1. Introduction

An adequate supply of livestock feed is crucial to the livelihoods of millions of people across the developing world, and not just for smallholders, but also for pastoralists and the large number of landless who depend mainly on common land for grazing (Sanford and Ashly, 2008). In Africa and other developing countries feed cost and feeding comprise 60-70% of total production costs (Madubuike, 1993). Feed shortages are acute at dry season for this reason research attention is to develop low cost pasture production technologies, introductions of different feeding strategies and improving crop residues through physical and chemical treatment. This scientific knowledge helps the farmers improve livestock production and produced throughout the years (Sand 1986; Collins, 1982). The nutrition of livestock is the most important factor affecting performance and productivity. Poor or inadequate nutrition results in low rates of production, low rate of growth and reproduction, low immune system, death or high mortality rate,
low live-weight gains and low milk yields in dairy cattle. The feasibility of livestock enterprises is, therefore, a function of the type of feed and feeding system.

Ration formulation is one of the most important of combining an assortment of feed ingredients into a ration that will meet the nutrient requirements of animals for the intended purpose of production. A balanced ration is one that provides all the required nutrients in such proportions and amounts that will properly nourish a given animal for 24 hours. In addition, consideration must be given to the amount of dry matter that the animal is able to or will consume during the 24 hour period. The goal of any feeding program is to provide the correct amount and balance of nutrients to animals at the proper time to achieve the desired level of performance and profitability. Rations are nutritionally balanced and formulated to meet the nutrient requirements of animals, both for maintenance and production (Adugna, 2008). The ration must be balanced in such a way that it provides, sufficient quantity of energy yielding nutrients, sufficient quantity and adequate quality of proteins, sufficient quantity and correct balance of minerals, vitamins and sufficient bulk or roughage for normal rumen function.

Feed conserving is also important to conserve available feed resource for the time of shortage at dry season a shay (dried fodder) or silage (wet fodder), depending on the weather conditions and the available resources (Tripathi et al, 1995). Forages can be conserved to feed livestock during periods of shortage caused by limited pasture growth or inadequate pasture conditions, or fed as a supplement. Several methods have been proven as efficient ways to store and preserve forages, it is important, to keep this fact in mind: At best, conserved forages can rarely match the nutritive value of fresh forage because some losses of highly digestible nutrients (sugar, protein, and fat) are unavoidable during conservation and storage. Our goal in forage conservation is to focus on minimizing losses, which start immediately after cutting. When selecting a conservation method, a producer should consider the suitability of the forage for a given method, storage capability, their livestock, weather conditions, and the intended use of the conserved forage. The selected conservation technique should maximize nutrient conservation, efficiency and minimize production costs (Alemayehu, 2002). Therefore the paper was designed to review on complete feed production and conservation methods.

2. Complete feed production

Livestock production is the major source of incomes, food, manure and transport, in the country. Therefore, all livestock owners animal feeding and balanced nutrition is the major concern. Inadequate nutrition is a major cause of low live-weight gains, high mortality, slowly growth rates, infertility and low milk yields in dairy cattle. Also pig, chicken, dairy goat and many other livestock producers have expressed challenges in feeding their animals (FAO, 2004). Complete feed rich in the composition of, carbohydrates, lipids, proteins, vitamins, and minerals.

2.1. Feed ingredients and nutritive values

Roughages include pasture, range land dry forages or fresh forage. All forages and roughages cut and cured and other products with more than 18% crude fiber or containing more than 35% cell wall (dry basis). Usually they are low in net energy per unit weight because of the high cell-wall content and carbonaceous roughages (low protein), straws, stalks, silages, proteins roughages) (Kellemes and Church, 1998). Energy feed is with less than 20% CP and less than 18% crude fiber or less than 35% cell wall on a dry basis. Examples Carbonaceous concentrates (low protein) - cereal grains (corn, oats, barley and wheat), milling by-products of cereal grains, molasses, fruit, nuts, roots and tubers of various types (Holden and Zimmerman, 1991).

Protein supplements are products that contain 20% or more of protein (dry basis) from animal and plant origin. Plant origin includes soybean meal, linseed meal, cottonseed meal, peanut meal, brewer's dried grains and sesame meal. The supplements of animal origin: Animal tissues - bone meat and bone scraps, blood meal, meat meal. The fish products - fish meal, dried fish soluble and condensed fish soluble. The milk products, dried skim milk, dried whole milk, dried buttermilk, condensed butter, milk and dried whey (Kellemes and Church, 1998). Others include single-cell sources (bacteria, yeast, and algae), non-
protein nitrogen (urea and ammonia). Mineral and vitamin supplements- bone meal, calcium carbonate, limestone, and Vitamin supplements Ensiled yeast, carotene and wheat germ oil. Additives are antibiotics, antioxidants, coloring material, flavors, hormones, enzymes and emulsifying agents, buffers.

<table>
<thead>
<tr>
<th>Energy Feeds</th>
<th>% Dry Matter</th>
<th>% TDN</th>
<th>NE Mcal/lb</th>
<th>NEg Mcal/lb</th>
<th>% CP</th>
<th>% Fat</th>
<th>Ca, % DM</th>
<th>P, % DM</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grains</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Corn, 56 lb/bu</td>
<td>87</td>
<td>85</td>
<td>0.91</td>
<td>0.61</td>
<td>9.8</td>
<td>4.3</td>
<td>0.31</td>
<td></td>
</tr>
<tr>
<td>Corn, cracked</td>
<td>88</td>
<td>90</td>
<td>1.02</td>
<td>0.70</td>
<td>9.8</td>
<td>4.1</td>
<td>0.32</td>
<td></td>
</tr>
<tr>
<td>Barley, heavy</td>
<td>88</td>
<td>74</td>
<td>0.94</td>
<td>0.64</td>
<td>13.2</td>
<td>2.2</td>
<td>0.05</td>
<td>0.35</td>
</tr>
<tr>
<td>Oats</td>
<td>91</td>
<td>73</td>
<td>0.79</td>
<td>0.50</td>
<td>13.6</td>
<td>4.9</td>
<td>0.07</td>
<td>0.30</td>
</tr>
<tr>
<td>Milo</td>
<td>90</td>
<td>85</td>
<td>0.95</td>
<td>0.64</td>
<td>11.3</td>
<td>1.9</td>
<td>0.05</td>
<td>0.34</td>
</tr>
<tr>
<td>Wheat</td>
<td>89</td>
<td>76</td>
<td>0.83</td>
<td>0.54</td>
<td>11.6</td>
<td>3.1</td>
<td>0.07</td>
<td>0.33</td>
</tr>
<tr>
<td>High energy, others and by-products</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Brewers grains, wet</td>
<td>21</td>
<td>70</td>
<td>0.74</td>
<td>0.47</td>
<td>26.0</td>
<td>6.5</td>
<td>0.29</td>
<td>0.20</td>
</tr>
<tr>
<td>Distillers grains, wet</td>
<td>25</td>
<td>90</td>
<td>1.02</td>
<td>0.70</td>
<td>26.0</td>
<td>9.9</td>
<td>0.32</td>
<td>1.40</td>
</tr>
<tr>
<td>Corn gluten feed</td>
<td>90</td>
<td>80</td>
<td>0.88</td>
<td>0.60</td>
<td>23.8</td>
<td>3.9</td>
<td>0.07</td>
<td>0.95</td>
</tr>
<tr>
<td>Hominy</td>
<td>90</td>
<td>91</td>
<td>1.03</td>
<td>0.71</td>
<td>11.5</td>
<td>7.3</td>
<td>0.05</td>
<td>0.57</td>
</tr>
<tr>
<td>Soybean hulls</td>
<td>91</td>
<td>80</td>
<td>0.88</td>
<td>0.59</td>
<td>12.2</td>
<td>2.1</td>
<td>0.53</td>
<td>0.18</td>
</tr>
<tr>
<td>Wheat midds</td>
<td>89</td>
<td>83</td>
<td>0.92</td>
<td>0.62</td>
<td>18.4</td>
<td>3.2</td>
<td>0.15</td>
<td>1.00</td>
</tr>
<tr>
<td>Molasses</td>
<td>74</td>
<td>72</td>
<td>0.77</td>
<td>0.49</td>
<td>5.8</td>
<td>0.0</td>
<td>1.00</td>
<td>0.10</td>
</tr>
<tr>
<td>Protein feeds</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Soybean meal – 44</td>
<td>89</td>
<td>84</td>
<td>0.94</td>
<td>0.64</td>
<td>49.9</td>
<td>1.6</td>
<td>0.40</td>
<td>0.71</td>
</tr>
<tr>
<td>Whole soybean, roasted</td>
<td>90</td>
<td>94</td>
<td>1.07</td>
<td>0.75</td>
<td>42.8</td>
<td>18.8</td>
<td>0.27</td>
<td>0.65</td>
</tr>
<tr>
<td>Cottonseed meal</td>
<td>92</td>
<td>75</td>
<td>0.81</td>
<td>0.53</td>
<td>46.1</td>
<td>3.2</td>
<td>0.20</td>
<td>1.16</td>
</tr>
<tr>
<td>Whole cottonseed</td>
<td>92</td>
<td>95</td>
<td>1.08</td>
<td>0.76</td>
<td>24.4</td>
<td>17.5</td>
<td>0.17</td>
<td>0.62</td>
</tr>
<tr>
<td>Poultry litter</td>
<td>78</td>
<td>60</td>
<td>0.99</td>
<td>0.59</td>
<td>28.0</td>
<td>ND</td>
<td>2.30</td>
<td>2.00</td>
</tr>
<tr>
<td>Fish meal</td>
<td>90</td>
<td>72</td>
<td>0.75</td>
<td>0.47</td>
<td>66.0</td>
<td>8.0</td>
<td>6.40</td>
<td>3.60</td>
</tr>
<tr>
<td>Urea forages</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Spring pasture</td>
<td>21</td>
<td>79</td>
<td>0.87</td>
<td>0.58</td>
<td>26.0</td>
<td>3.7</td>
<td>0.55</td>
<td>0.45</td>
</tr>
<tr>
<td>Summer pasture</td>
<td>22</td>
<td>67</td>
<td>0.72</td>
<td>0.43</td>
<td>19.5</td>
<td>3.2</td>
<td>0.40</td>
<td>0.27</td>
</tr>
</tbody>
</table>

Source: (Stanton, 2014)

2.2. Nutrient requirements of animals

Nutrient is any feed constituted by organic or inorganic matter that has different chemical composition and aids in the support of animal life. It plays an important role in maintenance, growth, reproduction, manure production and lactation (Abrams, 2000). Nutrient requirements of animal are depend on their physiological state and function; the larger the animal, the more feed it needs to maintain its body function. As production increases, so does the nutrient demand and feed requirement increases. Nutrient requirements of particular animals are the sum of its maintenance requirement and other physiological functions (pregnancy, growth and lactation) (Alamu, 2008).

2.3. Ration formulation methods

There are many methods of formulating rations useful for various situations. The result of using any of the methods is a ration that provides the desired allowance of nutrients in the correct proportions. Methods used for ration formulating; Pearson square, the trial and error methods, software and algebraic equation methods (Alemu, 2008). Factors should be considered in balanced ration making are nutritional factors- protein, energy, vitamin, and mineral. Economic factors are priced in accordance with their nutritive value of selected feeds. Requirement of the animal factors and other factors-stress due to temperature, parasite and disease has to be considered in balancing rations.
2.3.1. Pearson square method

The Pearson square method is a simple and rapid method that allows combination of two feeds with different nutrient concentrations into a mixture with the desired concentration. It is usually employed in cases of mixing feeds rich in energy with feeds rich in protein or definite percentage of protein, energy, calcium, phosphorus or any other nutrient is usually desired in rations (Alemu, 2008).

Example: Mosa wants to formulate a Concentrate supplement that provides 16% Crude protein. He has shelled corn (9% CP) and Cottonseed cake (40% CP). What combination of the shelled corn and cottonseed cake will provide a mix of 16% CP the producer wants? Solution: (a). Draw a square on the left side of the page; (b). Insert the % CP desired in the final mixture (16) in the middle of the square; (c). Place corn with its percent CP (9) on the upper left corner and the cottonseed cake with its CP (40) on the lower left corner; (d). Subtract the % CP desired (16) from the % CP in corn (9) and place the difference (7) without the negative sign at the corner of the square diagonally opposite the corn (on the lower right side of the square); (e). Subtract the % CP desired in the final mix (16) from the % CP in the cottonseed cake (40) and place the difference (24) at the corner of the square diagonally opposite from the groundnut cake (at the upper right corner of the square). The above remainders represent proportions of the two feeds that will provide a mix containing the desired % CP. (f). The amounts can then be converted to a percentage basis and then to any other weight basis (e.g. Quintal / ton) as desired for mixing purposes.

<table>
<thead>
<tr>
<th>INGREDIENT</th>
<th>PROPORTIONS</th>
<th>ON % BASIS</th>
<th>ON A QUINTAL BASIS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Corn</td>
<td>9</td>
<td>24</td>
<td>(24/31)*100=77.4</td>
</tr>
<tr>
<td>CS Cake</td>
<td>40</td>
<td>7</td>
<td>(7/31)*100=22.6</td>
</tr>
<tr>
<td>TOTAL</td>
<td>31 parts</td>
<td>100</td>
<td>100 Kg (Quintal)</td>
</tr>
</tbody>
</table>

Thus, mixing 77.4% corn (9%CP) and 22.6% Cottonseed cake (40%CP) will provide a mix of 16% CP. Check: One can check whether the final mix really contains the desired Crude Protein (CP) level by calculating the contributions of the ingredients constituting the mixture (corn and CS cake) and summing up. Contribution of corn = (9*77.4)/100=7, Contribution of CS Cake = (40*22.6)/100=9 Total CP in mix = 7+9 = 16%. When three or more feeds are involved it is common practice to use more than just two feeds in formulating a feed mixture to attain a specific nutrient level (Alemu, 2008).

2.3.2. Algebraic method

Algebraic diet formulation is with using equations with two unknowns, X and Y (Kellems and Church, 1998; Jurgens, 2002). Example - "Formulate a 14% crude protein (CP) diet using corn (8.8% CP) and a protein supplement (38% CP), and also check the results for accuracy." Algebraic equation with one unknown, X: If % supplement = X and % corn = 100 - X

\[(100-x) + x = CP\]
\[0.088 (100 - X) + 0.38X = 0.14 (100)\]
\[8.8 - 0.088X + 0.38X = 14\]
\[0.38X - 0.088X = 14 - 8.8\]
\[0.292X = 5.2\]
\[X = 17.81\] and \[100 - X = 82.19\]

\[0.88 (2.19) + 0.38 (17.81) =?\]
\[7.233 + 6.768 = 14.00\]
3. Methods of Forage feed conservation

Forages can be conserved to feed livestock during periods of shortage caused by limited pasture growth or inadequate pasture conditions or when fed as a supplement (for example, when supplementing with a legume). Conserved forages can take the form of hay and silage. While several techniques have been proven as efficient ways to store forages, it is important to keep in mind that, at best, conserved forages can rarely match the nutritive value of fresh forage, and some losses of highly digestible nutrients (sugar, protein, and fat) are unavoidable. The goal in forage conservation should focus on minimizing losses, which start immediately after cutting (Alemu and Solomon, 2006).

3.1. Hay making

Hay is forage conserved under aerobic dry or dehydrating green forage to a moisture content of 15% or less. Fresh forage typically has between about 75% and 85% moisture concentration (Collins and Coblentz, 2013). Thus, the goal in hay production is to remove moisture as quickly as possible to achieve a target moisture concentration equal to or less than 20% (Mohammed, 2011). The process of reducing moisture is called curing and is normally accomplished with energy provided by the sun (field curing) or by artificial barn drying using forced heated air. Moisture concentration less than 20% (preferably less than or equal to 15%) prevents plant respiration and allows for an almost complete conservation of plant nutrients for extended periods of month (Adugna, 2008). Dryness of hay is determined by twist by wisp of hay by hand and scrapes methods scrape stems with the finger nail, if epidermis can be peeled from the stem, the hay is not sufficiently cured.

Hay is the most convenient form of stored fodder and an appropriate forage conservation method for small-scale farmers and pastoralists with limited resources. Good quality hay is the cheapest form of feed during the dry season. Hay can be made by simple equipment, manually or with mechanization. Once correctly cured, reduces costs and efforts involved in transportation and handling. It can also be fed with little or no wastage. Hay making should be encouraged where climatic and economic conditions are suitable (Alemu and Solomon, 2006). Hay making is a suitable method to preserve fodders and grasses. Leguminous plants, which are a major source of protein, can also be conserved in this way for feeding at a later stage. Any method of feed conservation involves losses of dry matter in the process of fermentation and handling (Tripathi et al, 1995).

Hay may be made in several forms, according to the conditions, its intended use and the level of technology. Chopped hay is an option where conditions for drying are good and systems highly mechanized; it is less bulky and better for mechanical handling, but must be conditioned, windrowed and collected with forage harvester. Baled hay originally baling was by hand and then by machines. Big bales which can be individually handled by a tractor-mounted front-end loader are now the main kind in large-scale farming; round bales are the simplest to make and most popular. Their shape sheds rain and resists water better than traditional bales (Collins and Coblentz, 2013).

Precautions during hay making:-during hay making rain can deteriorate its quality; therefore, hay should be prepared when the weather is favorable. Keep in view the intensity of the weather because the nutritious value of the hay is lost if it is prepared during a very cold or a very hot weather. The place where hay is stored should be neat, clean and dry because the risk of fungal growth is higher, if it is stored in a damp place. Store the heaps or bales of the hay in a shady, open and well-ventilated place and protect it from rainwater (Mohammed, 2011).

3.1.1. Procedures and materials

Forage crops with soft and pliable stems, green oat best for hay making and leguminous fodder crops; lucerne, cow pea, and lablab (Abrams, 2000). Sickle mower the earliest methods of mechanically mowing hay was the sickle mower. It is still used today, typically in small haying operations or for clipping pastures. Raking turns the hay one more times to dry the bottom and forms it into a windrow ready to be baled. The windrows shouldn’t be rolled too tightly, as this creates a roping effect that prevents the hay from drying properly and causes it to clog as it enters the baler (John, et al, 2009). Baler is a piece of
farm machinery used to compress a cut and raked crop (such as hay, cotton, straw, or silage) into compact bales that are easy to handle, transport, and store in barn. Barn is building on a farm that is used for storing grain, hay and for housing farm animals or equipment.

Procedure of hay making harvested forage crops for hay making soon after reaching an early bloom stage of maturity. The harvested forage should be spread in the field and raked a few times for quick drying. Cure or dry in good dry weather condition at least for two day in thin layers. Turn the hay during curing to facilitate drying. Rake the hay before the forage crop completely dry to avoid excessive shattering and exposure. The dried forage should be collected and baled when the moisture concentration becomes lower than 15 percent. Baling the hay helps in storage and requires less space. Store the hay in the hay barn to avoid exposure to sunlight or rain and rat (Tripathi et al, 1995).

3.1.2. Quality hay production

Harvest of forage at optimum stage of maturity the most important factor that influences chemical composition and quality. The more immature the plant affects the quality of the hay. This is primarily due to the proportion of leaf to stem. Hay quality decreases with advancing maturity. Most forage should be mowed just after reaching an early bloom stage of maturity. Time of cutting is a compromise between quality and quantity of the harvested forage. The first cut of hay from a hay crop is usually of better quality than subsequent cuttings (Aleu and Solomon, 2006). Leguminous fodder crops should be harvested at their flower initiation stage or when crown buds start to grow, while grasses should be harvested at their pre-flowering or flower initiation stage. Harvesting should be done preferably when air humidity is low (Tripathi et al, 1995). God hay is prepared from legumes or mixture of grass legumes and characteristics of quality hay is green color, soft or flexible stems and leaves.

Proper drying is the essential so that the hay can be stored safely without heating excessively or becoming moldy. Maximum leafiness, green color, nutrient value and palatability can also be retained. The grass should be dried quickly and not unduly exposed to the sun to maintain these characteristics. Store to protect from rain, hay must be stored in a dry environment to avoid the development of moulds. A good stack of loose or baled hay will provide satisfactory storage in arid areas where there is little rainfall. More expensive shelters may be required for high rainfall areas. (Aleu and Solomon, 2006).There is different factors which affect quality of hay production, stem thickness, forage species, managements and Weather condition.

3.1.3. Storage structure

Hay is stored in the form of bales in a shady and well-ventilated place to avoid rain fail, entrance of domestics and wild animals, rodents and intensive light. A good stack of loose or baled hay will provide satisfactory storage in arid areas where there is little rainfall. More expensive shelters may be required for high rainfall areas. It is advisable to store hay by kinds and grades in case variable qualities are stored. Stacks may be covered by plastic sheets to keep out rain. The surface layer of a stack may also be "thatched," in the same manner as a thatched roof of a house. Hay stacks should be fairly compressed and loaf-shaped or conical shaped to shed rain water. It is advisable that the stack rests on a platform just above the ground. This provides air circulation and prevents the hay becoming wet from below (Aleu and Solomon, 2006). Earlier bales of the hay were prepared by hand, but now bales of different sizes are made with the help of machines in developed countries, and it is easy to protect these bales from water, rain and rodents (Mohammed, 2011).

3.1.4. Loses in hay making

Shattering is loss of leaves, which represents the most nutritious part of the hay plant. Legumes tend to shatter badly than grasses. Leaves of legumes contain 2-3 times higher percentages of protein as do the stem. Bleaching and fermentation is exposure to sunlight is damaging the quality of hay nearly all the carotene value will be destroyed. Amount of carotene in hay is proportional to the greenness in color. Because of fermentations, carbohydrates, especially sugars and starch are oxidized into carbon dioxide and
water, thus being lost (Tripathi et al., 1995). Leaching is exposed to heavy and prolonged rain, and then leaching will cause loss of more water from soluble nutrients. Due to this action about 20% protein and considerable nitrogen free extracts will be lost. Baling hay too early will trap moisture in the bale and result in spoilage. Mechanical losing occurs during collection, transportation and baling too dry will cause leaves to shatter and break, lowering hay quality. It takes close visual observation (John, et al., 2009).

3.1.5. Advantage and disadvantages
Advantage hay is a fungus-free fodder because crops are usually raked during the process of preparing, so that air should pass through the fodder and it should dry equally. The hay-making process reduces the harmful effects of pesticides sprayed on green fodder, costs and efforts involved in transportation and handling, if correctly cured. Fodder full of nutrition is available the whole year round. The availability of fodder/hay for the whole year makes the farmer tension-free and mentally comfortable (Mohammed, 2011). Disadvantage some nutrients are always lost in the field curing of hay under unfavorable conditions, under improper care; nutrient loses may amount to 30% of the dry matter compared to silage being usually below 10% (Mohammed, 2011).

3.2. Silage making
Feed conservation practices in the form of silage could be an option to increase dry season feed availability (Alemayehu, 1997). Silage is one of technology, which is used to conserve moist green forage by lactic acid bacteria fermentation that have been compressed and stored under anaerobic conditions in a container called a silo. Silage is made by chopping or cutting up fresh plant stems and leaves, so that they can be fed in a relatively fresh, succulent condition. Purpose of chopping and compacting is to release more plant sugar, which increases fermentation. Pushed out of oxygen from plant material when the silo is sealed, this increase rate of fermentation to produce lactic acid. Fermentation phase in silage making phase 1: Respiration phase, a plant nutrient degrades by the presence of oxygen (1 to 2 days), phase 2: Early fermentation, which produces acetic acid, formic acid and other organic acids as a result of the growth of facultative aerobic bacteria such as enterobacteria, which can live in the presence or absence oxygen (3 to 4 days), phase 3: Lactic acid fermentation by lactic acid bacteria that are strictly anaerobic (14 days) and Phase 4: Stable phase due to the presence of lactic acid, which inhibits further degradation.

Silage always has a characteristic good odor but it should not be moldy, 65-70% moisture and 4.2 pH, brown or yellow color, and 30-35% of dry matter contents. Any green forage can be made into silage that will keep in good condition without an excessive loss of feed nutrients. Few feeds are improved either in palatability or in nutritive value by undergoing fermentation in the silo. Very good silage can be made from the grasses or grasses-legumes mixtures.

3.2.1. Procedures and materials
Materials used forage crops (elephant grass, maize and sorghum) are rich in sugar, this increases the rate of fermentation; their silage has a higher nutritive value compared to other grass and legume forages. Silo is a structure designed to store and preserve high moisture fodder such as silage (Vanbelle, 1985). Chopper (machine chopper), compacter, plastic sheet, unchopped straw and labors are materials required during silage are ensiled.

The procedure followed all the necessary materials which are used for silage making are assembled. Stage of forage crops (blooming stage or 10-50% of flowering) identified; this varies from species to species of forage. Forage crops are harvested by manually or machine and transport to the silo area and wilt to reduce moisture content. Wilting tends to increase the number of lactic acid bacteria present at ensiling (Muck, 1988). The harvested materials were chopped by chopper on the plastic sheet by size of 1-3 cm and the size of chop is depends on the maturity stage of forage materials. The chopped forage is mixed together on polyethylene sheet. Silo is filled by compacting 20 cm thickness layer by layer with tractor, (filled 1-3 days). After the silo was filled, it is covered with a polyethylene sheet then un-
chopped maize or other heavy materials on the top of the silo. Finally after 21 days the silo will be partially opened and fermented silage will be provided to the animals alone or mixed with other feed.

### 3.2.2. Storage structure

A silo is a structure designed to store and preserve high moisture fodder such as silage (Vanbelle, 1985). The selection of a silo is made on the basis of required capacity, climatic conditions and economic considerations. Different silo types are used to conserve and store fodder: Horizontal silos, such as trench silos and bunker silos and Vertical silos, such as pit silos and tower silos. (Tripathi et al., 1995). Trench silos are horizontal silos, commonly used for easy handling of the silage. Trenches of different sizes, with depths up to 4 m are used, but the size can usually be made as per requirement. On an average, 700 kg fresh silage per cubic meter can be preserved. The ground water table should be below the maximum depth of the silo (Tripathi et al, 1995). Bunker silos are another type of horizontal silos that are used instead of trench silos, when the ground water table is high. The basic difference between the trench and bunker silos is only that the former is below ground level, whereas the latter is above ground level (Tripathi et al, 1995).

Pit silos are circular or rectangular vertical pits with a depth of 3-8 m. usually the required dimensions are prepared, keeping in view that the ground water table is lower than the depth of the pit. Circular pits are preferred as the silage can be compacted much better than with a rectangular pit. Pit silos are most suitable and economical for storage of smaller quantities, such as frequently available feed resource. Their cost is lower, and the losses are also lower than with the trench silos. Bag silo-chopped forage stored in large sacks made from polythene.

### 3.2.3. Advantage and disadvantages

The advantage of silage generally makes it possible by keeping more stock on a certain area or land. At low expense silage furnishes high quality, succulent feed for any season of the year. Crops may be ensiled when the weather does not permit curing them into hay or dry fodder and silage is eaten practically without waste. Crops from a given area can be stored in less space than dry forage. Since crop for silage is removed early from the land, the land may be preparing for another crop. Weedy crops, which would make poor hay, may produce satisfactory silage. Well ensiled silage can stored for more than three years.

Disadvantages of silage It requires labor for harvesting, chopping, filling of the silo, compacting and The management of silos is sometimes difficult for the farm because once a silo is opened, silage should be removed on a daily basis to minimize loss of nutritive value (Michel, 2002). The construction of a silo requires an investment. Handling and transportation require more effort as compared to hay, due to lower dry matter concentration and the marketability of silage is very low. Most of the time silage is prepared for grass forage crops than legume plant materials; because of grass forage are rich in sugars, which facilitate fermentation and silage prepared from grass alone are deficiencies in protein, nutrient 7.17-7.96% CP (Bako unpublished report) and lower vitamin D contents.

### 4. Conclusion

As reviewed from different sources of literature, livestock need different sorts of balanced ration of nutrients for maintains, reproduction, disease resistance, fattening, etc. Ration is formulated by different methods (Pearson square, software and trial and error and Algebraic) which provide important nutrient for livestock production. The energy source of feed provides the main part of the diet and supply the body’s fuel, allowing the animal to move, keep warm, stay alive and be productive. Protein source feeds helps young animals to grow and develop strong muscles. Vitamins are a group of substances that are required in the diet in very small amounts for normal functioning of the body. Insufficient supply of any of the vitamins results in a specific deficiency disease. Minerals are also required by the body in small amounts and serve a wide variety of important functions, including forming strong bones and generally maintaining health and normal body function. They differ from vitamins in being simple chemical elements, whereas vitamins are more complex chemical compounds. Water is important for normal body function of animals.
Without water to drink animals die very quickly. Water is necessary for food to be digested, for the animal to cool its body when it is too hot, and to remove waste materials from the body and also, milk contains up to 85 % water.

There is a surplus amount of high quality forage produced during the wet seasons in the country, severe shortage of the quality of forage occurred during the dry season. To avoid this shortage forage conservation would be very much essential to meet the use of forage abundance at shortage period. Conservation techniques are maximizing nutrient conservation, efficiency and minimize production cost and conserved in terms as silage and hay. Hay is green forage conserved under aerobic condition or limited moisture conditions from soft and pliable stems of green forage harvested at the optimum stage of maturity. Silage is a feed produced under anaerobic condition by controlling acid fermentation of green forage crops in the container called silo which is made within a different structure (trench, pit and tower silo).

5. Recommendation
a. The main problem of livestock production is the absence of quality feed which is not providing balanced diets. Livestock producers’ should be using a ration formulation which supplied balanced diet or complete feed for their animals.
b. Green forage was available mainly at wet seasons and scarcity or shortage during dry season. This is the main problems affecting production and productivity of livestock in the country. Therefore the farmers should be practiced forage conserve at the time of available of green feed for the time of scarcity to increase production of their livestock throughout the years.

6. References
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