Silage Production for Feed from Agricultural Waste in Menia

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1. About This Report

1.1. Description
This report belongs to a series of reports on usage of agricultural waste in Egypt to develop feasible business opportunities. This report aims at providing a business case for silage production using agricultural waste to show the potential for such a business for entrepreneurs and business owners at various levels. Furthermore, MC Egypt has the required capability to develop tailored business cases/feasibility studies/business plans to specific organizations. This will allow customizing data to the required size of business and existing capabilities.

1.2. How to use the report
This report aims at assessing the viability of a business focusing on producing silage as a source of feed for livestock. This report should be used as a guideline to such a business. It serves as a mini business plan with high level financial figures to show whether such a business has the potential of yielding financial return/profitability. Businesses are encouraged to perform in depth business plans before actually starting production. The detailed business plan should then focus on area-specific and crop-specific data as well as including business/individual capabilities that could serve this business. Moreover, the full-fledged business plan should generate forecasted financial statements that give deeper feasibility assessment of the business.
2. Market Description

2.1. Market Definition:
This report is a sub-segment report of agriculture waste management for small farmers. The report focuses on feed production from such waste, namely through silage production. This study focuses on a proposed feed production facility in Upper Egypt with special emphasis on Menia (governorate in Upper Egypt). The inputs for the project, namely agriculture waste, will be bought mainly from smallholder farmers in the area. Also, the output, silage, will be sold to local farmers of different sizes. The study will focus on Menia to give a clear example of the business opportunity with potential for scalability in Upper Egypt at large.

2.2. Need:
The primary needs of small farmers to be addressed by this market are:
I. Cost reduction and/or revenue generation:
   • Local feed industry in Egypt is facing serious problems in procuring affordable concentrated feed ingredients due to high international prices. Feed prices were up by 40% in 2012 due to the U.S. drought which highly affected global food supply.\(^1\) Silage can provide a substitute for highly priced and unavailable animal feed
   • Agricultural waste, otherwise thrown away or burnt, can be a source of income for the small farmer. The total amount of farm residues in Egypt is estimated to be more than 25 million MT.\(^2\)
II. Health considerations:
   Burning of agricultural waste generates a lot of health hazards and environmental contamination which can be avoided by selling this waste for better resource utilization.

2.3. Input:
Agricultural waste in Upper Egypt (especially Menia) comes from the following crops (ordered according to level of importance based on available quantity):

1) Corn stalks,
2) Sugar husks,
3) Cotton stalks and
4) Other horticultural and perennial crop residues. The amount of horticultural and perennial residue that can be used as feed needs extensive research on all types of crops. This is not the objective of this report and is thus, recommended as a topic for future researches.

Menia was chosen as the focus of this research because it has the highest level of potential supply of agricultural waste within Upper Egypt as per the below graph.\(^3\)

\(^1\) http://www.thefarmsite.com/reports/contents/eglsep12.pdf
\(^2\) http://www.fao.org/ag/AGP/AGPC/doc/Counprof/Egypt/Egypt.html#ruminant
2.4. Output:
Silage is fermented, high-moisture, stored fodder, which can be fed to ruminants (cud-chewing animals such as cattle and sheep) or used as a biofuel feedstock for anaerobic digesters. It is fermented and stored in a process called ensilage, ensiling or silaging, and is usually made from grass crops, including corn, sorghum or other cereals, using the entire green plant (not just the grain). Silage can be made from different field crops, and special terms may be used depending on type (oatlage for oats, haylage for alfalfa). 

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3. Market Structure

3.1. Porter Five Forces Model:

*Bargaining Power of Suppliers:* Suppliers of agricultural waste have little bargaining power when it comes to pricing as they are used to burning this waste (experts assume that around 85% of corn waste is burnt). Thus, gaining revenue out of agricultural waste will be attractive to the farmer. However, it is important to note that the farmer’s main interest is the actual plantation of his crops; i.e. agricultural waste is not the priority. This entails that the farmer needs to ensure timely collection of the waste with minimum hassle to him, without any negative impact on his plantation and at acceptable revenue to have an incentive to cooperate. Especially in the beginning of the project, this would serve as a promotion for the whole concept and will facilitate scaling up.

*Bargaining Power of Buyers:* Types of farmers who raise cattle are described below.⁶

<table>
<thead>
<tr>
<th>Production System</th>
<th>Characteristics</th>
</tr>
</thead>
<tbody>
<tr>
<td>Landless Industrialized Systems</td>
<td>• Industrial, market-driven production systems</td>
</tr>
<tr>
<td></td>
<td>• Detached from their original land base, commercially oriented, and specialized in specific products</td>
</tr>
<tr>
<td></td>
<td>• Generally associated with large-scale enterprises</td>
</tr>
<tr>
<td></td>
<td>• Small-scale urban-based production units also important in developing countries</td>
</tr>
<tr>
<td>Small-Scale Landless Systems</td>
<td>• Small-scale landless livestock keepers typically not owning croplands or with access to large communal grazing areas</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Grassland-based or Grazing Systems</th>
<th>Mixed Farming Systems</th>
</tr>
</thead>
<tbody>
<tr>
<td>Typically found in urban and peri-urban areas and in rural areas with high population density</td>
<td>Most of the world’s ruminants kept within crop-livestock systems</td>
</tr>
<tr>
<td>Typical of areas unsuitable or marginal for growing crops</td>
<td>Characterized by relatively low levels of external inputs</td>
</tr>
<tr>
<td>Most often found in arid and semi-arid areas</td>
<td>Products of one part of the system used as inputs for the other</td>
</tr>
<tr>
<td>Adaptive management practices needed for challenging environmental conditions</td>
<td></td>
</tr>
</tbody>
</table>

Menia is comprised of rural livestock keepers mostly with limited land. Land, if available, is used to plant crops necessary for revenue generation and/or household food requirements. This saves limited space for the production of “feed crops”. Many farmers turned away from livestock production in general because they could not afford feed prices. Moreover, the limited/poor quality of veterinary services available is a huge concern in the industry.⁷

The feed provider, in the normal market structure, usually has the upper hand in setting prices. The silage provider, on the other hand, will have less bargaining power over existing customers as a) they have established relations with current feed providers and b) they will be skeptical of silage in general as it is a new concept/product for farmers in Upper Egypt. Thus, the provider needs to give technical assistance in collaboration with existing veterinary service providers and NGOs that have farmer trust already. This will ensure faster adoption rates and transfer of trust to the silage provider. Moreover, in areas where veterinary services lack the quality and trust needed, the service provider needs to create alliances to develop a market system for veterinary services.

**Existing Competition:** Egypt’s livestock and beef production remains dependent on imported feed ingredients. The country imports 60% of its concentrated feed components for use in local production. High international prices for soybeans and yellow corn are driving up local feed production costs; roughly 35% of local feed utilizes imported yellow corn.

Egypt’s economic situation, along with high international prices will further reduce the number of local feed manufacturers. Reportedly, between 2007 and 2011, the total number of operational feed factories in Egypt fell by 21% from 112 to 88. Higher imported feed ingredient costs over time will further consolidate the local feed industry.⁸

There is no silage availability or know-how in Menia. However, prominent brands of feed products are El Santa (a company in Northern Egypt), El Amal (a company in Menia) and El Masreya (a company in Assiut, Upper Egypt).

**Threat of New Entrants:** The threat of new entrants is moderate. The initial required capital to start such a business is not very high making it easy to start a competing business. However, this could serve the service provider well, as awareness about silage will be reached faster. Silage can penetrate the

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market faster due to the efforts of multiple players. So while new entrants could be viewed as a threat, it can also serve as an opportunity for everyone to benefit from this untapped market.

**Threat of Substitutes:** Normal feed is already a huge substitute. The only reason people would be willing to switch to silage will be the lower price (assuming similar perceived quality). Moreover, pellets (waste compressed into the shape of a pellet) could become an alternative feed option. However, pellets production is still immature in Egypt at large, which gives a space for products to sell in parallel.

### 3.2. Product research

Livestock fodder consists of two main ingredients that are important for the animal to survive and produce meat and milk; namely dry matter (DM) such as hay and concentrated fodder premixes and green matter like clover and alfalfa.

Silage is a green matter that is preserved in a silo through a process of fermentation in the absence of air which is called anaerobic activity. Silage is a good substitute for green matter especially in the summer due to absence of clover. Moreover, silage has higher nutritional value than clover or alfalfa. Silage also has higher content of DM that is a good substitute for hay and other filler forage although animals still need to have a higher amount of DM that can only be found in wheat hay or rice straw for example.

If more crops are available, it is highly recommended to produce silage through combining more products and by-products. The most economically feasible results are obtained when low quality components (crops that cannot create silage on their own, such as fruits and leaves of sugar beet and sunflower) are added to more nutritious components (maize, alfalfa, etc.). However, silage feed has a lower nutritional value than the processed feed. The ratio of nutritional value of Silage to Processed Feed is 5:1; meaning, for every five kilos of silage feed, the animal gets the same nutritional value of one kilo of processed feed.

In Egypt (especially Lower Egypt where silage production is more widely known), corn is the main crop used for silage production. Majority of players use corn cobs along with corn stalks to produce silage; a method that produces silage with higher nutritional value. This reduces the required additional protein to provide the livestock with a nutritious meal. However, the stalks alone could be used to produce less nutritious silage. The advantage of the later method is that it only uses wasted corn residue instead of the more expensive cobs, thus offering the lower priced silage and offering a source for waste usage other than health hazardous methods currently applied.

Corn Stalks are harvested and chopped into small pieces from 1cm to 3cm and then compressed into 1 ton round bales or 50 kg bales and wrapped with plastic shrink in order for the anaerobic activity and the useful bacteria that forms the silo to start working. Another way could be applied in making silage is piling chopped forage and covering it with plastic sheet and then compressing air out with the use of a tractor that moves on the pile.

Silage must be firmly packed to minimize the oxygen content (around 2 months), or it will spoil. Silage goes through four major stages in a silo:

- **Pre-sealing**, which, after the first few days after filling a silo, enables some respiration and some dry matter (DM) loss, but stops
- **Fermentation**, which occurs over a few weeks; pH drops; there is more DM loss, but hemicellulose is broken down; aerobic respiration stops
- **Infiltration**, which enables some oxygen infiltration, allowing for limited microbial respiration; available carbohydrates (CHOs) are lost as heat and gas
- **Emptying**, which exposes surface, causing additional loss; rate of loss increases.\(^\text{10}\)

### 3.3. Market growth rate

The following graphs show the growth of the total ruminants market over the years in terms of production tons and number of heads.\(^\text{11}\)


11. FAO
Livestock production decreased on all types in 2010. Moreover, total domestic consumption in 2012 is down compared to the 2011 level of 529,000 metric ton, by 19,000 metric ton or about 3.5%. Feed and problems with veterinary services are reported to be the main problems facing livestock production in Egypt.\textsuperscript{12}

\textsuperscript{12} http://www.thefarmsite.com/reports/contents/eglsep12.pdf
4. Sales & Capacity Forecast

4.1. Market Sizing

**Demand Data:** Generally speaking, Menia and neighboring governorates Sohag and Assiut represent the highest concentrations of livestock within Upper Egypt.\(^{13}\) Menia has more than 1.8 Mil heads of ruminants.\(^{14}\) The below table shows the equivalence of each ruminant type in terms of feed consumption to reach the total number of available animal units as pertaining to feed usage. For example, a sheep eats 0.2 of what a buffalo (1) eats:

<table>
<thead>
<tr>
<th>Ruminant Type</th>
<th>Number of Heads</th>
<th>Equivalent Conversion Rate</th>
<th>Number of Animal Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>Buffalo</td>
<td>421,276</td>
<td>1.00</td>
<td>421,276</td>
</tr>
<tr>
<td>Cow</td>
<td>480,500</td>
<td>0.70</td>
<td>336,350</td>
</tr>
<tr>
<td>Sheep</td>
<td>460,256</td>
<td>0.20</td>
<td>92,051</td>
</tr>
<tr>
<td>Goat</td>
<td>450,000</td>
<td>0.16</td>
<td>72,000</td>
</tr>
</tbody>
</table>

**Total Animal Units**: 921,677

Menia animal heads is about 921,677 head and thus the feed market is about 1,382,516 Ton (calculating on a 1.5 ton per head feed requirement).

**Supply Data:** As shown before in the Inputs section of the market description, Menia has around 500,000 ton agriculture waste (mainly corn stalks and sugar husks). To produce silage (especially from corn without the cobs) 10-15% of the weight is lost in the process; i.e. 1 ton of stalks would produce 850-900 kg of silage. Assuming 15% of weight loss is applied, Menia’s agriculture waste has the potential to produce 425,000 Ton of silage.

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\(^{13}\) CAPMAS booklet 2012

\(^{14}\) [http://www.ida.gov.eg/PDF_En/Menia-Target%20After%20Revision%20FINAL.pdf](http://www.ida.gov.eg/PDF_En/Menia-Target%20After%20Revision%20FINAL.pdf)
4.2. Market Share Forecast

Taking the above data on total demand for feed and supply of agricultural waste, the following graph shows 3 proposed forecasts of both quantity of feed that can be sold and quantity of agricultural waste that can be collected from the farmers assuming 1. Conservative estimate, 2. Most likely estimate or average and 3. Optimistic scenario.

![Graph showing forecasted sales volume and capacity scenarios]
5. Proposed Silage Business

5.1. Marketing mix modeling

Product: Silage made from corn and sorghum straws would be ready for feeding by the end of September to October which is considered a very critical time for feed availability especially for small farmers. This time is characterized by acute shortages in feed due to the termination of summer forage crops and unavailability of winter forage crops (mainly Berseem). In addition to using the silage made from corn and sorghum straws to fill the feed gap, it could be used with Berseem as a balanced ration to feed the animals which will lead to saving at least 20% of the consumed Berseem as well as achieving higher productivity due to a balanced diet. Berseem covers about 96% of animal energy requirement and 177% of protein requirement during winter season (October to May) and 60 and 79% of the requirements during the whole year.15 A combination of corn stalks and other agricultural wastes will be used to develop silage mainly for the ruminant feed market of Menia.

Price: The final silage product is sold from the factory for 450 LE/ton on average adding to that the transportation cost, the product comes in 50 kg bags packed under pressure, or comes in bulk 1 ton cylinder bales that is wrapped under high pressure and in that case it needs specific treatment in the transportation period in order not to cut the shrink film and open the bale which will ruin the silage and the anaerobic activity.16

Promotion: Two types of promotion need to take place; one that encourages farmers to sell the company their supply of agricultural waste (at the beginning special focus will be put on corn stalks) and another one that focuses on sales of silage feed for livestock. Moreover, strategic marketing objectives are indicated below to ensure scalability.

- **Purchase of Agricultural Waste:** The reason why farmers opt to burn agricultural waste is the hassle and cost of moving it elsewhere to dispense of it or use it. The farmer has limited land and thus, can’t waste valuable space to store this waste. Moreover, transportation of the agricultural waste comes at a cost with no revenue to the farmer which makes it unfeasible. The role of the silage producer would be to 1. give technical assistance to the farmer to show the most efficient way of collecting agricultural waste for the company to pick up, 2. promote the financial return this process will yield to the farmer and 3. pick up the agricultural waste on time (before the land needs to be emptied for the following crop production).

- **Sales of Silage Feed:** Experts will provide seminars and door-to-door visits to farmers explaining how to use silage and the quantities needed depending on their livestock size and type. Moreover, silage provider can collaborate with NGOs interested in the area to increase livestock production relying on feed inputs from silage. This will create faster adoption rates alleviating at least some of the burden of technical assistance and promotion from the silage producer.


16 Marina for agriculture development, Silage producer & El Safa for agriculture products, Silage producer.
• **Strategic – Increase in Livestock Production:** To scale up operations, the silage provider needs to promote the increase of livestock production, especially in Upper Egypt to minimize transportation cost of fodder. This will be done not only by promoting the availability of lower priced feed but also facilitating farmer financing of heads purchase and veterinary services. This can be achieved by collaborating with an NGO or a microfinance entity.

**Place/Distribution:** The current distribution structure is that farmers buy feed from traders who buy it from the Delta (Northern side of Cairo) or other companies in Upper Egypt. The proposed distribution for silage is to develop collection centers to process the agricultural waste in the area into silage. The output of this process will either be sold to small farmers around the area or will be developed into bales and sold to large livestock farmers around Egypt.

5.2. **Key Success Factors:**

**Collection from farmers:** The key to successfully collecting high volumes of agricultural waste is managing the transportation for the farmer at no cost and at the time he needs it to be taken off the field to save space and start new crop production. Moreover, increasing farmer revenue by buying this otherwise unutilized waste from him will be an attractive offer to sway him from burning it.

**Access to “feed markets”:** The closer the market at which feed will be sold a. the higher the profitability as transportation cost is reduced and b. the more competitive your cost to the farmer is thus providing an attractive alternative to imported feed. Another parallel key success factor here is developing a “marketing campaign” so farmers of Upper Egypt at large and Menia in particular will start increasing their livestock production. Many farmers have turned away from livestock production due to high prices/unavailability of feed and or lack of veterinary services. If the silage business can facilitate buying livestock and develop veterinary services (as financing options or in collaboration with NGOs interested in such market and livelihood improvement), the business can open new markets for its silage.

**Storage facility:** As corn production in Menia happens during 2 months of the year. Creating production and storage capacity to serve the supply of the 2 months and sell it throughout the year is critical.

**Strategic Key Success Factors:** The business should be able to diversify into many crop wastes in the long-term either using same machinery or new ones to better exploit resources (governorate wastes) and maintain operation around the year (as corn stalks are only available 2 months of the year)

5.3. **Financial Data:**

**Raw Material:** Ardab is a measuring unit for different grains and each grain has its own weight. For corn (main crop currently used for silage production in Egypt), ardab of corn weighs 140 kg. Ardab of corn cobs with its leaves costs 220 LE and without the leaves (loss in weight) costs 200 LE. A feddan of Corn costs 4,800 LE with the cobs and without its corn cobs (stalks only, i.e. agricultural waste) will cost
around 960 LE taking. A feddan of corn produces between 20 and 24 tons of silage including corn cobs and less by 20% to 30% without corn. Thus, a ton of corn with cobs costs around EGP 218 and without cobs costs EGP 58. These prices are from Delta which is more developed in terms of silage production.

**Machinery:** The following table shows different machines and different model prices. Moreover, small wrapping machines can be imported but are currently unavailable in Egypt.

<table>
<thead>
<tr>
<th>Machine</th>
<th>Description</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tractor</td>
<td>This is needed to provide mobility for the harvester and/or chopper (Italian Foton model)</td>
<td>150,000-200,000</td>
</tr>
<tr>
<td>Harvester</td>
<td>Harvests corn stalks and/or with cobs (Italian model)</td>
<td>21,000</td>
</tr>
<tr>
<td>Chopper(^{18})</td>
<td>Chops corn stalks to produce silage 2-3 ton per hour (Egyptian model)</td>
<td>8,000</td>
</tr>
<tr>
<td>Chopper(^{19})</td>
<td>Chops corn stalks to produce silage 5 ton per hour (Italian model)</td>
<td>16,000</td>
</tr>
<tr>
<td>Chopper &amp; Harvester(^{20})</td>
<td>One machine doing both with the capacity of 120 tons/hour (Turkish model)</td>
<td>44,000</td>
</tr>
<tr>
<td>Large-Scale Chopper</td>
<td>Machine chopping around 120 tons/hour</td>
<td>1,000,000</td>
</tr>
<tr>
<td>Large-Scale Wrapping</td>
<td>Machine wrapping around 120 tons/hour</td>
<td>2,000,000</td>
</tr>
<tr>
<td>Baling Machine</td>
<td>Small-sized bales (65 kg each) producing 40-50 bales per hour (Chinese model)</td>
<td>180,000</td>
</tr>
</tbody>
</table>

**Other Expenses:** Each feddan of corn needs 7 workers each costing 120 LE per day to harvest the crop feeding the chopper and transport the chopped material to the silage yard. A feddan of corn will cost around 1,200 LE during the whole process to produce between 20 and 24 tons of silage including corn cobs and less by 20% to 30% without corn.\(^{21}\)

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\(^{17}\) Ahmed El Mezayen, Mohamed Abd El Fattah, Monofeya, September 2013.  
\(^{18}\) Alaa Shams, Nahdet Beniswaif, Beniswaif, September 2013.  
\(^{21}\) Ahmed El Mezayen, Mohamed Abd El Fattah, Monofeya, September 2013.
6. Social Impact:

6.1. Impact Metrics:

<table>
<thead>
<tr>
<th>Impact (change)</th>
<th>Indicator</th>
</tr>
</thead>
</table>
| Higher Income               | % increase in revenue per farmer in Menia due to sales of agricultural waste  
% decrease in cost per unit of feed per farmer in Menia                                      |
| Livestock Productivity      | % increase in number of liters of milk/ weight of cattle since using the silage  
# number of farmers who report positive feedback in using silage as feed                |
| Silages Business            | # number of farmers shifting to using silage for feed in Menia  
# number of new silage businesses opened in Menia and Upper Egypt  
# number of new full time employees hired in the silage business |
| Better Health               | # number of farmers who have less exposure to burning agriculture waste  
# numbers of farmers who report less health problems from burning agriculture waste  
% decrease in tons of agricultural waste unutilized/burnt                                    |

6.2. Unintended Consequences:

The silage business could have negative consequences for local traders dealing in normal feed. This could be overcome by using these traders to sell the silage through them and also making them part of the collection. This will have a positive impact on the silage business by creating a trust associated with farmers’ trust for the trader as well as take of the burden of product promotion.

Moreover, the nutritional qualities of silage need further study to create a mix (whether silage alone or silage with feed) that serves the nutrition requirements of the livestock.

Silos are potentially hazardous: deaths may occur in the process of filling and maintaining them, and several safety precautions are necessary. There is a risk of injury by machinery or from falls. When a silo is filled, fine dust particles in the air can become explosive because of their large aggregate surface area. Also, fermentation presents respiratory hazards. The ensiling process produces "silo gas" during the early stages of the fermentation process. Silage gas contains nitric oxide (NO), which will react with oxygen (O2) in the air to form nitrogen dioxide (NO2), which is toxic. Lack of oxygen inside the silo can cause asphyxiation. Molds that grow when air reaches cured silage can cause organic dust toxic syndrome. Collapsing silage from large bunker silos has caused deaths. Silage itself poses no special danger. 22

7. Appendix:

7.1. Livestock in Egypt

31% of the sheep population is concentrated in Upper Egypt, compared to 22.38% in Western Delta region. The goat population is concentrated in both Upper Egypt and Middle Egypt regions with percentages of 36% and 23.5%, respectively. Nevertheless, 31% of the sheep population is concentrated in Upper Egypt, compared to 22.38% in Western Delta region. The goat population is concentrated in both Upper Egypt and Middle Egypt regions with percentages of 36% and 23.5%, respectively.

<table>
<thead>
<tr>
<th></th>
<th>Total feed in MT</th>
<th>TDN</th>
<th>DCP</th>
</tr>
</thead>
<tbody>
<tr>
<td>Available</td>
<td>11 200 000</td>
<td>1 568 000</td>
<td></td>
</tr>
<tr>
<td>Required</td>
<td>13 500 000</td>
<td>1 044 000</td>
<td></td>
</tr>
<tr>
<td>Balance</td>
<td>- 2 300 000</td>
<td>+ 524 000</td>
<td></td>
</tr>
<tr>
<td>% self Sufficiency</td>
<td>82.96</td>
<td>150.2</td>
<td></td>
</tr>
</tbody>
</table>

Source: El-Nahrawy, 2008a.

The main characteristics of the animal production sector are:

- 17.3% of the cattle population and 6% of the buffalo population are owned by people who do not own agricultural land.
- 89% of the cattle population and about 75% of the buffalo population are in agricultural holdings of less than 2.1 ha.
- 93% of the cattle population and about 86% of the buffalo population are in herds of less than ten animals.
- 25% of the sheep and goat populations are owned by people who do not own agricultural land.
- 83% of the sheep population and about 87% of the goat population are in agricultural holdings of less than 2.1 ha.
- 51% of the sheep population and about 55% of the goat population are in herds of less than ten animals.

7.2. Limitations

- Inadequate feeding is the major limiting factor for animal development which causes high mortality of young animals and low daily gain and reproduction performances well below the genetic potential. Inadequate feeding results from low pasture productivity especially in the rainfed areas and inadequate use of berseem due to lack of producer knowledge of nutritional value and feed requirements.
- Inadequate stock water in most range areas. Animals may have to travel long distances to water points, and some water is of poor quality.
- Inadequate herd management practices leading to uncontrolled reproduction with no castration of inferior males and low replacement of old females. These practices lead to little or no genetic improvement in the herd.
- Health management of the herd is still insufficient, despite the efforts being made by the Ministry of Agriculture.
- Resource degradation, including soil loss to water and wind erosion, loss of soil fertility, soil salinization, decrease of aquifers, and degradation of range due to overgrazing, and cultivation of marginal lands.
- Access to improved bulls and artificial insemination services is limited, especially for small farmers.
- Climate constraints, particularly the high frequency and severity of drought.

7.3. Why Menia

Table 2.7: Updated Poverty Map: Geographic Distribution of Poorest Villages

<table>
<thead>
<tr>
<th>Governorate</th>
<th>Number of Poorest Villages*</th>
<th>Number of Population</th>
<th>Number of the Poor</th>
<th>Number of Households</th>
<th>Number of Poor Households</th>
</tr>
</thead>
<tbody>
<tr>
<td>Menia</td>
<td>356</td>
<td>30,493</td>
<td>12,703</td>
<td>6541</td>
<td>27,208</td>
</tr>
<tr>
<td>Suhag</td>
<td>271</td>
<td>27,310</td>
<td>12,686</td>
<td>5930</td>
<td>27,401</td>
</tr>
<tr>
<td>Assiut</td>
<td>236</td>
<td>25,300</td>
<td>13,679</td>
<td>5270</td>
<td>29,859</td>
</tr>
<tr>
<td>Qena</td>
<td>150</td>
<td>15,702</td>
<td>5,877</td>
<td>3,054</td>
<td>11,917</td>
</tr>
<tr>
<td>Sharkia</td>
<td>74</td>
<td>6,036</td>
<td>2,257</td>
<td>1,310</td>
<td>4,912</td>
</tr>
<tr>
<td>6 October</td>
<td>8</td>
<td>465</td>
<td>171</td>
<td>980</td>
<td>3,360</td>
</tr>
<tr>
<td>Helwan</td>
<td>10</td>
<td>869</td>
<td>317</td>
<td>183</td>
<td>659</td>
</tr>
<tr>
<td>Beni Suef</td>
<td>13</td>
<td>868</td>
<td>311</td>
<td>155</td>
<td>558</td>
</tr>
<tr>
<td>Behera</td>
<td>19</td>
<td>1,610</td>
<td>581</td>
<td>278</td>
<td>986</td>
</tr>
<tr>
<td>Aswan</td>
<td>4</td>
<td>650</td>
<td>239</td>
<td>180</td>
<td>655</td>
</tr>
<tr>
<td>Total</td>
<td>1,141</td>
<td>11,849</td>
<td>5,349</td>
<td>2,483</td>
<td>11,306</td>
</tr>
</tbody>
</table>

Source: Ministry of Economic Development, the National Project for geographic targeting of poverty, June 2008.
Note: *These villages include 340 villages distributed within the local units of the governorates of Menia (47), Suhag (21), and Assiut (42) and Qena (97), and Sharkia (26) and Behera (16).

http://www.undp.org.eg/Portals/0/NHDR%202010%20english.pdf
7.4. Supply – Corn Stalks:

Agricultural residues are mainly used for baking and cooking, collected either free from the fields or, in some cases, brought separately. Typical fuels are stalk and cobs of corn, cotton stalk and dried cow dung.

Corn stalk: Families that do not grow corn themselves often buy stalk per cart or camel load. Depending on the season, a cart of approx 10 m³ (bulk) of air-dry corn stalk costs 50-70 LE. At a bulk density of 1 t/m³, the price per tons is approximately 50-70 LE/m³. Corn cobs are not usually trade and no price level could be established.²⁵

7.5. Feed Requirement²⁶:

<table>
<thead>
<tr>
<th>Material</th>
<th>Required Quantities (MN Ton)</th>
<th>Available (MN Ton)</th>
<th>Deficit or Surplus</th>
</tr>
</thead>
<tbody>
<tr>
<td>Concentrated Feed</td>
<td>7.67</td>
<td>4.00</td>
<td>-3.67</td>
</tr>
<tr>
<td>Green Feed</td>
<td>33.52</td>
<td>60.00</td>
<td>+26.49</td>
</tr>
<tr>
<td>Dry Feed</td>
<td>8.6</td>
<td>4.2</td>
<td>-4.2</td>
</tr>
</tbody>
</table>

²⁵ https://www.google.com.eg/url?sa=t&rct=j&q=&esrc=s&source=web&cd=11&cad=rja&ved=0CCcQFjAAOQo&url=http%3A%2F%2Fwww.thegef.org%2Fgef%2Fsites%2Fthegef.org%2Ffiles%2Fgef_prj_docs%2FGEFProjectDocuments%2FClimate%2520Change%2FEgypt%2520-%2520Biomass%2520Energy%2520Technologies%2520for%2520Rural%2520Development%2FPIIMS%2520Draft%2520Project%2520Document_Final%2520030806.doc&ei=UCcsUs6IGauw7QbW0oGgDg&usg=AFQjCngf3ar5OaC8BsNdhx4LMMu2qQ&bvm=bv.51773540,d.d2k
8. Useful Readings & Sources

8.1. About Feed:

*Feed Composition for Cattle & Sheep*: Gives typical values of nutritional content and other make-up factors of different feedstuffs.
http://www.ext.colostate.edu/pubs/livestk/01615.html

*Agricultural Sector Model of Egypt*: Agriculture in Egypt in general and feed as part of it.

8.2. About Silage:

*نتاج الأعلاف غير التقليدية من المخلفات الزراعية*: Using Agriculture Waste to create untraditional feed items.

*Use of different silages as new feed resources for Ruminants*: Using palm waste to create silage for feed.
http://www.ibna.ro/arihiva/AZ%202012-2/AZ%202012-2%2009%20Hamza.PDF

*Silage Making for Small-Scale Farmers*: Silage production process and best practices. It also includes data on storing and packing types as well as maintenance of the product.

*Design And Cost Analysis Of Agriculture Wastes Recycling Alternatives For Sinbo Village,Gharbiya Governorate*: Animal Production details and agriculture waste recycling alternatives.

8.3. Silage in Upper Egypt:

*Silage video in el Tod (Luxor)*: This 3-minute video shows the silage usage and production in El Tod village in Luxor governorate in Upper Egypt.
http://www.youtube.com/watch?v=pxNPcOCoqxs