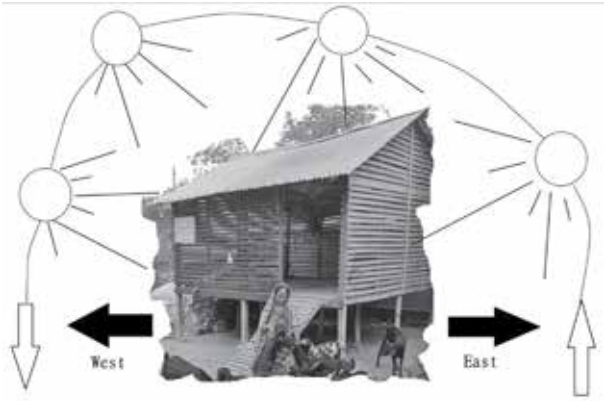
Wooden/BambooMacha (Platform) provides ample scope of smooth ventilation

Orientation

The orientation of the shed can be important depending on the climate. One can prevent the sun from heating up the stall too much by placing the longitudinal axis of the stall east-west.

Lighting

- Lighting is not only for the Visibility also to ensure the house dry and warm. Mostly natural lighting maintains good health.
- Technically lighting helps to ensure the photon to activate the vitamin D to ensure the calcium absorption to the blood vessels

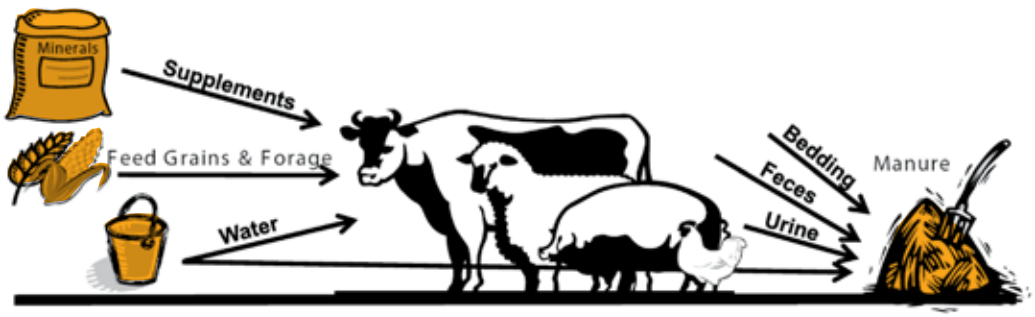


Temperature

- Temperature is the most important criteria for newborn kids. Heat lamps for newborn kids to eradicate Pneumonia.
- The Average temperature is 28-30C. Proper temperature is needed in both winter and summer.

Manure Disposal and Cleanliness

- Manure is composed of animal faeces and urine and may contain livestock bedding, additional water and wasted feed.
- It is a valuable fertilizer that contains a broad range of nutrients such as nitrogen (N), phosphorus (P) and potassium (K) as well as micronutrients such as copper (Cu), manganese (Mn) and zinc (Zn).
- Manures with added bedding are also an excellent source of organic matter which improves soil quality when applied to land. The water, nutrient and organic matter contents of manures, however, vary greatly making them more difficult to manage than synthetic fertilizers.



- If we properly manage the manure, that would be the great nutrients for the soil and it is also the part of sustainable waste management.

Spraying of Antibiotics

- To ensure the safety and to prevent the animals from the seasonal diseases spraying antibiotics are mandatory.

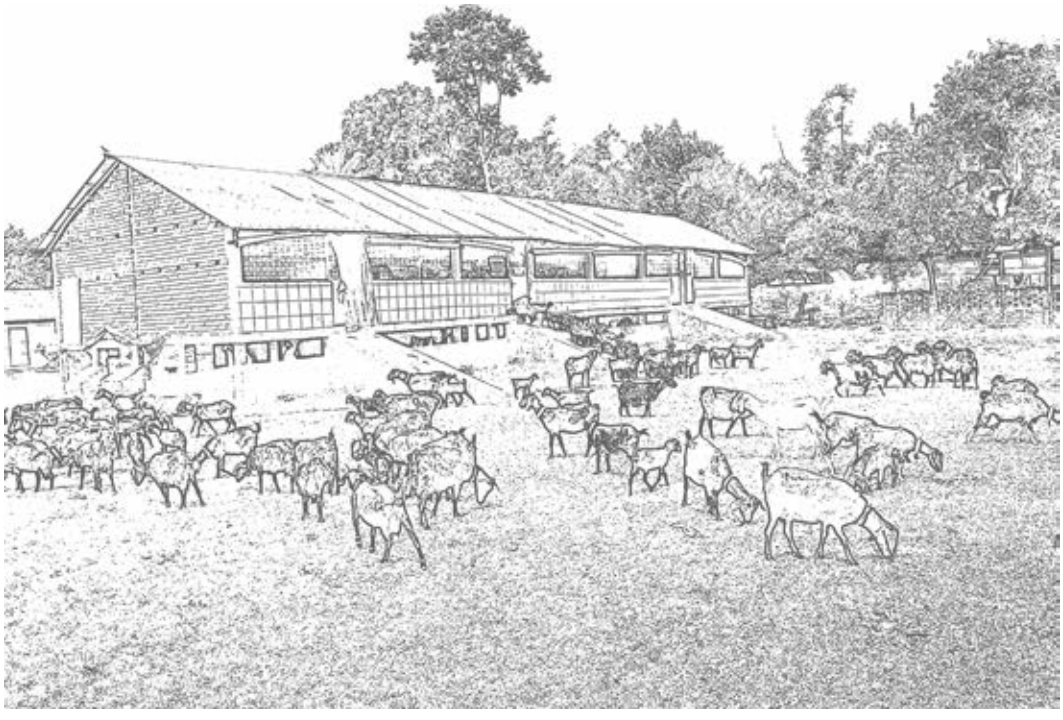
CHAPTER 1.5

Procedure to establish perch method at the household level

Step 1. Preference Area

The selection of space for establishing goat shed is primary and very important in influencing many factors for bringing a better ambience to the goats. As wetness causes the disease outbreaks, the place should be free from water stagnation preferably a high place. The place should have good ventilation for the easy removal of moisture, bad odours and replace with fresh air. During the winter and rainy season, Goat spends most of the time inside the sheds. So, air circulation is very important. The supply of feed and water to the goats are the major day to day activity. The place of sheds near feeder cultivation land and water source area will ease the process of supplying. As a whole, the place should be cool, dry and ventilated.

If the land availability is more, it is better to allocate a separate space for quarantine shed and isolation shed far away from the main rearing shed with the same specific conditions. The newly purchased goats are to be kept in the quarantine shed for monitoring and diseased goats are to be kept in the isolation shed for treatment. Based on the need, the buck shed for breeding can be added to the shed list.



Step 2. Available space and Number of goats for rearing – Area Fixation

Whatever we discussed so far is only about the environment. The second step is all about the available space for establishing a goat shed and the number goats intended to be reared in the long run. An adult goat needs 6-10 sq.feet area for living in the shed. Based on the number of goats to be reared and the availability of land in our hand, the minimum area for establishing a shed can be calculated and fixed. If we're planned to rearing 20 adult goats, the minimum area required for the shed will be to 120-200 sq.ft.

Then the piece of land with an area of 200 sq.ft can be selected with the above conditions in the available piece of land.

Recommended Floor and Trough Space for Goats in related to Live Weight

		Floor Space			
		Solid Floor	Slatted Floor	Open Yard	Trough Space
	Weight kg	ft^2/animal	ft^2/animal	ft^2/animal	ft^2/animal
Doe	35	9	7.5	22	4
Doe	50	12	10	27	4.5
Doe	70	15	12	33	5
Kid		4 - 5.5	3 – 4.5	-	2.5-3.5
Buck		55	45-55	-	5.5

Floor space requirement per animal (BIS standard)

Types of animals	Minimum floor space per animal (Sq.ft)
Buck in groups	20
Buck – individual	35
kids - in group	5
Goatlings	10
Doe in groups	11
Doe with Kid	16

Step 3. Size fixation of House

After selecting land and fixing the area for construction, the size of the shed should be finalized. The larger dimension can be called as length and it should be in an east-west direction for better ventilation. The dimensions of length and breadth of the shed can be adjustable to arrive in the calculated area for the shed in the available land area. For example, 40 sq.ft shed area requirement can be built as 8 feet length and 5 feet breadth. The Minimum height of the shed can 7 – 8 feet from the level of the stall. The stall should be minimum 4 to 5 feet from the ground level.

Step 4. Selection of Materials for Floor, Walls, Roofs

The selection of materials fully depends upon the local availability. The ground floor can be left muddy or levelled with concrete. The shed can be either fully or partially constructed by wood. The locally available wood or preferably bamboo can be used. The material should be free from any defects and have blunt edges. Any type of roofing sheets can be used for the shed.

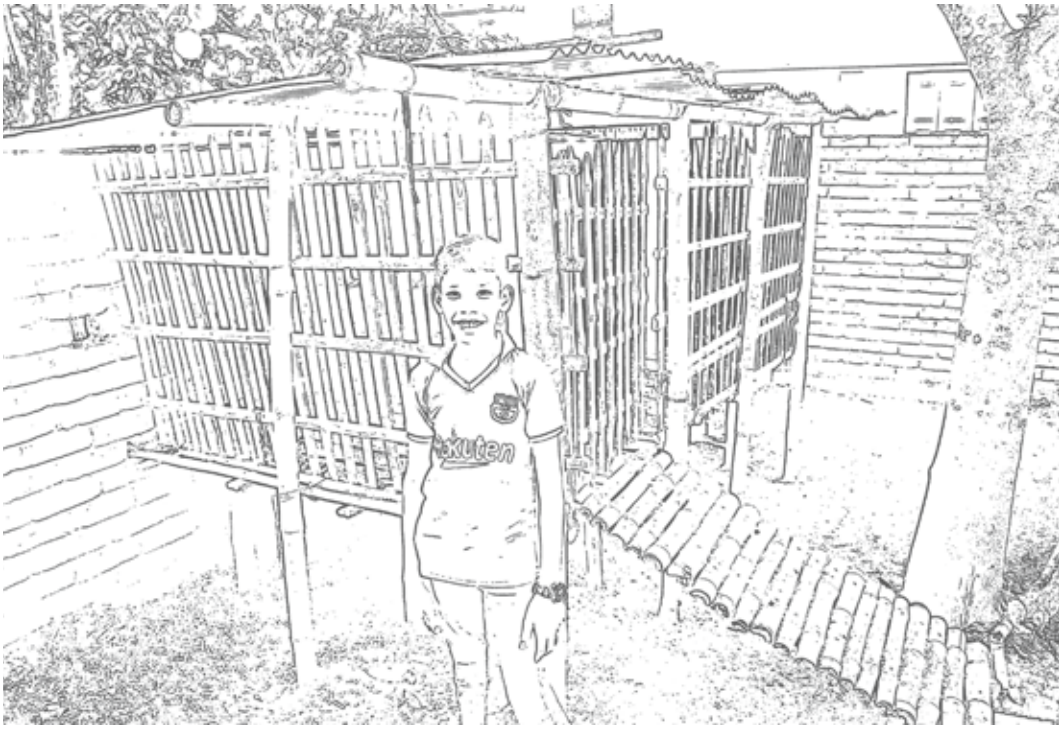
Step 5. Construction

Start from the ground, the floor should be levelled and concrete finishing can be done. After the erection of four pillars of the shed, the slatted floor can be built in the specified height from the floor with each slat placed between the gaps of 1.4cm to 1.6cm. The gaps between the slats in the area of kids should be less than 1.4cm. The Walls can be closed if built-in woods or bamboo. If it is built-in concrete the height should be only 1 foot especially in the ventilation direction. The roof should be placed in a sloping manner for easy drainage of rainwater. The shutters can be tied from the roof level to prevent from the rain. Doors and ladder for the slatted floor can be built in a north-south direction with a width of 1 ½ goat width. All the droppings fell on the ground floor can be collected in the dropping collection pit near the shed, which can be used as manure for the farm fields. Based on the availability of land space, the extended yard can be built in the door side with the height of the wall is 2 feet.

CHAPTER 1.6

Cost effective model

Smallholder producers with few animals are characterized by low input, low output production systems where costs need to be kept to a minimum. Cost reduction techniques such as making the animal shelter attached to the main house (lean-to house); using locally available, inexpensive materials; or, depending on the climate, providing minimum shelter (e.g., open yards) need to be considered. Designing animal houses for multipurpose use, such as including roof space to store farm implements, feed, seed, etc., is one way of reducing the cost of housing sheep and goats. Thatched roof houses are often adequate.



CHAPTER 1.7

WAVE intervention

WAVE Foundation started Black Bengal Goat rearing experimentally in 2000.A Pilot Project had started in 2002 that spanned from 2002 to 2007.This phase was a learning period that cemented our initial hypothesis that Black Bengal Goat rearing could play a transformative role in changing the life and livelihood of the poor family. One of the important features of this project was the introduction of Semi-intensive MACHA (Platform) method of Goat rearing which reduced Goat mortality rate significantly from 40% to 10%.

Semi-intensive Macha Method has revolutionized Goat rearing in our working area by reducing the mortality rate and increasing growth. The idea of Semi-intensive Macha method is, however, learning from the bitter experience of a destructive flood in 2000, which caused the huge loss. Since 2008, the advent of Semi-intensive Macha method has drastically changed the story of goat rearing.

Case study 1

ANNEXURE I

Economic sustainability: Effective goat rearing ensures children education.

A 38 year old lady Ms Gulchanara, the member of the SHG named 'Priya Mohila samuthi'- owning a domestic zoo in her residence with 14 goats, 3cows, 17 ducks, 10 hens and 50 pigeons. She looks active and hardworking to maintain these animals. Gulchanara's favourite animal is Sagol (Goat) she always pays additional attention towards goats fortunately in the year of 2013, she established her own perch housing for goats at her residence. Her initial expectation from this housing is to collect the goat droppings as a fertilizer for her agriculture field. Later she realized the important significance of diseases control happened among the group.

By considering her 14 goats, she invested 10,000BDT to establish her perch model of housing with bamboo and GI sheets as the base materials. Due to sufficient space availability, she established in the area around 150 square feet as the perch area for goat housing. She roughly spent three hours a day to maintain the mini goat farm. Her regular activities are cleaning the goat dropping at morning and preparing and ensuring the correct ratio and timing for feed to the goats. Her husband takes care of farming and rearing the goats for almost 2 hours to graze. In addition, she is ensuring the Vaccination and antibiotics to the goats from the support of WAVE Foundation. She has insured the goat with WAVE Foundation. This responsible lady ensures their children education through the income from the livestock particularly from the goat. In average, she is earning 3000BDT from the goat rearing activity. Not only economical changes she is psychologically happy about the activity of goat rearing.

Case study 2

ANNEXURE I

Belief brings Prosperity

10 years before, there lived a small family of a couple and their two children. The husband was struggling to earn income by working as an agriculture coolie and head load vendor. Due to their poor economic stability, school life of their ten-year-old daughter was interrupted and their two years old son was deprived of nutritious food to grow healthily. As their living district, Chuadanga is famous for Black Bengal Goat, the female leader of the family Mrs. Ferdhoshi Khatun decided to join the WAVE Foundation's Microcredit group called "Phonoful Mahalir Samithi " to get credit for building up a goat shed in their living space. Though she doesn't have any educational qualification and knowledge about perch method of goat rearing, She had only one thought in her mind that was in order to bring up their kids well, she decided to rear the black Bengal goats. She allocated a high levelled, cool and dry 40 sq.feet (10 X 4) land near the tree shed for establishing the goat rearing shed. With the help of 2,000 takas from WAVE Foundation, she erected a 5,000 taka cost goat shed (Macha).

The Macha is fully made up of bamboo, which is a local and easily available material in the vicinity. The roof is covered with aluminum sheets, which can withstand in heat, cold and heavy wind conditions. In order to reduce the cost, she raised the shed with one side leaning to the wall. Effectively twenty adult goats can be reared in that shed. Currently, she is having 11 goats. Out of which five are kids, which are born for a single mother in a single delivery. Yes, one doe is very lucky for her, which always deliver five kids at a time. It is a very rare case because the black Bengal goat usually delivers 2-3 kids at a time. She usually spends two hours in the morning and in the afternoon for cleaning and feeding the

goats. Goats roam outside of the shed during the day time and take rest inside the shed during the night time. She'll bath the goats monthly once and give vaccination six months once with the support of WAVE Foundation. Now, her husband is cultivating vegetables in a 0.08acres leased land for their livelihood. She is rearing 20 chickens and 11 black Bengal goats for boosting their family income.

The droppings from the goat shed are used as manure for their farmland. She'll sell the goats in the local Bisnupur market itself or in the nearby largest cattle market of the district Dug Dugi market. The income from goat is mostly used for their children's education. Their daughter is doing B.A economics and their son is studying 7th standard. Yearly they are getting 15,000 takas as a profit from this small goat rearing. She is a living example of how a small responsibility taken by any housewife can uplift the status of family drastically.

Major references

1. Semi-intensive Black Bengal goat rearing: An innovation for the poverty alleviation by WAVE Foundation

2. Technical bulletin No.32 from Ethiopia Sheep and Goat Productivity Improvement Program (ESGPIP)

ABOUT GOAT FEEDING

The Theme of the module is

- To understand the digestive system of goats
- To understand the nutrient and feed requirements of goats
- To know the sources of the required nutrients for goats
- To identify suitable fodder crops for semi-arid areas
- To understand the co-existence between crops and livestock
- To improve outputs from their crops and livestock enterprises by making use of the relationship between crops and livestock

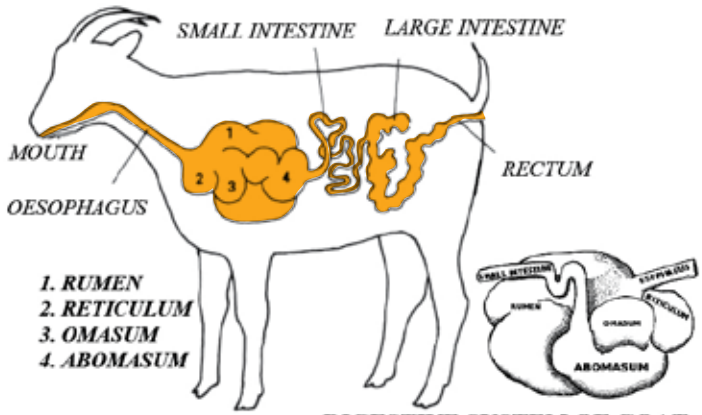
CHAPTER 2.1

Introduction for Goat feeding

Goats are mainly browsers (eat leaves off trees and bushes) although they will also graze (eat grass). They are ruminants. This means that they regurgitate feed or 'to chew over again'. Ruminants feed on plant matter which is comprised of cellulose, other carbohydrates and water. This has made it necessary for them to have a specially designed digestive system. To understand the feeding of goats one has to know their digestive system of the goats.

Digestive system

The goat-like any other ruminant (cattle, sheep) has four stomachs which are; rumen, reticulum, omasum and abomasums as illustrated in the diagram below.



DIGESTIVE SYSTEM OF GOAT

The abomasum is in fact, the true stomach. The rumen is big with numerous microorganisms, rumen and the microbes begin to digest and ferment this grass. Fermentation breaks down the starch, protein, fats and cellulose contained in the grass. The larger pieces of grass which are much more difficult to digest are regurgitated as cud and when the animal is relaxed, it is re-chewed and swallowed again. After the microbes have digested these materials, the products of their digestion are transported to the abomasum where final digestion and absorption takes place.

Why is Goat health important?

- One sick animal can sometimes contaminate other healthy animals and cause them to get sick too.
- Farmers who are aware of common diseases in their area need to think strategically about how to combat these diseases as a community rather than trying to just keep their own animals healthy.

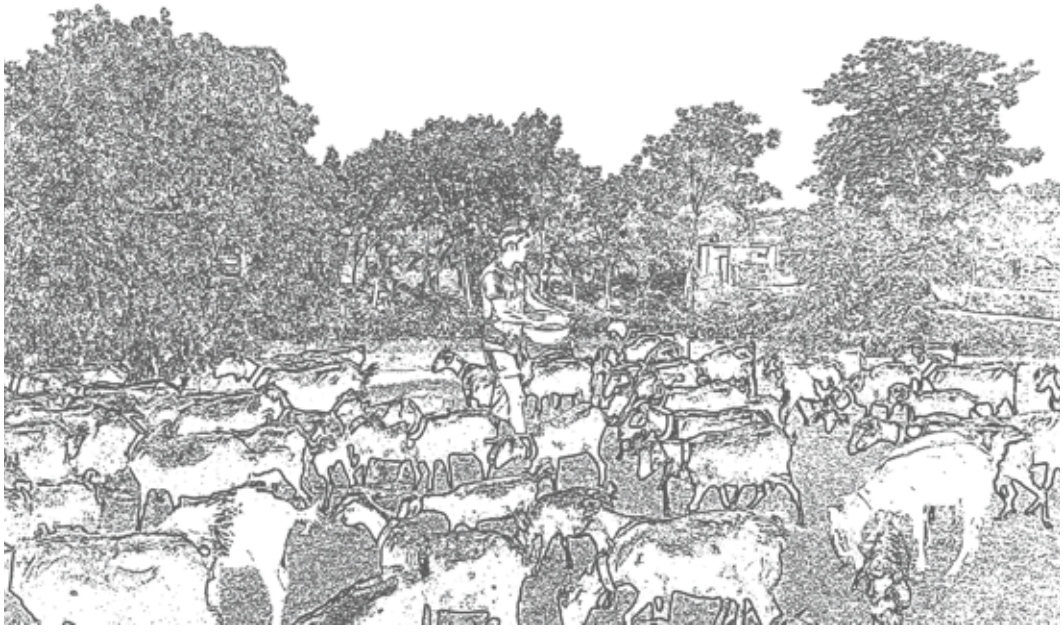
- So before we consider how to treat diseases, it is best to think about how to recognize healthy animals and how to keep them healthy.

What keeps animals healthy?

- The immune system keeps the animal healthy. The job of the immune system is to fight germs that invade the animal and could cause it to get sick.
- One way of getting an animal to have contact with a weakened form of the disease without killing the animal is vaccination. Some vaccinations must be given every year while others need only be given once in an animal's life.
- Infant livestock also develops stronger immune systems if they suckle their mothers very soon after birth to drink the first milk called colostrum, which is filled with the mother's immune cells (antibodies).
- Animals that do not spend too much of their energy on getting warm or staying cool are more able to recover from the disease. It is therefore wise to provide sick animals with shade and shelter from wind and rain to keep the animal warm and comfortable.

Why is food important?

- No matter how good your animal's immune system, if it is constantly hungry and very malnourished, it will eventually become sick.
- It is better to try to feed an animal properly so that it is generally in good condition.
- It is important that animals have enough good quality food so that they are able to maintain their immune system and to fight disease.
- Animals that are fed properly are also generally more productive, producing more milk, growing faster and having a shorter period between subsequent kids (preferably giving birth three times in a two year period).



How does a goat like to eat?

- A goat does not like to graze on the ground like a sheep or cow. Goats like feeding at knee height up to head height. So they like to feed above the ground often standing on their hind legs and resting their forelegs up on the bush or goat house wall. Goats need to be able to drink fresh water at all times.

What do they eat?

- They eat a lot of different plants/feeds. But they know what they want to eat.
- They even prefer different parts of the plant so they will eat leaves and flowers and not pods or stems, within the same plant.
- They get bored when fed the same feed every day.
- They can be wasteful. Only eating some of the plants. For example given un-chopped feeds like Napier grass they pull it out of the ground, eat the leaves only and do not eat the stem.
- Goats are clean feeders, and will not eat dairy feeds which are not fresh nor dirty feed e.g. Napier with mud splash from rain.
- Goats do not like sticky, mouldy, wet dusty feeds.

The best way to feed goats

- Feed only clean, fresh and dry fodder;
- always have fresh water for goats to drink at any time;
- clean the feeding trough and water bucket every day;
- give lots of different feeds such as grasses and legumes, tree leaves
- give chopped mixed feeds to make sure the goats eat everything and do not waste feed;
- feed goats at least three times a day and at the same time every day; and
- put some feed in the feed trough or rack or hang up some feed to be eaten overnight.
- If you use molasses to make feed taste better do not use too much it will make feed sticky
- Dusty feeds and concentrates should be wetted a little;
- provide fresh and clean water daily. There should always be water in the bucket;
- give mineral Lick [block] always to all goats;
- mix feeds with grass, hay, straw or Napier to balance;

CHAPTER 2.2

Basics of Goat Nutrition

Goats need a balanced diet comprising of water, carbohydrates, protein, vitamins, minerals and fibre. Goats require nutrition for body maintenance, growth, reproduction and production. The essential groups of nutrients for goats are water, Carbohydrate (energy), protein, minerals and vitamins.

- Daily feed intake of a goat is 3-4% of body weight.
- Feed supplement's requirements determined by age, sex, breed, production system, bodyweight, climate and physiological stage.

Importance of Nutrients in Feed

1. Insufficient water intake affects the production, growth and general performance. So provide ad-libitum freshwater for getting a good result.
2. Carbohydrate (Energy) from Roughages and Concentrated Feed Microbes in rumen help to utilize these feed. So keep the better microbial environment in rumen better metabolism and absorption better production.
3. Inadequate protein (CP) in diet negatively affects the growth rate, milk production, reproduction and disease resistance. To provide appropriate CP while ration formulation.
4. Goat needs a trace amount of minerals (Ca, Mg , Mn, Na, F, Cu , Zn etc) for basic body function and optimum production. Deficiency of Minerals leads to Metabolic diseases.

5. Vitamins for body maintenance require a very trace amount. Lead Vitamin deficiency diseases.

The table below shows the nutrients and some of the feeds from which the nutrients can be obtained.

Nutrient	Source	Uses
Protein	Leguminous plants, Poultry litter, Cottonseed cakes, acacia pods, beans, cowpeas, lucerne, soybean meal, green pastures and high protein concentrates (HPC).	• Proteins make up an important part of the diet • Proteins are broken down into amino acids before they can be utilized by the animal. • In plants, protein is usually concentrated in the leaves and seeds. • Protein or crude protein includes all of the nitrogenous compounds in feeds. • Young growing and lactating animals require more protein than animals only being fed for
Carbohydrates	Cereals(maize, sorghum, millet, corn),molasses	• Approximately 75% of a plant's dry matter is carbohydrates. • Carbohydrates are the chief source of energy for the goat and include sugars, starches and cellulose. • Commercial concentrate feeds also have carbohydrates and is divided into two categories: • Nitrogen free extract includes the easy to digest carbohydrates like starches and sugars • crude fibre is plain fibre.
Vitamins	Vegetables, green forage	• Vitamins are also important to dairy goats.Vitamin A is important for growth, • reproduction and milk production • Vitamin D is needed to combat rickets and a weakened skeleton. Vitamin D is supplied by sunlight but is also present in sun-dried hay.
Minerals	Agro-industrial residue, limestone flour	• Mineral matter is also referred to as ash. • Calcium and phosphorus are extremely important to animals. • Other important minerals are iodine, iron, copper and cobalt. • If an animal lacks iron, cobalt or copper it can become anaemic but if too much copper and cobalt are given to the animal it can die from toxicity.

Water	Water bodies, succulents (watermelons, cacti, etc)	• Goats should have constant access to fresh, clean water. • The amount of water consumed by the animal is depending on its diet. • One goat will drink 3 to 20 litres per day, depending on the stage of lactation and environmental temperatures. • During hot weather, all goats will have high water requirements.
Fat		• The fat component refers to fats and oils which are part of the diet. • Fats, including cholesterol and carotene, found • in grains and grasses, are vital for life and can be used to form important vitamins.

CHAPTER 2.3

Different Types of Feed and Management techniques

Feed Management Techniques

Extensive Grazing

- Allows to graze in the entire pasture land.
- Minimum feed cost.
- Making the best use of the whole grasses.

Rotational grazing

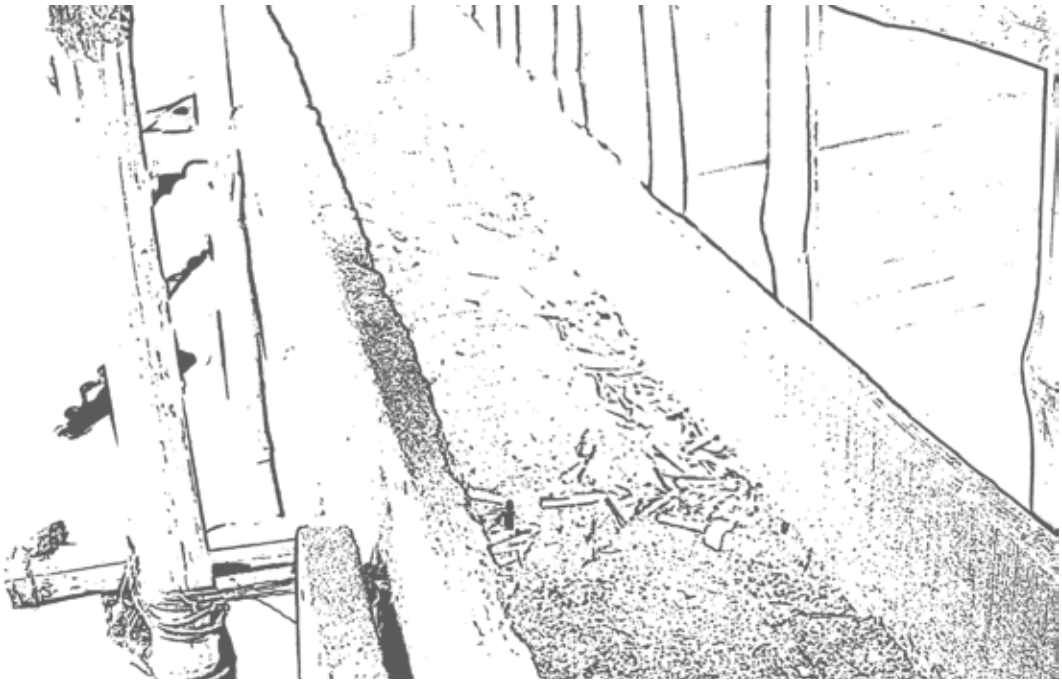
- The pasture land should be divided into several sections by temporary fences.
- Provides the quality fodder (immature) through the year.

Semi-intensive System

- Useful where the farm having limited grazing.
- Animals allowed to graze 3 to 5 hours in pasture land with stall feeding.

Intensive system or zero-grazing System

- Goats continuously kept in confinement
- Limited access to grazing or no zero grazing.
- Goats are fed only with stall feeding.



Different Types of Feed

Roughage:

A feed ingredient that has a high concentration of slowly degradable fibre.

- Dry roughages: hay, husk and straw.
- Green roughages: cultivated fodder crops, grasses, legumes and different tree leaves.
- 3% DM (Dry Matter) of Fodder is needed according to the animal's body weight.

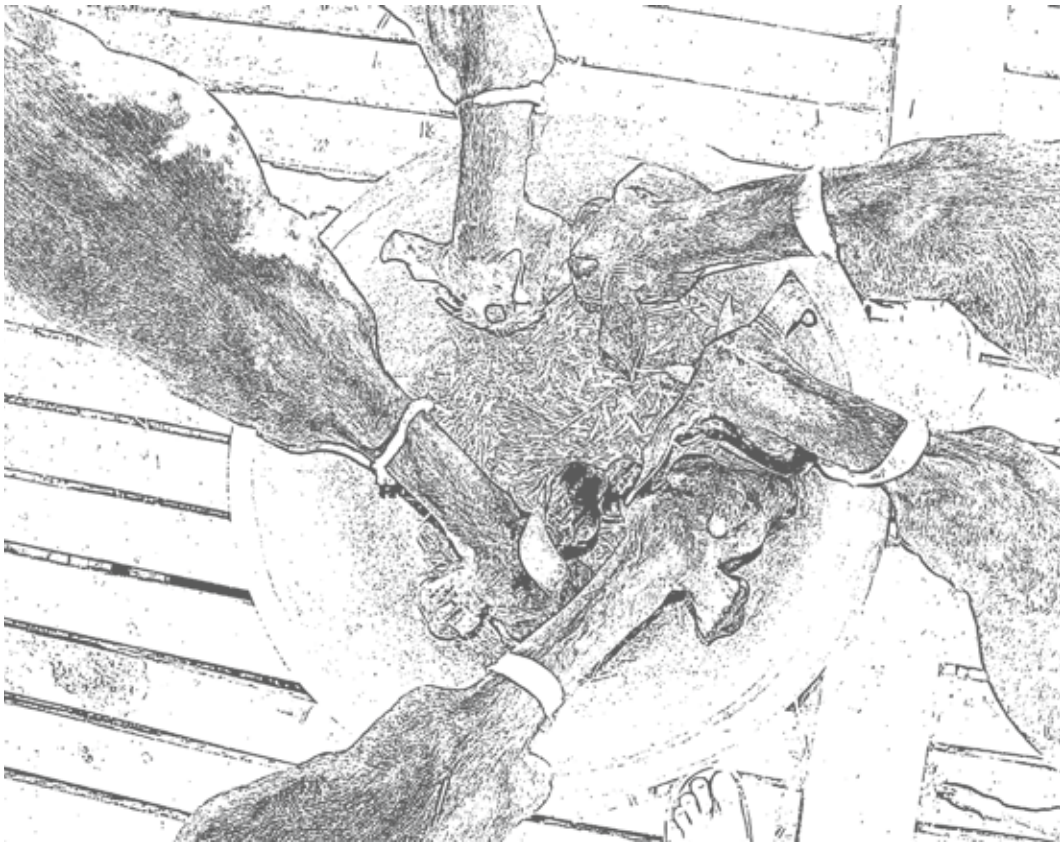
Example: For a goat weights 10kg needs 300g of DM.

Concentrated Feed:

- Contain a high density of total digestible nutrients usually low in CF (less than 18% of dry matter).
- High in protein as protein concentrates.
- High in energy as energy concentrates eg-cereals and milling by-products.
- Helps the animal for body growth, meat production and efficient breeding.

Balanced feed:

Contains all nutritional ingredients in proper ratio and quantity to meet up the demand of goat's body.



CHAPTER 2.4

Feed requirements for different goats

The quantity of feed consumed by a goat depends on age; breed; sex, size and physiological status (pregnant /lactating.)

- Goats will consume about 3-5% of their own body weight in dry matter daily
- Young goats will consume relatively more than mature goats
- Pregnant and lactating animals will need more feed to produce milk and to enable the foetus to grow.

Nutrient	Young Goats			Ewes (40 kg)	
	Weanling (3 kg)	**Yearling** (15 kg)	**Dry** (Pregnant)	**Lactating**	
				Avg Milk	High Milk
Daily Feed (kg)	1.0	1.5	2.2	2.2	2.5
Energy (MJ/kg DM)	10.2	9.7	9.0	9.0	9.7
Protein, % DM	14	12	10	11	14
Calcium, % DM	0.6	0.4	0.4	0.4	0.6
Phosphorus, % DM	0.3	0.2	0.2	0.2	0.3

Nutrient requirements for meat and fibre-producing goats (Note DM= dry matter)

Feeding different goats

Remember all goats must have fresh water whenever they need it.

Feeding sick goats

- Feed goats well when ill as good feeding will give strength;
- Small, weak, young and sick goats should be fed separately; and
- follow the best way to feed goats carefully and handle gently.

Feeding mature goats

Mature goats should be fed on whatever feed there is - enough feed gives more weight

Feeding the buck

- Feeding should be enough to keep its weight steady but not too fat as a fat buck will not be active.
- Give more feed two months before the buck has to serve the does as this will improve the bucks' sperm and make it more active.

- When a buck is being used a lot to serve does, it should be separated from other goats for about 2-3 hours per day. This will allow it time to eat as well as serve the does.
- Lots of fresh and clean water needed all the time.
- Must not to be lack of minerals.

Feeding does

- Concentrates should be fed to does just before the does are served by the buck;
- Gradually, increase feed until the doe gives birth; and
- Continue concentrate feed for sufficient latching.
- Feeding the breeding and lactating doe
- One month before mating the doe should be fed and watered very well so as she is in the best of health.
- Healthy doe is more likely to have twins or even triplets
- Give lots of water at all times

Feeding during pregnancy

During the first three months of pregnancy, the goats need to be fed as normal and to be sure that she is healthy. During the last two months of pregnancy

- The goat must be fed well with high-quality feed;
- There may be twins or triplets and they will need lots of good food to grow.

Feeding kids

During the first three months:

- Newborn kids should suck colostrum within 24 hours and then should be with the doe and allowed as much as they need;

- At one week, kids should be provided with small quantities of good clean feed e. g. tree legumes leave or natural tree leaves; and
- kids should continue with milk for the first three weeks and thereafter be allowed milk with fresh mixed fodder up to three to four months.

The requirement of Feed at different ages

Kids feeding (0-3 months):

- **One month:** 15 gram of concentrate feed and 50 gram of green fodder alongside suckling.
- **1-2 Months:** 25 gram of concentrate feed and 135 gram of green fodder alongside suckling.
- **2-3 Months:** 60 gram of concentrate feed and 230 gram of green fodder alongside suckling.

Category of goat	Roughage (Kg)	Concentrated Feed Requirement (gm /Goat/Day)	Water
Adult Doe	6	350	Ad-libitum
Adult Buck	8	500	Ad-libitum
Growing goat	3	200	Ad-libitum
Pregnant/ Lactating Doe	6	400-500	Ad-libitum

Problems encountered in feeding

- Bloat: Feeding leguminous feeds which are high in nitrogen content causes bloat, which is the accumulation of gases in the stomach. If animals are not attended to in the time they may die.
- Acidosis
- Bladder stones
- Plant poisoning (Umphaphapha)

Critical feeding times

Critical periods when you need to ensure your goats are properly fed are:

- Before mating (ewes and rams)
- Late pregnancy (last 6-8 weeks) to avoid small, weak kids – but do not overfeed or there will
- be kidding difficulties from large kids
- Early lactation (to make sure the ewe has enough milk for her kids).

CHAPTER 2.5

Formulating the Goat Diet

The brief descriptions given above will aid in your ability to design a diet that is suited for the needs of your animals. Concentrate feeds are considered supplemental feeding and provide the nutritional needs that are not met by forages. Forages or Roughage should form the basis of your diet. They can include green plants or dried plant matter (hay). Corn stalks, root crops and legumes are also considered roughage. Green forage is rich in vitamins but it contains a high percentage of water and fewer nutrients when compared to hay, an animal will therefore need to consume huge quantities of this forage to meet its nutritional needs. The diet that has a lot of green forages can also lead to bloat. This does not mean that green forages are not desirable, but that they must be understood and managed properly if it is to be fed to goats. Animals can gain access to green forages in two ways:

Stall Feeding

- Feeding the goat with feeders for reducing wastage.
- Feeder should be cleaned on a regular basis to avoid the smell and disease spread.
- Provision of appropriate feeders also reduces competition.

Separate feeding

- In open grazing, goats receive similar feeds for getting the required nutrient.
- Concentrate or roughage should be given separately to the buck, lactating doe, pregnant doe and kids.

Advantages of stall feeding

- Does not need a large amount of land and no grazing pastures;
- can use many farm products, banana leaves, maize, maize thinning, bean husks, etc.;
- saves time and labour, do not have to take goats out of the farm for grazing or spend time looking for them;
- less death amongst the kids and all goats because they can be easily looked after throughout the day;
- easier to plan and manage to breed;
- keeps goats from eating crops and damaging the farm;
- makes collecting manure very easy; and
- Helps in controlling diseases.

Balance Ration Formulation Technique

- Consider the animal condition like age, weight, doe, buck and kid.
- A nutritional feed with low cost, easily available and easily digestible.
- Fresh feed material free from wastes (mud, stones and dust)
- Fixed ration needs to be used providing balanced nutrition to the animal.

The Balance Ration Formulation technique is based on the standard Metabolic Energy and the Crude Protein.

The Required ME for goat=10.4MJ/Kg, CP=18.6%

To attain this value, we are in the need of understanding the nutritional value of the ingredients and the ratio of the concentrated feed.

Concentrated Feed Ingredients and its nutritional value

Ingredients	ME (Kcal/Kg)	CP (%)	Ca (%)	P (%)
Maize	3309	9.25	0.07	0.40
Wheat Bran	1085	13.8	0.11	1.21
Rice polish	2917	11.9	0.35	1.26
Pulse/Soyabean meal	2240	45	0.32	0.67
Master oil cake	2200	35	0.90	1.2
Molasses	2400	2.45	1.5	0.66
DCP	-	-	24.3	18.2

Concentrated Feed Ratio

Ingredients	Percentage
Maize	18.5
Wheat Bran	32
Rice polish	18.5
Pulse/ Soyabean meal	10
Master oil cake	18
DCP	1
Salt	1
Vitamin-minerals	1

Ration Formulation for Goat based on the available ingredients:

Ingredients	Amount (Kg)	ME (Kcal/Kg)	CP (%)	Total ME	Total CP	Percentage
Maize	16.25	3309	9.25	53771.25	1.503125	32
Wheat Bran	8.5	1085	13.5	9222.5	1.1475	17
Rice Polish	11	2937	11.9	32307	1.309	21
Molasses	1	2400	2.45	2400	0.0245	2
Master oil cake	2.5	2200	35	5500	0.875	5
Soyabean meal	9.75	2240	45	21840	4.3875	19
Salt	0.5	-	-	0	0	1
Vitamin-mineral	0.5	-	-	0	0	1
DCP	0.5	-	-	0	0	1
Total per day (Kg)=	50.5		Kcal	125040.75	9.246625	
The Required ME for goat=10.4MJ/Kg The Required CP=18.6%			The obtained ME for the goat =10.36 MJ/Kg The obtained CP= 18.3%			

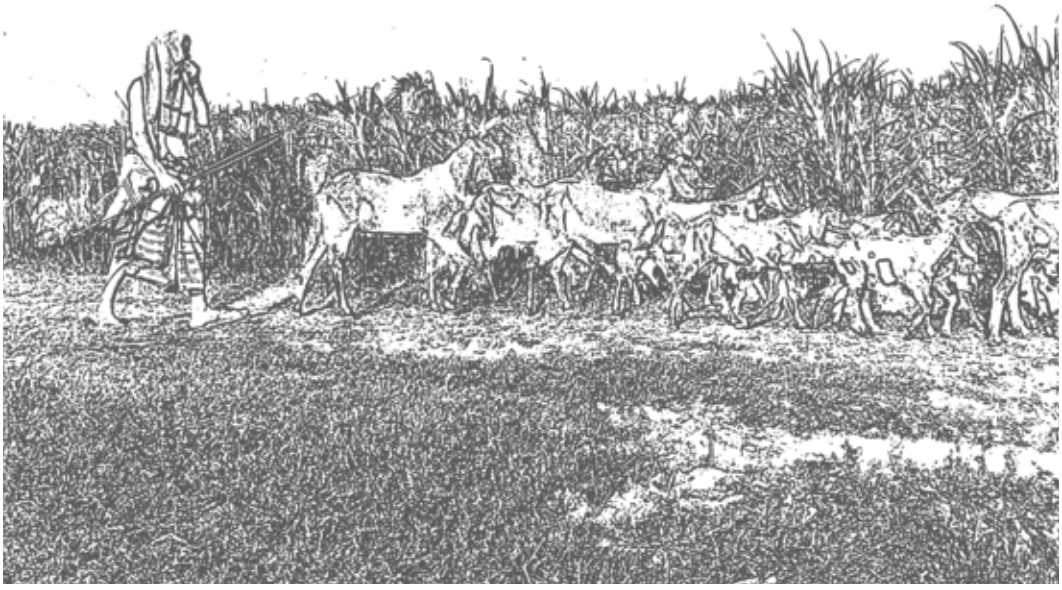
CHAPTER 2.6

Effective Feed Plan for a Small group of goats

Based on the several learning's we came up with the effective feed plan for a small group of goats. Goat can survive by ingesting only roughage based feed. Goat needs very less amount of concentrated feed or dry-matter (DM) in total required feed to survive its life. But concentrated feed should be provided to the goat for increasing milk production and enhancing physical growth.

For a 15Kg body weighted goat:

- 0.2 Kg carbohydrate (CHO) based feed is required.
- One-tenth of its body weight digestible protein-based feed is also required.
- It also needs excess feed during late pregnancy period as well as milk production and physical growth of kids in the fetus.



Concentrated Feed (sample diet) for Goat

For Growing Kids(Sample diet formula-1):

Feed Ingredients	Quantity (gm)
Broken Maize	220
Broken chickpea/Gram	200
Almond oil cake/master oil cake	350

Multi-Vitamins	15
Salt	5
DCP	10
Total	**1000**

**Provide 250-350 gm per day per goat along with grass or leaves.*

For Adult and Pregnant Doe(Sample diet formula-2):

Feed Ingredients	Quantity (gm)
Broken rice	200
Wheat bran	300
Bran of chickpea/Gram	100
Master oil cake	200
Sesame oil cake	160
Multi-Vitamins	20
Salt	5
DCP	15
Total	**1000**

**Provide 400-500 gm per day per pregnant goat with grass or leaves.*
***Provide 350-400 gm per day per Adult goat with grass or leaves.*

CHAPTER 2.7

Goat Fodder Production

Fodder, a type of animal feed, is any agricultural foodstuff used specifically to feed domesticated livestock, such as cattle, rabbits, sheep, goat and horses.

There are two types of fodder available.

- Annual fodder - Ex: Cowpea, Maize, Sorghum
- Perennial fodder - Ex: Sesbania, Hybrid Napier, Guinea grass.

Fodder Production and conservation

- The major constraint to livestock production is the unavailability of sufficient feed, especially in the dry season.
- The rangelands do not provide adequate (quantity and quality) feed throughout the year to support goat production.
- Therefore it is necessary to produce fodder crops for supplementary feeding during the dry season.

Fodder crops

These are crops that are grown for livestock feeding. They can be fed while still fresh or preserved. Some examples are given in the table below.

Fodder crops classification

Class	Crop name	Varieties	Planting
Grasses	Sorghum	• Sugar drip • Sugar graze	• Sow seeds with the first effective rains • Spacing-90x20cm
	Millet	• Nutrifeed	• Sow seeds with the first effective rains • Spacing-90x20cm
	Bana grass		• Planted in furrows/rows with the first effective rains • Rows should be 1m x1m in irrigated lands and 1.5mx1m in drylands • Use plant cuttings (vegetative propagation)
Legumes	Cowpeas, Dolichos bean, Velvet bean		• Sow seeds with the first effective rains • Spacing-10cmx10cm • For Dolichos the spacing is 75cmx15cm

Napier

- Plant Napier along river beds, along soil terraces, road reserves, etc.
- Where a farmer has a big farm, then plant as one crop near the home to save time and work when talking to the goats.
- Good Napier needs manure and top dressing with fertilizer, and it needs weeding.
- Where new fields are being planted, mixed cropping with desmodium improves the quality of the fodder.
- If you plant Napier around your maize, it stops Maize stalk borer!
- Cut Napier often so it is easy for the goats to eat and digest
- Crop type: Perennial grass fodder.
- Soil: Heavy soil in a wet condition not stagnated
- Seed spacing : 60X50 sq.cm
- Cutting: First cut: 75-80 days
- Subsequently 45 days once.
- Yield: 360-400 ton/ hector.

Maize

While maize is grown for farmer's food, there is a lot of fodder which can be used for feeding the goat which will not stop the farmer getting a good maize yield.

- Thinning: all the extra maize seedlings that grow from the same seed hole should be thinned and dried a little before feeding to the goats.
- Remove extra leaves - this should start with the leaves below the cobs as soon as the cob can be seen.
- Cutting the tops - this should start after the grains have hardened.
- Stover - these should have sweeteners (molasses) added or sprinkle common salt after chopping.
- Broken grains - these are very nutritious especially after a heavy harvest but should be fed carefully to avoid grain overload
- Crop type: Annual
- Soil: Sandy loam and clay.
- Seed spacing : 30 X 15 sq.cm
- Cutting: When the cob is in milky stage.
- Yield: 40-50 ton/ hector.

Moringa

This legume is widely distributed and is also referred to by the following names: drumstick tree, ben oil tree, benzolive tree and horse-radish tree. Moringa is propagated from seeds or from cuttings. The legume should be sown at the beginning of the rainy season on elevated seedbeds so that it is protected from water-logging but it can benefit from soil moisture. While propagation through seeds is well adapted to foliage production, propagation from cuttings is suitable for high-grade fruit production and for root production. Moringa has an outstanding growth rate and can be harvested for foliage in less than 2.5 months. Optimal cutting intervals range from 15 to 75 days, depending on local conditions and management practices. Moringa leaves are a valuable source of protein for ruminants but they have moderate palatability. It is estimated that the crude protein in Moringa can reach more than 20% with proper management practices. Ruminants find this forage palatable and studies have shown that Moringa can improve dairy goat milk production.

- Crop type: Perennial tree fodder.
- Soil: Loamy, sandy or sandy-loam types of sand.
- Seed spacing : 20X10 sq.cm
- Use: All parts of moringa are used as traditional medicines.

Advantages of consuming fresh fodder:

- Faster weight gain and better quality meat.
- High-grade fibre

- Improved quality milk production
- Improved hoof health
- Improved fertility.

Integrated crop-livestock production systems

This topic explains the inter-dependence between crops and livestock that is each benefiting from the other.

- For most small scale and marginalized farmers, crops and livestock are often the major sources of income.
- These products are often disposed of during times of need where cash is needed urgently to provide for other services.
- Integrated systems can increase farm productivity for most resource-poor farmers.

Crop –livestock Interaction

Benefits of Livestock to Crops	Benefits of Crops to Livestock
Sold to procure crop production inputs	Crops sold to procure inputs for livestock
Supply of manure for crop production	Provide feed.
Nitrogen supply through urine.	Produce Oxygen used by livestock
Livestock helps balance ecosystems through foraging	Use of crop residues as bedding and Roofing material.
Help in seed dispersal of certain crop and grasses	
Insurance against of crop failure	

Case study 1

ANNEXURE II

Effective feeding is a key for market price: An experience of the rural graduate.

"Goat rearing springs economical confidences for women" said by Reshma, a 30 years old progressing graduate from the trivial village, Peerpur, Damarkuda Upazilla of Bangladesh.

She realizes that managing the seven-member family with her husband income is not an ample one. She safeguarded her family's economic sustainability through the goat rearing. Eight years ago she started with a single goat and now she is ended up with twenty-two goats. She believes that her progressive successes are mainly due to her effective feed management for the goats.

She comprehends that traditional grazing alone not going to be adequate for goats to gain the weight. So she capitalized her morning time to prepare the healthy food made-up of white rice and Corn. She fixes two-kilogram food daily with rice and corn with the equivalent ratio. She invests daily 60BDT and monthly around 3000BDT which includes vaccination and goat management.

Apart from this, she guarantees the four hours of grazing for the goat. To mark effective grazing she endorses her father to graze in the area where Napier grasses and Ipilipil branches are maximum. In her economics, she sells more than 5-6 goats which cost around 12000BDT when the goat attains 20kgs.

She trusts that high weight gain of goat leads to high market price so the key to market price lies under the weight of the goat, the weight of goat is lies under the effective feed management. After revelling her business secret, she laughs.

Case study 2

ANNEXURE II

Healthier their Goat, Healthier their Livelihood Growth

The country where the farm field and livestock are the two eyes, being a farmer is not as easy as portrayed. "Me and my wife works minimum 12 hours per day for the better living" say the farmer of Bishnupur village in Damurhuda Upazila of Chuadanga District. Managing of available resources without or with minimum input for the farm field and livestock decides the profitability of all the farmers. The weeds from the farm field can be used as fodder for the livestock and the droppings of cattle can be used as a manure for the farm field.

Ms.Leema Khatun and her husband doing agriculture in a two biga land, where they cultivate paddy two times in a year and vegetables based on the season. They're also rearing fifteen goats, seven bulls and six chickens. At the time of their marriage, Leema's husband did agriculture alone but once the arrival of their first daughter, they thought for the secondary occupation. They started rearing cattle. The couple has school-going two daughters and a son. They invested most of their earnings for the children's education.

Three years before, with the help of WAVE Foundation, they got support to build a perch type housing for their four goats. Ms.Leema got a loan from the microfinance group of WAVE foundation along with the technical support for housing and disease management. Now, they're having fifteen goats, where four are bucks, five are does and six kids. Perch method of housing helped them to collect the droppings of goats easily and use it as manure for their farm field.

They usually sell the bulls and goats in the nearby Cattle Market called Dug Duhi Hart – Largest in the vicinity, which opens every Monday. Leema's family sell two to four goats for every three months and they get 5,000 takas for the kids and 20,000 takas for the adult goat. In a year, they usually get an average of 70,000 BDT from the goat sale alone. As they're having perch type of housing, the mortality rate of a goat is almost zero, as it's safeguarding the goats from diseases especially during the raining season.

In order to increase the bodyweight healthily, they're providing a concentrate feed with a mix of rice, corn, starch and Chola (protein) along with the open grazing and leaves from their farm field. Usually, it takes five-kilo grams of feed per day for all the goats. They're making their goats stay healthy and gain weight by spending 5000 BDT every month for buying these fodder. Apart from this, they also provide tree leaves whenever necessary. As they're having three cattle, their place looks like a small integrated livestock farm. They also provide vaccination every six months with the support of WAVE Foundation. Healthier the livestock, healthier their livelihood.

Annexure-III

Effective feeding: An action research trial on FEED CONVERSION RATIO (FCR)

Background of FCR

Goat is a favourite domestic animal widely reared by every underprivileged family in the developing countries. These goats act as informal economical insurance for the family during the requirement. In goat management feeding plays a vital role. In general, Feeding takes about 70-75% of the total cost of production in a livestock enterprise. This simply means that the type of feed you serve your farm animals will determine their quality and yield.

Feed conversion ratio or FCR is the rate or degree at which a farm animal converts feed served into the desired output. In practical term, it is the amount or quantity of feed your farm animal will eat to attain a live weight of one kg or yield a unit of the desired product (Meat, milk, etc). The desired output in Cow is milk; in our case for the black Bengal goat is simply meat. So, the ratio of feed given to the weight gain is called as FCR of Black Bengal Goat.

As a profit-oriented farmer, it is very important you understand the FCR of your goat so as to plan their budget before production. In order to understand and analyze the farmer's input and output happening in the goat rearing, we tried to do Goat FCR in the Koshagata Black Bengal Goat Farm with the thumb rule of "Effective Feed: more the weight more the profit"

Formulation

There is a way to test the FCR of any livestock you feed; the simple arithmetic feed conversion ratio formula is:

$$FCR = \frac{\text{Amount of Feed given to the goat}}{\text{Weight gained of the goat}}$$

The value you get from this conversion is called the ratio. It shows how well the farm animals actually utilize the feed to produce the desired output. In some cases, it shows the quality of the feed. The output could be meat or milk. For instance:

- Poultry birds have an average FCR of 1.5
- Rabbit has an average FCR of 4
- Feed conversion ratio for cattle is 12.5
- Feed conversion ratios in fishes are: For Tilapia: 17 and for Catfish: 1.5.
- Feed conversion ratio sheep and Goat have an average FCR of
  - 4.5 on high concentrate feed,
  - 5.5 on good quality forage
  - About 30 on straw ratio.

There are some important factors that affect the FCR some of them are Age of animal, feed quality, Management Practices and Genetics of the animal.

Methodology

In order to monitor all the sections, we selected 4 bucks, 4 does and 4 Castrated goats for this FCR Process. All the goats are in and around six months old, which the growing stage where the feed directly impacts the growth in the body. All the goats were grouped into two as 2 bucks, 2 does and 2 castrated goats in each. Group one is marked as X and two as Y. Buck as B, Doe is D and Castrated goat as C. Therefore, the goats with tags of XC1, XC2, XD1, XD2, XB1, and XB2 are in the Group X and goats with the code of YC1, YC2, YD1, YD2, YB1 and YB2 are in the group Y.

Goat type	**Group Name**			
	X		Y	
	Code	**Weight (g)**	**Code**	**Weight (g)**
Bucks (B)				
First Buck	XB1	9640	YB1	10540
Second Buck	XB2	9360	YB2	12840
Does (D)				

First Doe	XD1	4760	YD1	5680
Second Doe	XD2	5000	YD2	5640
Castrated (C)				
First castrated	XC1	8140	YC1	6840
Second castrated	XC2	5940	YC2	7680

For the safety and better monitoring purpose, bucks were separated from their own group but provided the same feed. XC1, XC2, XD1, XD2 in the cabin 1, YC1, YC2, YD1, YD2 in the cabin 2, XB1 & XB2 in the cabin 3 and YB1 & YB2 in the cabin 4. First, the weight of all the twelve goats was noted down and dropped in the respective cabins.

Feed Calculation

Goat needs 3-4% Dry matters of feed out of its body weight for basic metabolic activities and the growth daily. For example, 10 Kg of weight goat needs 300-400 grams of Dry matters. The needed Dry matters were calculated for all the goats based on their weight as follows.

ROUGHAGE CALCULATION					
X GROUP	Weight of Goat in grams	DM needed in grams	Y GROUP	Weight of Goat in grams	DM needed in grams
XC1	8140	244.2	YC1	6840	205.2
XC2	5940	178.2	YC2	7680	230.4
XD1	4760	142.8	YD1	5680	170.4
XD2	5000	150	YD2	5640	169.2
XB1	9640	289.2	YB1	10540	316.2
XB2	9360	280.8	YB2	12840	385.2
	TOTAL	**1285.2**		**TOTAL**	**1476.6**

Trail 1

In the Trail 1, we are planned to measure the FCR and the significance of colocasia plant in providing nutrient to the goat. so we have decided to provide 50% dry matters of grass plus 50% concentrated feed for the group X and 50% dry matters of grass plus 50% Colocasia leaves for the group Y. Colocasia is a locally available plant, which is rich in starch & fibre and can be boiled with salty water to use as a goat feed.

The Grass contains 25% Dry Matters of its weight. For example, 1kg grass contains 250 grams of DM. So, 10kg goat needs 1200 grams of Grass to consume its need of 3% DM demand. (300* 4 = 1200).

The Colocasia contains 16% Dry Matters of its weight. For example, 1kg colocasia contains 160 grams of DM. So, 10kg goat needs 1875 grams of Grass to consume its need of 3% DM demand. (300* 6.25 = 1875).

Intensive Feeding was implemented to measure the accurate intake and weight gain of all the goats. The feeding was done twice a day with grass followed by the respective concentrated feed in the morning and evening by keeping the goats in-cabin throughout the day. Grass and Concentrated feed were collected from the farm, Colocasia was collected from the roadside and cooked on the farm.

We feed in the above-said method and observed for a few days. Goats denied to eat colocasia and became very dull. Bucks also jumped from the cabin at the night time and created trouble. So, we decided to drop the colocasia and buck from the process.

Trail 2

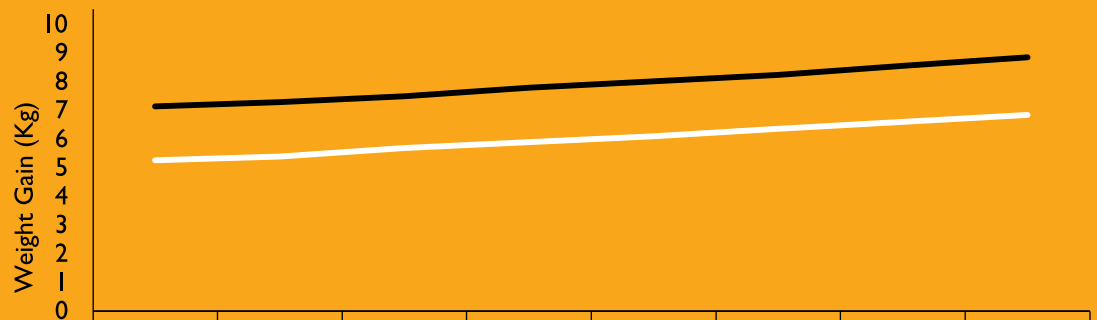
In the trail 2, we dropped the colocasia plant as the feed. Then we decided to feed the Grass and Concentrated Feed for the cabin 1 (XC1, XC2, XD1, XD2) and cabin 2 (YC1, YC2, YD1, YD2). We also normalized the feed content and provided an equal amount in both the cabin.

	Feeding Schedule			
	Morning		Afternoon	
	Roughage (g)	Concentrated feed (g)	Roughage (g)	Concentrated feed (g)
Cabin 1 (XC1, XC2, XD1, XD2)	1430	500	1430	500
Cabin 2 (YC1,YC2,YD1,YD2)	1550	500	1550	500
**Roughage is calculated based on the bodyweight of goat. **25% DM in grass **3% of body weight is the needed DM for the goats*				
**Depends on the age of goat Concentrated feed calculated **Each goat gets 250 grams of Conc.feed/day*				

Findings

The systematic feeding is provided for the 35 days. In the regular interval, the weight of each goat is measured. The feed is calculated according to dry matter (DM) need and the essential conc. feed. After the careful measurements, we end up with the FCR individually for the castrated goat and the Doe.

Monitering Period-Weight gain



	Day 1	Day 5	Day 10	Day 15	Day 20	Day 25	Day 30	Day 35
Castrated	7.15	7.3	7.5	7.8	8.025	8.25	8.555	8.86
Doe	5.27	5.4	5.7	5.9	6.1	6.37	6.61	6.85

WEIGHT CALCULATION

Group	Day 1	Day 25	Overall Growth at Day 35	Feed	FCR Value
Castrated Goat					
XC1	8.14	8.88	1.42	13.69	9.64084507
XC2	5.94	6.594	0.86	13.69	15.91860465
YC1	6.84	7.587	1.28	13.69	10.6953125
YC2	7.68	10.022	3.28	13.69	4.173780488
Avg.	7.15	8.27075	1.71	13.69	10.10713568
Doe					
XD1	4.76	5.755	1.66	13.69	8.246987952
XD2	5	5.94	1.6	13.69	8.55625
YD1	5.68	6.963	1.57	13.69	8.719745223
YD2	5.64	6.86	1.48	13.69	9.25
Avg.	5.27	6.3795	1.5775	13.69	8.693245794

There is a gradual increase in the weight of both types of goats. Based on the 35 days feed and the gradual weight gain end up in the results of FCR. The Average FCR for the castrated goat is 10.1 and for the Doe are 8.7.

In conclusion, a lower FCR is the most desired, it means goat eats lesser feed to attain the desired weight or output. The highly nutritious feed has lower FCR the protein content of the feed plays a major role the FCR, the higher the protein, the lower the FCR and conversely the more the profit made as the cost of feeding is relatively reduced. Either the Defect feed nor the excessive feed, both create a serious problem with goat productivity. So planning of goat feed has become necessary even for small scale goat rearer's.

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