### Contents

Executive Summary: .................................................................................................................. 5  
1. Introduction: .......................................................................................................................... 7  
2. Aims and Objectives: .............................................................................................................. 8  
3. Methodology: ........................................................................................................................... 8  
   3.1. Key Informant Interviews (KII) with dairy stakeholders .................................................. 8  
   3.2. Review of literature on dairy sector in Zimbabwe ............................................................. 8  
   3.3. Selection of Milk Collection Centres (MCC) and dairy farmers ....................................... 8  
   3.4. Preliminarily evaluation of two MCC .............................................................................. 9  
   3.5. Farmer extension training on land preparation ................................................................. 9  
   3.6. Farmer extension training on seed selection and planting ................................................ 9  
      3.6.1. Amount (kg) of different seed varieties, cost to plant in 0.5 hectare and planting space are as below; ............................................................................................................. 10  
   3.7. On farm seed multiplications nurseries .......................................................................... 12  
   3.8. Production of silage .......................................................................................................... 12  
      3.8.1. Forage harvesting and transporting ........................................................................... 12  
      3.8.2. Chopping and compaction ....................................................................................... 13  
      3.8.3. Sealing ...................................................................................................................... 14  
      3.8.4. Why maize and sugar graze for silage production? .................................................. 14  
   3.9. Production of Hay ........................................................................................................... 15  
4. Results and Discussions ........................................................................................................ 15  
   4.1. Findings of the preliminarily evaluation of MCC ............................................................... 15  
   4.2. MCC in the pilot intervention ........................................................................................... 16  
      4.2.1. Gokwe MCC .............................................................................................................. 16  
      4.2.2. Tongogara MCC ...................................................................................................... 16  
      4.2.3. Mushagashe MCC in Mashvingo ............................................................................ 17  
      4.2.4. May field, Mafumise, and Upperant MCC ............................................................... 17  
      4.2.5. Umzingwane MCC .................................................................................................. 17  
   4.3. Legumes used in pilot intervention phase ......................................................................... 17  
      4.3.1. Cowpea (*Vigna unguiculata*) ................................................................................. 18  
      4.3.2. Velvet beans (*Mucuna Pruriens*) .......................................................................... 18  
      4.3.3. Lablab (*Lablab purpureus*) ................................................................................... 19  
      4.3.4. Soya beans (*Glycine max*) ................................................................................... 19  
      4.3.5. Sun hemp (*Crotalaria juncea*) .............................................................................. 19

---

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Executive Summary:</td>
<td>5</td>
</tr>
<tr>
<td>1. Introduction:</td>
<td>7</td>
</tr>
<tr>
<td>2. Aims and Objectives:</td>
<td>8</td>
</tr>
<tr>
<td>3. Methodology:</td>
<td>8</td>
</tr>
<tr>
<td>3.1. Key Informant Interviews (KII) with dairy stakeholders</td>
<td>8</td>
</tr>
<tr>
<td>3.2. Review of literature on dairy sector in Zimbabwe</td>
<td>8</td>
</tr>
<tr>
<td>3.3. Selection of Milk Collection Centres (MCC) and dairy farmers</td>
<td>8</td>
</tr>
<tr>
<td>3.4. Preliminarily evaluation of two MCC</td>
<td>9</td>
</tr>
<tr>
<td>3.5. Farmer extension training on land preparation</td>
<td>9</td>
</tr>
<tr>
<td>3.6. Farmer extension training on seed selection and planting</td>
<td>9</td>
</tr>
<tr>
<td>3.6.1. Amount (kg) of different seed varieties, cost to plant in 0.5 hectare and planting space are as below;</td>
<td>10</td>
</tr>
<tr>
<td>3.7. On farm seed multiplications nurseries</td>
<td>12</td>
</tr>
<tr>
<td>3.8. Production of silage</td>
<td>12</td>
</tr>
<tr>
<td>3.8.1. Forage harvesting and transporting</td>
<td>12</td>
</tr>
<tr>
<td>3.8.2. Chopping and compaction</td>
<td>13</td>
</tr>
<tr>
<td>3.8.3. Sealing</td>
<td>14</td>
</tr>
<tr>
<td>3.8.4. Why maize and sugar graze for silage production?</td>
<td>14</td>
</tr>
<tr>
<td>3.9. Production of Hay</td>
<td>15</td>
</tr>
<tr>
<td>4. Results and Discussions</td>
<td>15</td>
</tr>
<tr>
<td>4.1. Findings of the preliminarily evaluation of MCC</td>
<td>15</td>
</tr>
<tr>
<td>4.2. MCC in the pilot intervention</td>
<td>16</td>
</tr>
<tr>
<td>4.2.1. Gokwe MCC</td>
<td>16</td>
</tr>
<tr>
<td>4.2.2. Tongogara MCC</td>
<td>16</td>
</tr>
<tr>
<td>4.2.3. Mushagashe MCC in Mashvingo</td>
<td>17</td>
</tr>
<tr>
<td>4.2.4. May field, Mafumise, and Upperant MCC</td>
<td>17</td>
</tr>
<tr>
<td>4.2.5. Umzingwane MCC</td>
<td>17</td>
</tr>
<tr>
<td>4.3. Legumes used in pilot intervention phase</td>
<td>17</td>
</tr>
<tr>
<td>4.3.1. Cowpea (<em>Vigna unguiculata</em>)</td>
<td>18</td>
</tr>
<tr>
<td>4.3.2. Velvet beans (<em>Mucuna Pruriens</em>)</td>
<td>18</td>
</tr>
<tr>
<td>4.3.3. Lablab (<em>Lablab purpureus</em>)</td>
<td>19</td>
</tr>
<tr>
<td>4.3.4. Soya beans (<em>Glycine max</em>)</td>
<td>19</td>
</tr>
<tr>
<td>4.3.5. Sun hemp (<em>Crotalaria juncea</em>)</td>
<td>19</td>
</tr>
</tbody>
</table>
**List of Acronyms:**

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>CCR</td>
<td>Cereal Crop Residues</td>
</tr>
<tr>
<td>CGIAR</td>
<td>Consultative Group for International Agriculture Research</td>
</tr>
<tr>
<td>DDP</td>
<td>Dairy Development Programme</td>
</tr>
<tr>
<td>DM</td>
<td>Dry Matter</td>
</tr>
<tr>
<td>DVS</td>
<td>Department of Veterinary Services</td>
</tr>
<tr>
<td>FFS</td>
<td>Farmer Participatory School</td>
</tr>
<tr>
<td>FTLRP</td>
<td>Fast Track Land Reform Programme</td>
</tr>
<tr>
<td>ICRISAT</td>
<td>International Crop Research Institute for Semi-Arid Tropics</td>
</tr>
<tr>
<td>ILRI</td>
<td>International Livestock Research Institute</td>
</tr>
<tr>
<td>LCB</td>
<td>Local Capacity Builder</td>
</tr>
<tr>
<td>LOL</td>
<td>Land O’ Lakes</td>
</tr>
<tr>
<td>LPD</td>
<td>Livestock Production and Development</td>
</tr>
<tr>
<td>MCCs</td>
<td>Milk Collection Centres</td>
</tr>
<tr>
<td>NADF</td>
<td>National Association of Dairy Farmers</td>
</tr>
<tr>
<td>SCC</td>
<td>Swedish Cooperative Centre</td>
</tr>
<tr>
<td>USAID</td>
<td>United States Aid for International Development</td>
</tr>
</tbody>
</table>
Executive Summary:
Since 2000 the collapsed of the commercial dairy sector in Zimbabwe resulted in declined in dairy herd size and genetic capacity of the breeds, milk quantity and quality and skilled personnel in the country. Smallholder dairy sector faces number of constraints and challenges such as lack of quality feed, weak genetics of existing breeds, high disease prevalence and poor management of dairy herds. In addition to shortage of quality feed (dairy forage/fodder, high cost of stock feed) imbalanced nutrition (energy, protein, fat, vitamins and minerals) is a major factor for low productivity of smallholder dairy sector in Zimbabwe. Furthermore smallholders lack of information, knowledge, skills, access to loans and finance which make the sector non viable for them. Balanced nutrition in dairy rations contributes to improved growth, fertility, milk quantity and quality as well as to reducing both the cost of production and the emission of green house gases per unit of milk product. However the methods of feeding dairy cows should be easy to practice, cheap and locally available to make smallholder dairy sector viable and sustainable

The main objective of this pilot intervention was to train farmers on forage/fodder, silage and hay production and to balanced rations in order to increase milk quality and quantity in Zimbabwe. Cost of commercially available stock feed is unaffordable for most of the smallholders and access to stock feed is poor in rural areas of Zimbabwe. Therefore the production of on farm multi-purpose legumes and cereal crops fits in well for the smallholder dairy sector. Legume varieties such as cowpea, lablab, velvet beans, soya beans and sun hemp were intercropped with cereals (maize and sugar graze) in this pilot phase. Five Milk Collecting Centres (MCC) (Gokwe, Tongogara, Umzingwane, Mushagashe and Chipinge) were selected based on their present performance, efficiencies and geographical distribution in the country. Two to four farmers were selected from each MCC and demo plots were established on each farm. Quality seeds were selected and each demo plot was 0.5 or 1 ha ( depended on land availability) and all five legume varieties were intercropped with cereals. Plants were harvested at the beginning of maturity (cereals at tussling and legumes at 50% flowering stages). Cereals were chopped in to 2 cm using a motored chopper grinder in Gokwe and at all other four MCC plants were chopped manually in to 4-5cm using pangas and axes. Chopped cereal was mixed with velvet beans or lablab or cowpea (only up to 25% of the total bio-mass in order to obtain high quality, high energy silage). Pit silos were an average of 2.5m depth, 6m height and 2m width, (size was depended on the yields of plant materials) and chopped materials was added layer by layer (20 to 25cm to keep the air tightness) and used a water filled drums for thorough compaction. Silo pits were covered with black polyethylene and soil was added on the top to maintain the air tightness and to avoid water and soil contamination. Silos were left for 6-8 weeks under anaerobic condition for microbial ensiling process. Silage samples were analysed for dry matter (DM), crude protein (CP), crude fibre (CF), ADF (acid detergent fibre), fat and Ph. Rest of the legumes in the field (after making silage) were harvested at 50% flowering stage and air dried for one to two days to process high quality hay and preserved in plastic bags or bales and stored in the shade until the long dry winter period.

Rainfall in 2012/2013 was very good (ZimVac 12/2013) and forage yield was very good compare to last few years particularly in Matabeleland South and Mashvingo. Seed germination varied between 75-90% in all 19 demo plots. Some of the demo plots in Gokwe and Mushagashe were affected by water logging and cereal and sugar graze germination was poor than legumes in these two areas. One demo plot in Rusitu Mayfield had the problem of water leaching and therefore soil fertility and crop yields were poor. The best demo plot with high yields of sugar graze, maize and all five legumes were obtained in Umzingwane. Gokwe had the second best demo plots and the poorest were in Tongogara. It was noted that the availability of legume and sugar graze seeds was very poor and the cost of seeds was very high. Some of the dairy farmers reside too far from MCC and local business centres and delivery of the milk and access to the inputs was challenging for them.

The silage was given to dairy cows at peak lactation 16, middle lactation 10 and late lactation 8 kg/cow/day. This will be continued at least for 100 days at each stage and farmers will be able to see the increased milk production and quality at farm levels. Gross Margin analysis was carried out for this pilot phase. The results
showed that farmers will be able to profit 5000.00 USD per year through production of forage and silage on their farms and feeding the herd through-out the year.

The next phase of the project should target more farmers and more MCC in the country in order to revitalise smallholder dairy sector and make the sector commercially viable for both producers and for MCC in the country. This will result improved food security and livelihoods of smallholder dairy farmers and the milk and dairy products diary markets. Since the feed and water are the most critical constraints related to the sector effort should be taken to improve the feed availability in the country particularly low cost fodder and silage production at farm levels. This can be done not only with the dairy farmers but also contracting non-dairy farmers who have land and water resource to cultivate forage and silage on their farms. MCC can be the contractor for the feed business and facilitate it between dairy farmers and silage producers at each MCC.
1. Introduction:
Zimbabwe used to be self-sufficient with its milk production and surplus exported to the neighbouring countries prior to the Fast Track Land Reform Programme (FTLRP) in 2000 (ZimVac 2012). Since then the collapse of commercial dairy sector has resulted in reduced size of dairy herds together with their genetic quality, skilled personnel, milk quantity and quality. In 1990 milk production was 262 million litres and it declined to 37 million litres by year 2009. However with the support from the government and various donors, milk production has increased up to 51 million litres within the last three years.

The major constraints and challenges for the smallholder dairy sector are poor availability of quality feed/nutritionally balanced diets particularly in the long dry winter season (May to October), poor genetic quality of existing breeds, high prevalence of diseases, and on farm poor herd management practices. These constraints make dairy farming non-viable business for players in the dairy value chain particularly for smallholder dairy farmers, and also other actors i.e. MCC (Milk Collecting Centres), processors, transporters, wholesalers and retailers. The high cost and poor access of stock feed, non-existing on farm forage/fodder, silage and hay production make dairy sector un-profitable for smallholder farmers in Zimbabwe.

The available feed particularly during dry winter period is poor quality, low nutritive Cereal Crop Residues (CCR-e.g. maize stover) which are low in crude protein (CP) <5%, high fibre >60%) hence low in palatability, low intake, poor digestibility, metabolism and nutrient absorption in animal body. Feeding of poor quality CCR results in low milk yields, such as 1-3 for a local breed and 5-6 L/cow/day for cross bread, poor quality (low fat and protein content<3%) of milk and high disease prevalence in dairy cows. Feeding a balanced ration can increase net daily income by 10–15% for smallholder farmers in Zimbabwe. This is through an increase in milk production and a decrease in the cost of feeding dairy cows. Feeding balanced rations reduces greenhouse gases (methane) emissions by 15–20% per kg of milk produced (FAO 2005). Imbalanced feeding of dairy cows leads to excess feeding of some nutrients whilst others remain deficient. This not only reduces milk production and increases costs per kg milk, but also affects various physiological functions including long term animal health, fertility and productivity of dairy cows. It is also essential that smallholder dairy farmers feed their animals the required nutrients that match the physiological needs (animal growth, milking, pregnant cows) of the animal. However smallholder dairy farmers lack in information, skills, knowledge, and access to loans and finance which has profound impact on the development of this sector.

Smallholder dairy production and productivity (milk quantity and quality) can significantly be increased by supplementation of CCR with locally available, inexpensive fodder/forages, silage and hay production as well as rangeland reinforcement. Improved varieties of legumes (CP 15-30% and rich in minerals- calcium (Ca) & phosphorous (P) and vitamins- A & D) and grasses (Napier, Rhode grass, star grass) which are resistant to drought, fast growing, thrive in low fertile sandy soil, resistant to biotic and abiotic factors are the best bet for smallholder dairy sector in Zimbabwe.

Recent dairy sector study carried out by SNV-Zimbabwe evident the current situation of the sector in general and particularly the poor availability of on farm quality feed, nutrients and feeding technologies and weak genetic quality of existing breeds in the country. Therefore SNV has hired a livestock production and market linkages development consultant Dr. Dammika Carr, (Consultant-Livestock production and market linkage development specialist from, AgriMarket Services Pvt. Ltd) to implement a dairy forage/fodder, silage and hay pilot intervention project at five Milk Collecting Centres (MCC) in the country.
2. Aims and Objectives:
This pilot forage/fodder intervention phase aimed to develop the five selected MCC into commercially independent units which maximize the use of high quality, nutritional forage/fodder, and hay and silage availability in the dairy value chain. By introducing commercially viable models for the feed issues and balanced rations, farmers can realise a strong positive correlation between increased availability of quality affordable feed and increased milk quantity, quality and therefore increased income together with reduced feed costs. With a robust and efficient impact monitoring system, this phase will be used to pilot test assumptions and ‘fine tune’ a model for further up scaling and ‘roll out’ in October 2013 for the full programme.

3. Methodology:
Inception meeting was held between Dr. Dammika Carr and SNV staff Morgan Gomo, Sylvia Khumalo, and Donald Ditima. The purpose of the inception meeting was to fine tune the T.O.Rs and to develop a common understanding on the key areas of activities in this pilot phase. It was emphasised during the meeting that the pilot intervention phase needs to focus on identifying suitable forage/fodder and silage for small holder dairy cows in order to increase milk quality and quantity and to reduce feed cost to make the sector more profitable for the smallholders.

3.1. Key Informant Interviews (KII) with diary stakeholders
SNV staff, Dairy Development Programme (DDP), Land O’ Lakes (LOL), National Association of Dairy Farmers (NADF), GRM International, Swedish Cooperative Centre (SCC), Departments of Crop Science and Animal Science, University of Zimbabwe (UZ), International Livestock Research Institute (ILRI), local level MCC, Livestock Production and Development (LPD), Department of Veterinary Services (DVS), AGRITEX staff, and private Seed companies such as Zaka super seed and milk processors-(DairyBoard Chipinge). Semi-structured questionnaire was used as a guideline for the interviews (See Annex 1).

3.2. Review of literature on dairy sector in Zimbabwe
Relevant documents in smallholder dairy sector, feed production (forage/fodder, silage and hay production), balanced rations, and milk production were reviewed. These documents were obtained from UZ, ILRI, FAO and web based on line research papers. It is necessary to review the relevant documents and reports to see what forage/fodder crops are already being used in MCC in the past and feeding values of those crops and if available, cost benefit analysis or Gross Margin Analysis (GMA) to identify appropriate forage/fodder production systems for smallholder sector. It is economical and efficient to improve same species of crops and by getting better improved varieties than introducing completely new forage/fodder crops for dairy farmers and MCC in Zimbabwe

3.3. Selection of Milk Collection Centres (MCC) and dairy farmers
MCC were selected based on the out-come of KII, their efficiency, (MCC structure, capacity, farmers’ commitments for dairying as a business, MCC practices ranging from weak to top level), and links to commercial processors and to various markets and geographical location of MCC in four different agro-ecological zones of Zimbabwe. Selected MCC were; Rusitu Mayfield (Manicaland- large herd/low yields), Gokwe (Midlands, best in class, some aspects), Shurugwi (midlands, recently stated new intervention will impact the dairy sector) Mushagashe (Mashvingo, low herd size, high potential) and Umzingwane (Matabeleland South, severe drought and lack of water resources for forage production, at the time of selection centre was non functional). A total number of 19 farmers were selected to set up demonstration plots and seed multiplication units, [4 (Rusitu Mayfield), 3 (Gokwe), 4 (Shurugwi), 4 (Mushagashe), 4
(Umzingwane) farmers respectively. Farmers were selected from MCC, number of dairy cows (at least 1-5 dairy cows), some experience of previous dairy farming.

3.4 Preliminarily evaluation of two MCC
Two field visits were made on the 28th to 30th of November 2012 to evaluate the situation of MCC, (Mushagashe in Masvingo and Umzingwane in Matabeleland South) prior to the initiation of the pilot intervention. Field level KII were carried out with the staff of extension (LPD, DVS and Agritex), NADF, LOL and MCC. Dairy farmers were interviewed with the help of LOL, MCC and NDAF staff. In addition to the interviews, several farm visits were made in order to identify the locally available resources such as sizes of farms, available seed varieties, quality & quantity and the cost to purchase them, fertilizer, and most importantly the available water resources.

3.5 Farmer extension training on land preparation
Farmers and extension staff training was carried out on the Farmer Field School (FFS) approach. This extension approach is ideally suited to the promotion of quality feed/balanced rations, feeding technologies (forage/fodder, hay and silage production and improved land management) and dairy herd management. Due to the erratic and low rainfall particularly in Matabeleland South and Masvingo provinces attempt was paid to select the FFS near the water resources (natural rivers, springs and dams). The demonstration plots represented as the ‘virtual classroom’ for farmers as they are engaged in a participatory learning environment throughout the entire growing season, or in other words ‘seed to seed’ and production of silage and hay. Farmer training in land preparation, seed identification (legumes) and selection, cereal (maize and sugar graze) legume intercropping were carried out at 19 FFS in five districts. Designing, implementation and monitoring of the demonstration plots were carried out by the consultant with the help of SNV staff, extension officers and lead farmers. In order to achieve the maximum sustainability of the forage/fodder dairy programme farmers selected their preferred seed varieties during this pilot intervention. However availability of forage/fodder legume seeds and the cost of these seeds were the biggest challenge during this pilot phase. Three to four demo plots were established in each district. Legume seeds were intercropped with maize or sugar graze giving enough spacing for the plants to grow. Compound D fertilizer was applied for cereals at the time of planting and in some cases top dressing ($NH_4NO_3$) was applied after a month of planting seeds.

The demonstration plots attempted to showcase the Conservation Farming techniques;
- Minimum tillage
- Mulching (crop residue, green manure, cover crops) and
- Crop rotation (legume-cereal and fallow, intercrop, sole crop);
- Correct planting techniques (population, spacing, thinning, planting and harvesting time)

Prior to practical work began in the field at virtual FFS, extension staff and farmers were given brief introductory lectures on seed identification & selection, land preparation and planting of forage/ fodder seed (cereal and legumes), within the CA context.

3.6 Farmer extension training on seed selection and planting
One of the main objectives of this project was to provide quality feed/nutritionally balanced rations for dairy cows (energy, protein, fat, vitamins and minerals) at daily basis. Although water is not considered as a nutrient, it is fundamental to provide sufficient water for dairy cows to increase feed intake, digestibility, metabolism and absorption of nutrients in animal body. The methods of feeding smallholder dairy cows should be easy to practice, economically viable and locally available feed. Use of legumes varieties in dairy feeding regimes fits in well for the smallholder sector compare to commercial stock feed which are poorly available and expensive for smallholder farmers. Legume varieties, such as cowpea, lablab, velvet beans, soya beans and sun hemp were used in demo plots for silage and hay processing to feed dairy cows during the long dry winter period. Poor availability and the high cost of these seeds were the biggest challenges during this
pilot intervention phase. Seeds were visually selected according to their uniformity, size, shapes and moisture content for planting in demonstration plots in FFS.

1. Cowpea seeds
2. Velvet beans seeds
3. Lablab seeds
4. Soya beans seeds
5. Sun hemp seeds
6. Maize

3.6.1. Amount (kg) of different seed varieties, cost to plant in 0.5 hectare and planting space are as below;

Maize 12.5kg (27$), sugar graze 5kg (5$), velvet beans 15kg (30$), cowpea 10kg (20$), lablab 15kg (30$), soy beans 5kg (6$) and sun hemp 3kg (6$). These seed varieties were purchased from farmers, and NADF, MCC, SeedCo, Farm & City and different local agro dealers. Compound D fertilizer was bought locally from agro dealers at 66$ for 100kg. Compound D was applied prior to planting cereal varieties such as maize and sugar graze. This pilot project provided top dressing (NH4NO3 at 39$ for 50kg) to apply for cereals after four to six weeks of planting date. Plant spacing between rows was 50 cm for legume varieties and 90cm for cereals in each demo plot in all five districts. The spacing between seeds within row was 15 cm for maize and for legumes 20 to 25 cm. Cereals (maize and sugar graze) and legume varieties were intercropped in all 19 demo plots as described earlier. Sugar graze and Sun hemp were planted using drill method. One seed per hole was used for maize, lablab and velvet beans and two seeds for cowpea and soya beans were planted to give better germination rate. Plants were thinned after 2-3 weeks from planting date. Plots were weeded manually every two to three weeks to control weed particularly during the rainy season. These seeds were the best sown into a well-prepared even, smooth seedbeds that has a good depth of subsoil moisture (at least 75 cm). Seed were sown at a depth of 4 to 6 cm into moist soil with good seed-soil contact.

Sowing cowpea seed at 10 to 14 kg/ha of good quality seed under dry land conditions, with 18 to 35 cm row spacing, to give a plant population of 90,000 to 130,000 plants/ha (9 to 13 plants/m²) is recommended in previous studies. In irrigated areas and higher rainfall districts, rates can be increased to 20 kg/ha.
(190,000 plants/ha). Sowing lablab at 15 to 20 kg/ha under dry land conditions, to achieve a plant population of 40,000 to 60,000 plants/ha (4 to 6 plants/m²), and up to 30 kg/ha in irrigated or high rainfall areas (95,000 plants/ha) are recommended. Same study proved that the row spacing from 18 to 90 cm is suitable for lablab. Soybeans should be sown at around 40 to 50 kg/ha (depending on seed size) in areas with high rainfall.

Use the following formula to calculate the required seeding rate (kg seed/ha):

\[
\text{Seeding rate} = \frac{\text{Desired plant population/ha}}{\text{Seeds/kg} \times \text{germination} \% \times \text{establishment} \%}
\]

Examples:

What seeding rate is required to establish 100,000 cowpea plants/ha?

\[
\begin{align*}
\text{Number seeds/kg} &= 15,000 \\
\text{Seed germination} \% &= 90\% \\
\text{Establishment} \% &= 70\% \\
\text{Required seeding rate} &= \frac{100,000}{15,000} \times \frac{100}{90} \times \frac{100}{70} \\
&= 10.5 \text{ kg seed/ha}
\end{align*}
\]

What seeding rate is required to establish 60,000 lablab plants/ha?

\[
\begin{align*}
\text{Number seeds/kg} &= 5000 \\
\text{Seed germination} \% &= 90\% \\
\text{Establishment} \% &= 70\% \\
\text{Required seeding rate} &= \frac{60,000}{5000} \times \frac{100}{90} \times \frac{100}{70} \\
&= 19 \text{ kg seed/ha}
\end{align*}
\]
3.7 On farm seed multiplications nurseries

This pilot project established on farm micro-seed seed producing units which are capable of producing different types of ‘standard’ grade seed on farmers’ fields. The seed producing units were managed by farmers with supervision from the LPD staff during the pilot phase. Seed will be sold among farmers at competitive rates in order that they are affordable for the farmers. In this way, the seed producing units will be established on a ‘cost recovery basis’, making them self sustaining in the future.

3.8 Production of silage

The silage production process can be divided into three stages: (1) forage harvesting and transporting (2) chopping and compaction (3) sealing (air tightness). Silage is forage preserved in a succulent condition by partial fermentation by microorganism under anaerobic (without air) conditions. Silage produces high animal growth rates and milk production, and on farm production of silage is an important component to make smallholder dairy enterprise viable. The feed quality of well-made silage is almost as good as the original forage but the advantage of making silage during the summer is to increase the availability of high energy / protein feed for dry winter period. Selecting the forage for silage making should consider; the highest feed value (key nutrients for animal growth and milk production), easiest to ensile (to produce silage from) and the best crop variety to grow in that particular local area (rainfall, soil, temperature, day length, frost and etc). The total amount of silage to make depends on the number of dairy cows to feed silage, length of the feeding period, percentage of silage in the full ration and material resources available (equipment, labour, finances, technical assistance, etc.).

3.8.1. Forage harvesting and transporting

In order to obtain the best quality silage, maize and sugar graze plants were harvested at the right growth stage (at tussling stage). Correct harvesting time was when maize silage feed value reaches a maximum i.e. 30 to 40% whole plant dry matter or aim for a milk line score of 2.5 (i.e. when grain in the middle of the cob is half milky and half solid starch). All maize cobs were chopped or cracked to exclude the oxygen from the silage. Effort was made to avoid harvesting maize and sugar graze too early as it will result in a small loss in quality and a large decrease in the quantity of silage and the silage will be too wet and effluent may be produced. Not
only is silage effluent a pollutant, but valuable nutrients are lost from the silage. During the plants maturity, lignin content increases and plant digestibility decreases therefore harvesting cereal plants too late or dry (greater than 40%), will result poor compaction of plant materials. Furthermore it is difficult to exclude air and the silage will heat and lose feed quality (higher fibre and less digestible) or may go mouldy. It is important to only cut as much forage as can be transported during a day’s work in order to minimize the respiration lose and development of aerobic micro-organisms. Harvested plant materials were transported to the silo pits by donkeys, ox drawn carts and in some cases people. The whole process was completed in as short a time as possible, ideally in one day, maximum of two days in order to maintain forage/fodder quality.

3.8.2. Chopping and compaction

Fine, evenly chopped plant materials are essential in maintaining quality silage. Plants were chopped into average length of two cm (with motored chopper grinder in Gokwe) and four to five cm manually using axes or pangas. The correct length of forage reduces oxidation losses during storage and maximizes the amount of silage able to be stored. Great effort was taken to compact materials tightly and to remove all the air out of the silo pits. To achieve a good compaction of chopped plant materials, spread them into 20 -25 cm layers. Chopped materials was compacted using water filled drum and care was taken to ensure that the compaction capacity matched the harvest rate to avoid “pile-ups” of plant materials in silo pits and to avoid soil or water in the soil pits. Also during this silage process match the silo filling with compaction capacity.
3.8.3. Sealing
Sealing helped to ensure that the anaerobic fermentation process of the plant materials works well and the correct pH (5.4) is achieved for good storage. Once all the air has been removed from silos and compacted airtight, silo was sealed to prevent any air returning to pits. The base, top and the sides of silo pits were covered with black polyethylene and soil was added on the top of the cover to keep air tightness and to avoid soil and water contamination in the pit.

Pictures 16. A silo pit covered with black polyethylene in Gokwe 17. Permanent silo pit in Mushagashe

3.8.4. Why maize and sugar graze for silage production?
Maize is renowned as the outstanding crop for silage and there are some maize hybrids that produce high yields of energy, good quality silage and easy to ensile. Generally the best silage maize varieties are the ones that produce the highest yield, late maturing, resist water logging, early vigour and with ‘stay green’. Maize grain has 80% more energy i.e. high water soluble carbohydrate (WSC) levels than dry maize stover (which is the most available feed for smallholder dairy sector during the long dry winter period). Maize silage is highly palatable, contains fibre for rumination and energy for milk production and to maintain good body condition for animals. Maize is harvested directly without the need for in filed wilting and maize silage has high dry matter and energy, which compliments grass-based rations. Natural micro-organisms (bacteria and protozoa) use WSC for fermentation and to produce volatile fatty acids (VFA) such as Acetic, Acid (AA), Propionic Acid (PA) and Butyric Acid (BA) in the rumen. These VFA are used as the main energy source in the animal body. Energy is the most vital nutrients in milk production and required amount depends on the milk yield and composition (protein and fat content). Silage was made only with maize or sugar graze or combination of these two varieties together with legumes (cowpea, lablab and velvet beans up to 25%) on a total of 16 farms at all five MCC.

Sugar graze grows well in less favourable areas (drought resistant, low fertile soil) for high grain crop yields and is ideal for pit silage. Sugar graze has 35% sugar and yields exceptionally high. High range of disease resistances and has a wide chopping window to make quality silage for dairy cows. A major advantage that Sugar graze has
over other forages is its very high sugar content which improves the feed quality, increases palatability and intake hence results in significantly reduced feed wastage. Sugar levels in the plant increase as the plant matures resulting increased digestibility, absorption and metabolism in animal body. Mature Sugar graze promotes good weight gain and provides adequate energy for dairy cows to produce milk.

![Picture 18. Sugar graze in Umzingwane demo plot](image)

### 3.9. Production of Hay

Legume forages were harvested at the 50% flowering stage. Then they were air dried for a day or two to reduce the moisture content of forage (to avoid mould growth) and to process hay. Sun hemp stems were chopped manually into 5cm and stored in bags and in the shade until the winter period. Legume varieties such as cowpea, lablab, velvet beans, and soya beans were air dried and rolled into bundle and stored in shades with good ventilation.

![Pictures 19. Cowpea hay ready for feeding dairy cows in Tongogara 20. Sun hemp hay in Chipinge](image)

### 4. Results and Discussions

#### 4.1 Findings of the preliminarily evaluation of MCC

The majority of dairy farmers are members of MCC and supported by LOL and NADF in Umzingwane and Mushagashe. However consultants was informed that the majority of farmers are not committed and do not attain for training, field days or do not keep records on dairy herds (reluctant to be transparent on their dairy business) in Umzingwane. On the other hand there has been very little rain in Umzingwane and Mushagashe for many years (except year 2012/2013) and farms are found to be in extreme dry conditions in November 2012 when this study was done. The water resources are the most crucial factor in forage/fodder production and it is not viable to grow fodder for dairy sector in these drought conditions with no irrigation or natural water resources in place. MCC in Umzingwane was not functional due to the electricity disconnection by ZESA (farmers have not paid bills for a year) during this study. Most members have left the MCC as they were unable to provide milk to MCC. This was due to the severe drought in last two years and scarcity of water, nutritional
feed (on farm forage/fodder silage production) and high cost of commercial stock feed and long distance to markets in the areas. However there is a non-dairy farmer 16 km from Umzingwane MCC, where his farm is located by a dam and has his own irrigation system in place. Therefore it is possible to carry out a demo plots, seed multiplication unit and contract silage production in the next phase of the project. During our preliminary study we realised that there was a very little chance for rain-fed forage/fodder production in Umzingwane and need to be done under irrigation or periphery of natural water resources. However by the time of setting up FFS and demonstration plots in January 2013 Umzingwane was receiving good rainfall and the highest forage yield was obtained from a farmer in Umzingwane.

MCC in Mushagashe and surrounding areas are in similar situation to Umzingwane as there has been no rain in 2011/2012 season. Almost all members are small-scale commercial farmers who have access to vast areas of land with 1-5 dairy cows. These farmers are well organized and committed for the dairy business and they still need some training in forage/fodder, silage production. There is a farmer who lives by a perennial river and he has his own irrigation system in place. Demo plot and seed multiplication units were carried out on his farm in early January 2013.

4.2 MCC in the pilot intervention

4.2.1. Gokwe MCC
This is one of the best MCC in Zimbabwe and situated in Midlands. Gokwe MCC has 60 registered members and only 33 farmers deliver milk at the time of this pilot project. Farmers and the staff of MCC/LPD are well organized and committed for the dairy business. MCC staff maintains good governance, record keeping, and are very transparent. A total of 87 cows belong to members of MCC and average milk production is 4 litres per cow per day. MCC receives average of 400 litres per day during peak time and during the off peak 200 litres per day. Most of the equipments (milk test kit, pasteurizer, cooling tank/bulking tank, cold room, sealer) are available at the MCC. Milk is pasteurised as well as cultured milk, yoghurt and naturally sour milk (Amazi) are produced at daily basis. During the peak period of milk production in Gokwe (during the rainy season, December to April) milk is sold out to DenDairy in Kwekwe. However during the peak milk production in the summer the price of milk litre goes low as 40 cents and during off peak of milk production (during the long dry winter period) price of milk litre can go up to 70 cents. Gokwe MCC has an old motored chopper grinder which was used for chopping maize and sugar graze to make silage for dairy cows in this pilot phase. However transporting it to farms from the centre is difficult due to the size of it and also efficiency of the chopper grinder is poor.

4.2.2. Tongogara MCC
This MCC is in midlands and does not perform well presently due to many constraints and challenges. The management team of the centre is not transparent and do not keep record systems on milk production and account books at the centre. This milk centre currently has 160 members and only 13 farmers provide milk daily basis. Average daily milk production is 4-5 litres per day. Currently this centre is underutilized due to the poor governance, lack of processing equipments, pasteurizer, cooling and bulking tanks. Milk is not properly pasteurized or processed at the MCC. The most of the milk is sold to Gweru town twice a week when the milk delivery truck is functional. The long distance to MCC is one of the biggest challenges that farmers face in delivering quality milk to centre in time. No manual or motored chopper grinders at the centre and farmers used axes and knives for chopping plants in silage making activity. However there is a huge potential in this area and need some support in materials as well as capacity building and training of dairy farmers and extension staff.
4.2.3. Mushagashe MCC in Mashvingo
Mushagashe MCC found out to be as the second best among all five centres. This MCC has 36 members and average daily milk production is 6 litres per cow per day. Milk is processed as sour milk and yoghurt at the centre. Milk and milk products are sold to nearest market in Mashvingo town. Natural grazing is common during the rainy season. Only a few dairy farmers process silage and hay to feed cows during the winter period. Some farmers have cultivated Bana grass, star grass and Rhodes grass and are used to feed dairy cows during the rainy season. The majority of the farmers are not familiar with forage legume seeds such as velvet beans, soya beans and cowpea. However availability of quality legume seeds and sugar graze was one of the biggest challenges in the area as in many other parts of Zimbabwe.

![Cultivated Bana grass in Mushagashe field](image)

4.2.4. May field, Mafumise, and Upperant MCC
These three MCC are situated Midlands. Some of the MCC are dysfunctional currently. The challenges related to governance, transparency, distance to MCC were reported during the pilot intervention phase. Three farmers were selected from three MCC for forage FFS/demo plots and SMU. However there is a huge potential to improve feed production and milk production and marketing in the area.

4.2.5. Umzingwane MCC
This MCC was not functioning during the preliminarily evaluation in November 2012 due to the severe drought and farmers couldn’t feed their dairy cows. 57 dairy members are attached to the MCC and only 28 farmers produce milk during pilot intervention of dairy forage programme. MCC receives average of 90 to 100 litres per week. This is due to the good rainfall in December 2012 and natural pastures are common at the time. Milk is pasteurised, processed to sour milk and yoghurt and these products are sold locally as well as to Bulawayo city. Umzingwane dairy farmers face serious droughts and erratic rainfall almost every year. Hence the biggest constraint is the low availability of water resources and the distance to MCC for most farmers. Four farmers were selected for FFS/demo plots and to set up on farm seed multiplication units. However farmer Mahlanga produced the best demo plots during this pilot phase and he planted one hectare of cereals and legumes for silage and hay processing. This farm had the best forage germination and therefore higher yields than other plots. Documentary and brochure was made on forage and silage production process to share with the other key stakeholders in dairy value chain.

4.3 Legumes used in pilot intervention phase
Legume forages which were used in this pilot intervention phase are listed below. These legumes are tropical varieties, grow fast and thrive in low fertile sandy soils. Legumes improve soil nitrogen levels by nitrogen fixation or by incorporation in soil as a green manure crop particularly in crop rotation and intercropping programmes within the Conservation Agriculture context.
4.3.1. Cowpea (*Vigna unguiculata*)

Cowpea is **drought tolerant and** grows well in low fertile sandy soil. This legume forage is high in CP (20-30% DM), minerals and vitamins and low in fibre content. There are different types of cowpea varieties which can be used in small holder dairy sector. Cowpea dual-purpose (food/feed crops which are semi-erect and fast growing produces average grain and forage yields), food type cowpea varieties are erect plants with more pods, 6 to 8 seeds per pod and very little vegetative bio-mass) or forage type (spreading/prostrate varieties with small, few pods per plant with high yields of forage) cowpea is suitable as a cover crop and as a forage for dairy cows. Cowpea can be fed to dairy cows as a fresh forage, hay or silage (mix with maize or sugar graze). Palatability, intake and digestibility of cowpea is high and it is good quality feed with high protein, vitamins and minerals content. Therefore cowpea can be used as a supplement feed for CCR during the long dry winter period. Cowpea makes good quality hay but care must be taken to preserve the leaf and to reduce leaf senescence.

![Cowpea variety](image)

*Picture 22. Forage type cowpea variety with high yield of bio-mass in Umzingwane.*

4.3.2. Velvet beans (*Mucuna Pruriens*)

This is a tropical legume plant which thrives in water logging and low fertile soils. The whole plant can be fed to dairy cows as silage, dried hay or dried seeds. Velvet beans contain 11-23% crude protein, 35-40% crude fibre, and the dried beans contain 20-35% crude protein. The plant is infamous for the extreme itchiness it produces on contact, particularly with the young foliage and the seed pods. However with the plant maturity hair completely disappears.

![Velvet bean plot](image)

*Picture 23. Velvet bean seeds germination was better than maize seeds under water logged condition in Gokwe.*

24. Vigorous growth of velvet bean plot in Gokwe
4.3.3. Lablab (*Lablab purpureus*)
Most lablab varieties grow vigorously producing good bio-mass yield. The average protein content of lablab is 14-19%. The dry matter yield is about 10.9 tons per hectare at flowering stage (about 110 days after germination of the seed), which is slightly above average when compared to many forage legumes. The protein content decreases with maturity of the plants. Lablab is high quality dairy feed and can be fed as fresh foliage, hay or silage. Lablab has the potential of alleviating nutrient deficiencies in poor quality diets of dairy cows especially during the dry winter season. Fresh lablab forage should not be fed to milking animals within at least two hours before milking time. Wilting or drying lablab foliage before offering it to the cows helps to avoid “off-flavour” in the milk.

![Picture 25. Lablab at flowering stage for seed multiplication in Mushagashe](image)

4.3.4. Soya beans (*Glycine max*)
Soya bean is a legume crop and can be used as hay or silage to feed dairy cows. However soya bean yields are generally lower than other legumes. CP content is about 30% DM. For best results limit whole soybeans to 15% of the total ration dry matter. Higher levels of soybeans in a ration may cause scouring, acidosis, decreased performance, and may cause cattle to "go on and off feed." Raw soybeans contain urease so they should not be mixed with urea in a ration. Storage moulds can be extremely toxic, soy beans with storage moulds should not be fed to dairy unless extreme care is exercised. Beans should be below 13% moisture to prevent bin moulding. Beans should be introduced to animals slowly and increased gradually. The beans should not be fed to young calves that do not have a functional rumen.

![Picture 25. Soya beans at early stage podding in Gokwe](image)

4.3.5. Sun hemp (*Crotalaria juncea*)
Sun hemp is a good source of Nitrogen and Potash. It is a tropical legume so as it grows it produces Nitrogen. Then when the crop dies it releases Nitrogen back into the soil for the next crop. Sun hemp’s claim to fame is that in sixty days from planting, it is typically six feet tall and produces 100 pounds of Nitrogen, translocates from the subsoil to the topsoil 10 pounds of Phosphorus, 80 pounds of Potash and produces four tons of organic matter. Over the summer, sun hemp in favourable conditions may grow ten to twelve feet tall and
release over 200 pounds of Nitrogen, 20 pounds of Phosphorus and 160 pounds of Potash back into the soil. 
(http://www.petcherseeds.com/about-sunn-hemp/production-guide/).

Picture 26. Sun hemp ready for air drying to make hay

Silage is not yet ready to be fed to dairy cows and is still in silo pits at all five MCC. Therefore at the time of writing this report results are not available on total yield of silage, wastage, quality or milk yield and quality. However assumptions are made here that silage will be in quality and feeding it to dairy cows’ milk quality and quantity will be increased and hence the household income. Hay is ready for feeding dairy cows and results will be monitored during the feeding time.

5. Gross Margin Analysis

The Total cost of seed, fertilizer, polyethylene, labour (4 USD/person/day) to produce fodder & silage (pit size 37.5 m$^3$) = **650 USD**

Total yield of average forage fresh weight = 14-20 t/ha

Volume of silage = 6m L x 2.5m H x2m W = 30 m$^3$

Thumb rule of silage quantity= 35%DM, 2.5m H = 557 kg

Total amount of silage =(30 m$^3$ x 557) = 16710 kg

**If farmer has 5 cows at peak lactation (100 days)**

Total amount of silage in a dairy ration = 16 kg/ day

Total amount of silage for 5 x16kg x 100 days = 8000 kg

Assume the total milk yield = 10 L/day

Average price of milk = 0.50 $/1 L (peak period)

Total income = 5 x 10 Lx 0.50 $ x 100 = **2500 USD**

**5 cows in mid lactation for 100 days**

Total amount of silage in a dairy ration = 10 kg/ day

Total amount of silage for 5 cows for 100 days = 5000 kg

Assume the total milk yield = 8 L/day
Average price of milk = $0.60/1 L

Total income = 5 x 8 x 0.60 x 100 = 2400 USD

5 cows in late lactation for 100 days

Total amount of silage in a dairy ration = 8 kg/day
Total amount of silage for 5 cows for 100 days = 4000 kg
Assume the total milk yield = 5 L/day
Average price of milk = $0.70/1 L (off peak production)

Total income = 5 x 5 x 0.70 x 100 = 1750 USD

Annual income from five cows = 2500+2400+1750 = 6650 USD
Other annual costs (stock feed, management, drugs) = 1000 USD
Annual profit = 6650-(650+1000) = 5000 USD

6. Discussion, Conclusions and Recommendations:
A balanced ration should provide dairy cows enough amount of water, protein, energy, minerals and vitamins. Quality feed such as young forage/fodders, silage, and hay, commercial stock feed, vitamins and mineral premixes should be given in appropriate quantities to enable dairy cows to perform optimally and remain healthy.

6.1 Imbalanced feeding results in:
• Low milk production, poor growth and reproduction
• Milk production of cows lower than their genetic potential
• Shorter lactation length and longer calving intervals
• Animals more prone to metabolic disorders such as milk fever and ketosis
• Slow growth in young animals and delayed age at first calving
• Shorter productive life
• Excessive amounts of pollutants released into the environment
• Lower profit to smallholder farmers

The milk is considered as a perfect human food which enhances the immune system of people particularly children, pregnant, sick (HIV/Aids) and elderly women. Also contributes considerably to the reduction of child mal-nutrition and mortality. Moreover, it remains available during periods when common food often is in shortage. The daily sale of milk provides the farmer with a regular income throughout the year (not like meat production where farmers have to sell their animals in order to earn an income, dairying is continual cash flow which suites better for poor farmers in Zimbabwe). Therefore income from milk is more reliable than from meat. Milk sales continue during outbreaks of diseases when livestock movements are banned. The dairy herds provide organic manure, which is essential to maintain good soil fertility at the farm. Small holder dairy farming is agriculture based rural development enterprise, which creates employment in the rural areas. It contributes to the formation of a commercial agro-industry and creates business opportunities. However, proper feeding and good balanced rations remains the basis of a successful dairy production.

Milk yield per cow and the cost of feed to produce milk have by far the greatest influence on profitability in a dairy operation. In order to make smallholder dairy sector viable business, Farmers must continually attempt...
to adopt practices that allow the greatest output of milk at the most economical cost. In order to achieve this, culling for low production dairy cows and replace with more productive (cross-bread, at early lactating stage, healthy), controlling feed costs by on farm forage/fodder, silage and hay production.

Farmers should be trained on dairy cow nutritional requirements, fodder and forage production, processing and conservation through FFS, demonstration plots with the help of MCC and LPD staff. Key stakeholders of feed producers in dairy value chain (farmers, seed producers, private and the public sector must work together in order to sustain feed availability and feed marketing in remote areas. The feed and feeding technologies should be tested and evaluated on-farm through ‘demonstrations’ which can show farmers the benefits of the range of improved feeding practices (silage/hay). Most technologies (production of silage, hay, cut and carry and crop residues with urea treatment) which improve feed quality and availability of feed are simple and easy to apply. Yet they are seldom part of basic training for farmers and extension workers. Lack of knowledge and skills among extension staff and farmers is one of the reasons why this area has been given such little attention.

6.1 Specific recommendations to improve feed and water resources are the following:

1. Improve supplementary feed particularly for long dry winter season; e.g. production of on farm forage/fodder, silage and hay and appropriate treatment for CCR with urea treatment. Promote such feed and feeding techniques at farm level that improve the quality, palatability, digestibility, metabolism and absorption in dairy cows. When there is no feeding plan for dairy cows farmers use crop residues to feed dairy cows particularly during the dry winter period. Treating crop residues with urea/salt together with water will improve the palatability, intake, digestibility, crude protein content and live weight gain of animals.

2. Encourage farmers to grow drought-tolerant, multi-purpose legume crops such as cowpeas, lablab, velvet beans, soya beans, sun hemp (improved new varieties resistant to drought, biotic and a-biotic, thrive in sandy soil, fast growing) as food/feed crops (cowpea, soya beans), improved soil fertility (improved N fixation, ground cover, water retention) and locally adapted Napier grass (Bana grass), star grass and Rhodes grass can be grown with very little inputs under dry conditions. Supplementation of quality feed (high content of protein and energy) will increase dairy production, household income and food and nutrients security particularly for children, sick people, pregnant and elderly women.

3. Facilitate farmers to intercrop cereal crops (maize, sugar graze) with multi-purpose legumes within the context of Conservation Farming. Include and improve multi-purpose legume forages production in nutritional gardens. Legume pods and grains can be consumed within households and residues can be utilised by dairy cows.

4. Increase use of legume fodder trees (Sesbania sesban, Leucaena leucocephala, Caliandra) as live fences and feed dairy cows with leaves of these fodder trees

5. Encourage farmers to use cut and carry system for Acacia branches, Mopani leaves, pods and grasses (Bana, star, Rhodes)

6. In smallholder dairying, farmers should practice zero grazing as dairy cows waste lot of energy for wondering around looking for more palatable feed in surrounding areas. This energy should be utilized for growth, to maintain body condition, to improve fertility rate, pregnancy, and for milk production. However farmers let dairy herds to graze natural grassland/rangeland during the wet summer season. It is important to preserve and increase the productivity of rangelands together with restoring degraded grazing areas. To achieve this strengthen local institutes / community based organization (CBO)/ MCC together with private sector and NGOs to manage rangelands. ACHM (Africa Centre for Holistic Management) is actively involved in planned grazing schemes and offer a new approach to rangeland management. The process begins to cover bare soil and restore biodiversity
7. Enhance the access (de-centralise) and utilization of stock feed (wheat bran, cotton seed mixtures) particularly for dry season in the country by facilitating relations between farmers and feed suppliers (agro dealers, National Foods)
8. Increase access and use of agro industrial by-products (e.g. Molasses, sugar tops, Maize and Sorghum malts from Delta Beverages)
9. Feeding strategies; Develop feed calendars showing local and seasonal availability of feed resources and dairy cow nutritional requirements (protein and energy) and use these to illustrate the need for proper feed management and supply
10. Facilitate strategic dry season feeding (comparable use of feeding and breeding calendars), early enough to prevent losses in body condition and long enough to plan forage/fodder, silage, hay cultivation, rangeland regeneration and improved animal condition for increased conception rates. Practise of control breeding, aiming for calving during the rainy season will provide plenty of nutritious feed for dairy calves and cows
11. Explore the potential of local and regional feed and fodder markets between areas better endowed with feed resources and those without
12. Stimulate forage/fodder, hay and silage production and marketing as cash income regardless of livestock ownership (contact farming for silage, hay, grass production in community level)
13. Explore the potential of irrigation schemes, rehabilitation of existing bore holes, micro dams, and sand abstractions for forage/fodder intervention programmes.
14. Develop and strengthen rain water harvesting technologies at household levels (roof water harvesting, wells)
15. Request continued national investments in construction and maintenance of adequate water supply, infrastructure, particularly to vulnerable groups in remote areas
6. Reference:
EADDD dairy manual 2012

Fodder and feed in livestock value chain in Ethiopia. 2012. International Livestock Research Institute, Ethiopia


ZimVac, 2012 and 2013, Rural Livelihoods Assessment Report, Harare, Zimbabwe
7. Annex 1

Dairy Forage Pilot Intervention Programme-SNV, Zimbabwe

Interview Guide and Response Form

Province:   District:    Name/contact details:

Introduction myself, team, and the pilot phase:

1. Please provide a brief description of the organization (size, staff, capacity)?

2. Describe the current situation dairy sector in the area (No. of farmers, cows in milking, production, yield/day, processing, etc)

3. What is the feeding practices/availability? (Forage/fodder/hay/silage/stock feed) at MCC or on farm level

4. Seed varieties, availability, fertilizer, cropping systems, costs?

5. Soil fertility, type, acidity, water availability

6. What are the common breeds in the area?

7. What are the challenges and constraints related to the feed sector?

8. Lessons learnt, and future recommendations?