

Acknowledgement

National Agricultural Research Organization (NARO), Ministry of Agriculture, Animal Industry and Fisheries (MAAIF) and The World Bank

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Small Scale Dairy Production Systems

**A Feeding Manual for Production of
10 liters milk/Cow/Day in a Small
Scale Dairy Production System**



The Ministry of Agriculture,
Animal Industry and Fisheries



The National
Agricultural
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Organization

Introduction

Small scale dairy production is generally a labour intensive enterprise which is mainly constrained by limited availability and quality of feeds. At the same time inadequate understanding of small scale farmers on a dairy cow's feed requirements leaves them vulnerable to seasonal changes in feed availability and quality. However, it is possible to plan all year round feeding for a dairy cow without succumbing to the changes in feed availability and quality. This manual addresses the feed production and feeding challenges faced by the small scale farmers. The manual envisages production on a one-acre piece of land. The key issues addressed include: (1) Feeding according to the needs of the cow, (2) Forage production (3) Forage conservation (silage).

Feeding according to the nutrient requirements of a cow:

The nutrient requirements of a dairy cow are determined by maintenance, growth, lactation and pregnancy status of the cow. A lactating cow generally requires more nutrients and subsequently more feed than a dry or non-lactating cow. This manual considers a mature cow with the following characteristics:

- Live weight - 400 kg
- Daily milk yield – 10 litres
- Milk fat content – 4%
- Milk protein content – 3.3%
- Daily intake
 - 12 kg dry matter DM i.e. 31 kg fresh forage plus
 - 15.2 kg fresh total mixed ration (TMR)

TMR is a formulated diet from different feedstuffs such as maize bran, cotton seedcake, hay, silage, etc



Feed production

A forage production plan should consider providing feed for the cow throughout the year. The priority forage for this model will include napier grass (*Pennisetum purpureum*), Brachiaria mulato (Improved signal grass), Lablab and Alfalfa (*Medicago sativa*). If the cow eats 31 kg of fresh forage (grass) per day, it will need $31 \times 365 = 11,315$ kg of forage per year.

A farmer should therefore ensure he/she can produce the above quantities of feed all year round. The following table summarizes the land (acres) required to produce the forage required.

Table 1: Land required for forage production for one cow per year

Feedstuff	Land required (acre)
Napier	0.5
Brachiaria mulato	0.2
Lablab	0.1
Alfalfa	0.2
Total	1.0



Napier



Lablab

Total mixed ration (TMR)

Total mixed ration is very important in small scale dairy production because it is the quickest way to meet the nutrient requirements of dairy cows. TMR is meant to provide for fibre, protein, energy, minerals and vitamins. TMR can be formulated from several feedstuffs as long as it meets the requirements of the cow. For this manual, the feedstuffs used include Napier silage, maize bran, alfalfa hay, sunflower cake, cotton seedcake and cassava (Table 2). However, it's always important to add mineral premixes according to the recommendation of the manufacturers. The TMR can be offered to a cow grazing pastures or fed fresh forage such as Napier or Brachiaria mulato under zero grazing.

Table 2: Composition (%) of TMR and fresh amounts of each feed provided per cow per day

Feedstuff	Fraction in diet (%)	Quantity per day (kg Fresh)	Total required (kg for 9 months)
Napier silage	26	9.23	2,492
Maize bran	30	2.37	640
Alfalfa hay	8	0.67	181
Sunflower cake	7	0.55	149
Cotton seed cake	12	0.98	265
Cassava roots	17	1.41	381
Total	100	15.2	4,104



Brachiaria mulato



Alfalfa

Forage conservation (Silage)

This manual only addresses silage as an important means of conserving forage. For this manual, there will be need to prepare and ensile at least 2,990 kg of fresh napier per year per cow. This can be obtained from quarter an acre of land.

Steps in preparation of silage

Stage 1

The first stage of making silage is calculating how much silage to make. This protocol proposes to feed 9.23 kg of silage per cow per day for nine months. Therefore, the total amount of silage to be made = $9.23 \text{ kg} \times 9 \text{ months} \times 30 \text{ days} = 2,492 \text{ kg}$. However, there are losses during ensiling and harvesting of the silage which can account for up to 20%. Hence, the silage made should be 20% more than the calculated = 2,990 kg.

Stage 2

The second stage is deciding the size of the silo based on the compactness or density of the silage material. In this case will consider the density of the napier silage 600 kg/m^3 . Therefore, the 2077 kg of silage will require a silo of $2,990/600 = 4.98 \text{ m}^3$. This is equivalent to a pit which measures $3\text{m (length)} \times 1.8 \text{ m (width)} \times 1$

Stage 3

The third stage is preparing the silo. A silo can be a flat surface, pit, polythene bag or a container that can be used to compact the silage.

Stage 4

The fourth stage involves harvesting, chopping, compaction and sealing of the silage. Materials should be chopped short enough (2 -3 cm) to ease compacting which is a core factor in ensiling. A forage chopper like the one in the picture below is therefore important for silage making. Compaction ensures total elimination of air which is a major determinant of successful silage making when all other conditions are fulfilled. Well compacted and sealed silage can last for over one year before use.

Stage 5

Stage five involves harvesting and feeding the silage. Silage should be harvested carefully with minimum exposure to minimize losses resulting from aeration. The sealing or covering material should always be opened just enough for a day's harvest and resealed completely.

