Fact Sheet: Egyptian Clover

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First Page Photo
The photo on the first page is for the first cut of the introduced Egyptian clover at MAIL-Shishem Bagh Agricultural Research Station in Jalalabad, Nangarhar Province in January 2011; through the “Farm Resource Management” program activities.
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**ABBREVIATIONS AND TERMS**

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Description</th>
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<tbody>
<tr>
<td>AWATT</td>
<td>Afghanistan Water, Agriculture and Technology Transfer</td>
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<tr>
<td>Canal</td>
<td>In this and all AWATT documents, the word “canal” refers to either a secondary or tertiary canal. ¹</td>
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<tr>
<td>CSU</td>
<td>Colorado State University</td>
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<tr>
<td>jerib</td>
<td>Unit of land area approx. 0.2 hectare</td>
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<tr>
<td>karez</td>
<td>Usually unlined sloping tunnels in the hills that access aquifers</td>
</tr>
<tr>
<td>MAIL</td>
<td>Ministry of Agriculture, Irrigation and Livestock</td>
</tr>
<tr>
<td>MEW</td>
<td>Ministry of Energy and Water</td>
</tr>
<tr>
<td>NMSU</td>
<td>New Mexico State University</td>
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<tr>
<td>NVDA</td>
<td>Nangarhar Valley Development Authority</td>
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<tr>
<td>SIUC</td>
<td>Southern Illinois University Carbondale</td>
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<tr>
<td>UIUC</td>
<td>University of Illinois at Urbana-Champaign</td>
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<td>US</td>
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<td>USAID</td>
<td>United States Agency for International Development</td>
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<td>USDA</td>
<td>United States Department of Agriculture</td>
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</table>

¹ This distinction is important because the new Afghan Water Law passed this year (2010) gives responsibility for primary canals (diverted directly from the rivers) to the Ministry of Energy and Water (MEW), and for secondary canals (diverted from the primary canals to villages) and tertiary canals (diverted from the secondary canals for distribution to the farms) to be the responsibility of MAIL, specifically the newly established MAIL Department of Irrigation (DI). Similarly, the term “watercourse” is used interchangeably with the word “canal” in AWATT documents.
Egyptian Clover

Common Name: Egyptian Clover and also called Berseem Clover
Scientific Name: *Trifolium alexandrinum*
Local Name: مصري شفتلة

**INTRODUCTION**

Egyptian clover is a landrace crop native to Egypt, where it has been cultivated as a major winter crop for thousands of years. In the early years of the twentieth century, it was introduced to Sindh-Pakistan, where it was so well adapted to the conditions and farming systems that it rapidly spread throughout the irrigated tracts of northern India (Roberts & Singh, 1951). It is now the major cultivated fodder crop on millions of hectares around the world, almost certainly the most rapid spread of a fodder in recent times, and all the more notable for being cultivated primarily by smallholders. It is also grown in the US, and in southern Europe as both a winter and summer crop.

*Egyptian clover is the major winter forage legume in Egypt. It is highly nutritional and has excellent N-fixing ability. The crop was introduced to Afghanistan by Dr. Hamdy Oushy, AWATT-Forage Specialist, to help break the cycle of wheat/rice crop rotation and to provide high-quality feed for livestock.*

Egyptian clover is a winter and spring annual, grown on nearly four million acres as a winter forage or green manure crop, usually preceding cotton or summer vegetables. Most modern-day Egyptian clover varieties can be traced to one of the Egyptian landraces: Miscawi, Saidi, or Fahl, representing the three general types of Egyptian clover, based on stem branching. Miscawi is a basal or crown branching type that can be cut five or six times during its growing season. Fahl is a stem branching type that can be cut only once. Saidi is both basal and stem branching and can be cut two to three times during the growing season.

Egyptian clover is a fast-growing summer annual. In Afghanistan, it can produce up to 18 tons per *jerib* of fresh green forage from five cuts under irrigation. It is a heavy nitrogen producer and the least winter-hardy of all true annual clovers. Egyptian clover draws down soil nitrogen early in its cycle. Once soil reserves are used up, it can fix 23 to 45 Kilograms nitrogen per *jerib* or more.
In Afghanistan, if it establishes well, Egyptian clover can make an excellent cover for crop rotation with wheat and barley in winter; and with corn, cotton, pearl millet, vegetables, and Sudan grass in summer.

Six Egyptian clover varieties (Hellaly, Sahk-4, Gemiza-1, Giza-6, Serw-1, and Fahl) have been introduced to the MAIL/Afghanistan agricultural system by Dr. Hamdy Soliman Oushy, AWATT Forage Specialist, to break the cycle of wheat/rice crop rotation, improve soil fertility, and provide high-quality feed for livestock.

Egyptian clover is the fertility foundation of agriculture in the Nile Delta of Egypt, and has nourished soils in the Mediterranean region as a green manure for thousands of years. It is mainly grown in arable rotations for livestock and is valued as a fertility-building crop. It is commonly integrated into rice-wheat cropping systems as a winter and spring feed. In weather temperatures of 16°C, Egyptian clover will be ready to cut about 60 days after plantation. This variety of clover produces up to 200 kg seed/jerib if it is left to mature.

**Plant Characteristics**

Egyptian clover is a winter annual legume with oblong non-hairy leaflets and hollow stems. It resembles alfalfa with the exception of producing small seed heads with white flowers.

**Soil**

Egyptian clover will provide the highest yields when planted in fertile, well drained soil. It will grow on a wide range of soils, from loam to clay, provided they are not waterlogged, but prefers medium to heavy loams. Tight, heavy soils are not well adapted to this crop, but lighter loamy and silty soils produce excellent crops. It is tolerant of relatively high salt concentrations. Animal manure should be added to newly reclaimed sandy soils before cultivation of Egyptian clover (Knight, 1985; Zahradnik, 1985).

**Soil pH:** Egyptian clover tolerates soil pH ranging from 4.9-7.8, with a mean of 6.8, and has been noted for tolerating basic to acidic soils (Munoz & Graves, 1988). It has also been demonstrated to be alkali-tolerant and does best on slightly alkaline soils (Zahradnik, 1985; Knight, 1985).

**Salinity Tolerance:** Egyptian clover is tolerant of salinity or alkalinity and is used in reclamation of "salty" land in Egypt. Graves et al. (1987) showed that it tolerates moderate salinity.

**Climate Requirements**

**Temperature:** Egyptian clover does not withstand extreme heat or cold and is the least winter hardy of the cultivated clovers (McLeod, 1982). It should not be grown in areas where winter temperatures are commonly 6°C or lower. In general, Egyptian clover sown early in autumn resists frost much better than that which is late sown. Egyptian clover, 'Miskawi', does not do well with intense heat; late sowings result in a reduced number of cuttings due to injury.
from summer weather; however, it appeared to be the most cold resistant of the varieties. It is a winter annual in some parts of the world and a summer annual legume in other parts of the world. Most Egyptian clover cultivars cannot stand frosts. They will survive winters down to 15-18°C. Egyptian clover does best below 65 m (2,500 ft) of elevation. ‘Miskawi’ is best adapted to regions with mild winters where irrigation is practiced. The optimal temperature for the growth of Egyptian clover ranges between 18-25°C. The Egyptian clover germination rate is sharply reduced when temperatures reach 35°C, and low temperatures can delay germination and result in weak growth.

**Shade Tolerance:** Adequate phosphorus helps ensure the shade tolerance of Egyptian clover in agro-forestry systems (Hazra and Tripathi, 1986).

**GREEN MANURE**

Egyptian clover is the fertility foundation of agriculture in the Nile Delta, and has nourished soils in the Mediterranean region for millennia.

**VARIETIES**

Egyptian landraces of Egyptian clover (berseem clover) include Miscawi, Saidi, and Fahl (Graves et al., 1989). Kennedy and Mackie (1925) reported that there are four distinct agricultural varieties of Egyptian clover grown in various localities and differing in rapidity of growth, number of cuttings per season, height of plant, and amount and method of irrigation required. They are Miskawi (ممسكاوي), Khadrawi (خضراوي), Saidi (صعدي), and Fahl (فحل).

Miskawi (Muscowi USDA) is the variety most commonly grown in Egypt. It is preferred in the delta region of Lower Egypt where there is an abundance of water for winter irrigation but none in summer. It is a basal or crown-branching type and can be cut five or six times during its life (Graves et al., 1989).

Kennedy and Mackie (1925) mention that Khadrawi (Kadrawi USDA) resembles Miskawi in its habits of growth, but requires more water. It is said to have a longer vegetative period and heavier yield.

Saidi (Saida USDA) is characterized by a long root system, which enables it to withstand drought. It is intermediate in growth between Miskawi and Fahl. Saidi is the berseem of Upper Egypt; it is grown on the basin lands and sown in the mud after the Nile flood. Saidi branches both basally and on the stems, and can be cut two or three times (Graves et al., 1989).

Kennedy and Mackie (1925) note that Fahl (Fachl USDA) is used where water is not available after sowing and where the land is to be used immediately after cutting the crop. The land is flooded by the Nile during the autumn months, and when the water subsides, a layer of mud is deposited. The seed is sown in the mud. No further irrigation is given and only one cutting of green fodder is obtained. ‘Fahl’ is a stem-branching type and can be cut only once (Graves et al., 1989).
These six Egyptian clover varieties (Hellaly, Sakh-4, Giza-1, Serw-1, Gemiza-1, and Fahl) were introduced to Afghanistan by Dr. Hamdy Soliman Oushy, AWATT Forage Specialist, in September of 2010. The first forage research, demonstration, and seed production sites for Egyptian clover in Afghanistan were established at MAIL-Shishem Bagh Agricultural Research Station, Nangarhar University, Nangarhar Valley Development Authority (NVDA) in Jalalabad, and at 20 demonstration plots on 20 farms in four distracts: Kama, Behsood, Chaparhar, and Kewa in Nangarhar Province, in addition to a research site at Balkh University in Balkh Province.

The introduced Egyptian clover varieties fall into the following categories:

**Miskawi (مسقاوي)**
- Hellaly
- Gemiza-I

**Khadrawi (خضراوي)**
- Sakh-4
- Serw-1

**Saidi (صعيدي)**
- Giza-1

**Fahl (فحل)**

**Sowing Rate**

Use, clean Egyptian clover seeds from reliable sources that are free from weeds, especially dodder weeds. The recommended seeding rate is from 5-7.5 kg per jerib when broadcasting, or 4-5 kg per jerib when drilling. Egyptian clover planted for forage production should be sown under irrigated conditions.

**Sowing Method**

Egyptian clover is best sown in a well-prepared and leveled seedbed that has a good depth of subsoil. Seeds should be sown at a depth of 1.5 to 2.5 cm with a light soil covering.

Egyptian clover can be sown using one of the following methods:

**Wet plantation, broadcasting in a soft puddled field**

This method can be used when planting in a small farming system in loamy or sandy soils. The fields are ploughed and harrowed for achieving the required tilth. Farmyard manure is uniformly distributed and mixed into the soil. The land should then be leveled well, and borders should be established. Soil should then be heavily irrigated and seed broadcast directly into the mud in the puddled borders.

Broadcasting in a soft puddled field has the following advantages:

- A good leveling of the land is ensured.
- The weeds are buried at the time of puddling, reducing weed problems.
• The population of plants is more uniform.
• The availability of most of the plant nutrients needed for germination is increased.

**Dry plantation, broadcasting in borders**

Dry broadcasting can be used when planting in a small farming system in clay and/or clay/loamy soil. The fields are ploughed and harrowed for achieving the required tilth. Farmyard manure is uniformly distributed and mixed in soil. Lands should then be leveled well, and borders should be established. Seed is then broadcast directly into the borders, then lightly covered with soil and heavily but softly irrigated.

**Dry plantation, seed drilling in rows**

Dry seed drilling can be used when planting on large plots of land. The fields are ploughed and harrowed for achieving the required tilth. Farmyard manure is uniformly distributed and mixed into soil. Land should then be leveled well. Seed is then drilled directly into the soil with 10-15 cm of spacing between rows; borders are established and heavily but softly irrigated.

**Broadcasting into rice before and after harvest**

Egyptian clover may be seeded into rice before the harvest of the cereal, or right after the harvest; it should be done after irrigation and without plowing the soil.

**Broadcasting into a rice field before the harvest**

With late maturing rice varieties, Egyptian clover seed may be broadcast during the second half of the month of August into rice fields before the harvest; then the field should be heavily but softly irrigated. When the rice is harvested, the Egyptian clover has already germinated, rooted in the soil and is ready to be established. After the rice is harvested, the soil should be fertilized with urea (20 kg per jerib) and then heavily irrigated.

**Broadcasting into a rice field after the harvest**

In early maturing rice varieties, Egyptian clover seed may be broadcast during the second half of the month of October into rice fields, right after the harvest, after irrigation, and without plowing:

• Rice field harvested;
• No soil plowing is implemented; and
• Field is heavily irrigated.

Egyptian clover seed is broadcast, along with 20 kg of urea fertilizer per jerib, directly into the mud in the puddled borders, even with the presence of rice stubble.

Broadcasting into a rice field after the harvest of the cereal has the following advantages:

• It is a low-cost operation; and
• It allows early plantation and higher yield.
**Sowing Time**

In Afghanistan, the optimum planting time for Egyptian clover is from mid-September to the mid-November in areas with climates similar to Jalalabad, where environmental conditions are similar to the Mediterranean. Early sowing, before the middle of September, will result in a low germination rate due to higher temperatures and be subject to cotton worm attacks. Late sowing, after the middle of November, will expose the newly germinated plants to low temperatures and result in weak plants, delaying the first cut and reducing the number of cuts. The fresh yield could decrease by 62% if sown November 30 as compared to October 15.

Egyptian clover can be grown as a summer annual in areas with cool, moist summers, but as a winter annual, it does best in areas with long, warm winters and no frost danger, like in Nangarhar.

*Egyptian clover is best sown into a well-prepared and leveled seedbed that has a good depth of subsoil. The use of animal drafting to plow and level is important in areas where small farm systems predominate.*

*Egyptian clover is best sown into a well-prepared and leveled seedbed that has a good depth of subsoil. Tractor and laser-leveling can be used in large farming systems to cultivate Egyptian clover (Oushy 2009).*
FERTILIZER

Animal manure

Location, soil type, and the history of fertilizer application will determine fertilizer needs. It is preferable to add animal manure or other organic matter to poor soil. Animal manure should be applied at soil preparation, especially with sandy and calcareous soils, which are poor in organic matter.

Farmers were encouraged and trained to apply animal manure to AWATT forage demonstration plots in Balkh District, Balkh Province, June 2009 (Oushy 2009).

Phosphorous

Phosphorous fertilizer provides an important nutrient element for Egyptian clover production. Therefore, Di-Ammonium Phosphates (ADP 46% P2O5) should be applied to the soil at rates ranging between 36-48 kg per jerib, depending on the phosphorous content of the soil.

Nitrogen

Nitrogen fertilizer should be applied as an encouragement dose at a rate of 20 kg of urea per jerib. The N-fertilizer should be applied in two separate doses; 10 kg broadcast with seed at plantation, and the second dose, 10 kg of urea, should be applied after two weeks from plantation. Egyptian clover draws down soil nitrogen early in its cycle, but once soil reserves are used up, it can fix 23 to 45 kilograms of nitrogen per jerib or more.

Nitrogen Contribution

The total nitrogen contribution of Egyptian clover can range from 20-100 kg/jerib/year of atmospheric nitrogen; this was demonstrated in four years of field testing of the 'Multicut' Egyptian clover germplasm under supplemental irrigation in the Central Valley (Morey and Marchant, 1977).
IRRIGATION MANAGEMENT

The spacing and number of irrigations needed depends on soil type, plant variety, and climactic conditions.

**Egyptian clover, Fahl variety**

The Fahl variety needs only two irrigations in addition to the first one applied during the initial growing period (90-100 days).

**The other Egyptian clover varieties**

The other Egyptian clover varieties need from nine to ten irrigations during their growing season.

**In clay soil**

In clay soil, it is recommended that Egyptian clover receive two irrigations before the first cut and two irrigations after each subsequent cut, to maximize the green forage yield.

**In sandy soil**

If the soil is sandy, the number of irrigations should be increased. Egyptian clover should be irrigated every three to five days, depending on climatic conditions and temperatures.

Egyptian clover planted in sandy soil should not be irrigated right before cutting. This prevents crown and root rot diseases that can occur when the soil is poorly drained or during periods of excessive rainfall and water irrigation usage.

*Egyptian clover needs light, frequent irrigations for the first two weeks to promote seed germination.*
Egyptian clover should be irrigated one week before cutting in order to encourage new tillers from the crown area to grow up. The second irrigation should be applied one week after cutting. Irrigation concentration in one part of the field should be avoided.

An appropriate irrigation regime for Nangarhar and the Eastern Afghan Provinces would include:

- Light, frequent irrigations in the first two weeks to germinate seeds;
- Heavier weekly irrigations after the seedling stage, implemented until the first late fall rains;
- No irrigation in the winter unless a dry period of more than three weeks occurs, or unless the soil is sandy;
- Spring irrigations to start as soon as soil drying begins and to continue until the final cutting is made or seed formation is completed.

Irrigation for seed production

For seed production, Egyptian clover should be left without cutting from the beginning of May, and should be irrigated through the bloom stage in order to produce large-size, high-quality seeds in high quantities. In addition, irrigation should be stopped after May 10 if cotton was planted near the Egyptian clover, which helps stop the invasion of cotton worms into the Egyptian clover fields.

Forage Production

Green forage yields differ depending on the variety, sowing date, number of days until the first cut, fertilizer and water irrigation availability, and the length of the growing period between the successive cuts. The Egyptian clover Fahl variety is characterized by only one growing period; therefore, it provides only one cut, 90-100 days after plantation. It yields about 7.5-10 tons per jerib of green forage, or 1.5-2 tons of hay.

The selected Egyptian clover varieties have been characterized by prolonged periods of vegetative growth and a resulting high number of cuts. These varieties produce from 4-5 cuts per growing winter season. The green forage yield per cut ranges between 3.5-4.5 tons per jerib. The total green forage yield per winter growing season ranges between 16 to 20 tons per jerib, if grown in environmental conditions like those at Jalalabad.

Cutting Management

In order to obtain highly nutritional fresh forage, the first cut of Egyptian clover should be started 45-55 days after plantation, or when the plant reaches 40-50 cm in height; this will also maximize yields in the upcoming cuts. Successive cuts should be harvested approximately every month, or when the plant reaches 50-60 cm heights. A minimum of 5 to 7 cm stubble should be left to facilitate good regrowth for the next cut and to keep the crown healthy.
Egyptian clover is the major winter forage legume in Egypt. It is highly nutritional and has an excellent N-fixing ability. The first cut of Egyptian clover should be made 45-55 days after plantation, or when the plants reach a height of 40-50 cm.

Cuts should not be delayed for any significant period of time; otherwise there will be increased fiber and lignin contents, which decrease the forage’s nutritional quality. In all cases, the harvested fresh forage should not be left on the field, and the remnant plants should be collected after cutting to avoid crown rot disease.

Below are some of the best agronomic practices for farmers; when practiced, they increase the productivity of Egyptian clover by 20-30%:

- Use high quality and productive varieties of Egyptian clover.
- Practice early plantation to increase the number of cuts and overall productivity.
- Apply an adequate quantity of phosphorous fertilizer.
- Apply an adequate quantity of water irrigation at the right times.
- Leave five to seven cm stubble after cutting.
- Cuts should not be delayed for any significant period, to avoid an increase in fiber and lignin contents in the forage, resulting in a decrease in the nutritional quality.
- The harvested fresh forage should not be left in the field for any significant period.
SEED PRODUCTION

Egyptian clover seed is small and egg-shaped, reddish brown, and about 2 millimeters long (2 mm). On average, there are about 200,000 seeds per pound (Graves et al. 1987), or about 440 seeds/gram (Graves et al., 1989). Most seeds are yellow; about 10 to 15% of the seeds are purple.

Egyptian clover, Fahl variety

If the Fahl variety is used, plants should not be cut so that seeds are produced at the end of the growing season, approximately 90-100 days after plantation.

Egyptian clover, Miskawi, Khadrawi and Saidi varieties

For the Miskawi, Khadrawi, and Saidi varieties, plants should be cut two or three times before leaving them for seed production.

In general, no cuts should be allowed after the third week of April, encouraging the plants to move toward the flowering and seed development states. Honey bee hives should be provided in large seed production areas of Egyptian clover to assure a high percentage of cross pollination and high seed yield. Water irrigation should be carefully applied during the flowering stage in order to secure high seed quality and quantity.
Egyptian clover seed productivity ranges between 100-150 kg per *jerib* in Jalalabad-type environmental conditions. The rate could be increased to 200 kg per *jerib* if the bee hives were provided in adequate numbers at the flowering stage to increase pollination and seed production.

**Intercropping Egyptian clover with wheat for seed production**

In some cases, Egyptian clover seeds can be produced by intercropping with wheat; three kg of Egyptian clover seed should be mixed with the wheat seeds. At harvest time, both crops will be harvested and threshed; the seeds can be easily separated due to the size difference.

**Threshing Methods**

Egyptian clover pods can be threshed by hand or machine. Manual threshing is the method most often used by small-scale farmers; large-scale farmers tend to practice engine-powered threshing.

**Forage Mixtures**

Intercropping forage legumes with cold-season grasses or cereals is a very common practice. In Mediterranean countries such as Egypt, intercropping of cereals, especially barley, with Egyptian clover has been a common cropping system in the winter season due to increased productivity and sustainability. In addition, this agronomic practice has increased the dry matter content and decreased the moisture content of the plants in the first cut.

**Mixing Egyptian Clover with Barley**

Intercropping Egyptian clover with barley is a very common practice among Egyptian farmers. It produces high yielding fresh forage that is high in dry matter, highly nutritious, and palatable for animals.

The seeding rates of Egyptian clover when planted mixed with barley are 3.4 kg of Egyptian clover and 7.5 kg of barley per *jerib*. This mixture produces an excellent fresh and balanced diet for animals. It also makes good silage and hay.
Sowing methods of mixture

Dry plantation and broadcasting into borders

Dry plantation is used when planting Egyptian clover mixed with barley in a small farming system in either clay or clay/loamy soil. The fields are ploughed and harrowed for achieving the required tilth. Farmyard manure is uniformly distributed and mixed into soil. Land should then be leveled well, and borders should be established. Egyptian clover seed is broadcast directly in the borders, followed by barley seeds; then, the seeded areas should be covered with light soil, followed by heavy but soft.

Fertilizing the mixture

Di-Ammonium Phosphates (ADP 46% P₂O₅) should be applied to the soil as preparation at a rate of 45 kg per jerib. Nitrogen fertilizer is also needed, with a rate of 20 units of nitrogen (44 kg of urea 46% N). It should be applied two weeks after planting the mixture.

Cutting the mixture

The first cut of the Egyptian clover and barley mixture should be started 45-55 days after plantation, or when the plant reaches 40-50 cm in height; this will produce a highly nutritional fresh mixture of forage, in addition to maximizing yields in the upcoming cuts. Both crops have a similar growth rate, so they generally reach the cutting stage around the same time. The mixture of Egyptian clover with barley will be cut together only the first time; barley is not a multiple-cut plant.

Forage Quality

Egyptian clover provides high-quality forage suitable for growing and fattening livestock, as well as feeding lactating dairy cows. Egyptian clover is capable of producing herbage of very high quality. Herbage quality generally declines as plants approach maturity. In order to maximize the quality of conserved forage, it is recommended that Egyptian clover be harvested before flowering commences. It should be cut at no more than 10% bloom. The crude protein level of Egyptian clover is between 18-23 per cent and crude fiber is between 22-25 per cent, depending on the crop's stage of growth and seasonal conditions.

Effects of Egyptian Clover on Livestock

All kinds of livestock and poultry feed on Egyptian clover, and prefer it to alfalfa. In mixed fields of alfalfa and Egyptian clover, cattle and horses select the Egyptian clover, leaving most of the alfalfa until the Egyptian clover has been grazed to the ground. Replacing alfalfa with Egyptian clover has shown an increase in butter fat per cow daily of more than 10%, and there are no problems with butter or milk having an unusual flavor. Bloating (tympanitis) from feeding on Egyptian clover when covered with dew is very rare in Egypt and Australia and not serious when it does occur. In the Imperial Valley in the US, no bloating with Egyptian clover has occurred, although it is reported for alfalfa (Kennedy and Mackie, 1925).
**POSITION OF EGYPTIAN CLOVER IN CROP ROTATION**

Egyptian clover could be rotated with cereal crops such as wheat and rice to minimize disease or weed build-up and take advantage of increased soil nitrogen from the legume crop. In summer, it could be rotated with rice, forage pearl millet, or cowpea and/or vegetables. In winter, it should be rotated with wheat.

*Figure 1 Egyptian clover in a two-year rotation with wheat in winter, and rice and pearl millet in summer.*

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**FEEDING SYSTEM FOR LIVESTOCK**

We recommend that livestock are fed 50% Egyptian clover dried hay at the beginning and end of the growing system; this will help avoid health problems in the livestock. In addition, berseem (Egyptian clover) should not be cut in early morning; the dew at that time could possibly cause bloating. For that reason, animals should not be grazed at that time either, but should wait until the dew is burned off by the sun. In general, Egyptian clover should be cut for forage rather than grazed in order to avoid the hoof action that compacts the soil and damages the Egyptian clover’s crowns.
**Egyptian Clover Haymaking**

Hay in simple terms is preserved forage that is dried using sun curing and natural air drying. Good hay is characterized by its green color, acceptable smell, abundance of leaves, and lack of rot (which is usually accompanied by a foul smell.) Egyptian clover hay is traditionally made from the third and any subsequent cuts, because they are lower in moisture content than earlier cuts and therefore provide a large amount of dry matter.

**Egyptian clover haymaking steps:**

- Use only the third and following cuts for hay.
- Sun cure the harvested forage in rows in the field for one day only.
- Transfer the sun cured forage to the “Hay House” (see fig 2).
- Keep the forage in the Hay House for four days.
- Turn the forage upside down daily throughout the four days to dry it down.
- Transfer the hay to a storage place when it reaches 25% moisture content.

**Note:** The “Hay House” design was developed by Dr. Hamdy Oushy for haymaking in small farming systems in Afghanistan.
Figure 2 Egyptian clover haymaking, step-by-step in the “Oushy Hay House” (OHH), developed for small farming systems in Afghanistan.

“Oushy Hay House”
This method of making hay from Egyptian clover is clean and fast, requires little labor, and results in low mechanical losses. It is thus very efficient. The frame used three triangle shaped forms of different sizes. It also needs three wooden bars, each four meters long, to build the skeleton, then three wooden bars for each floor: three meters long for the first floor, two meters long for the second floor, and one meter long for the third floor (see photo 2 in Fig 2). Plastic nets should be established on the three floors to hold the forage (see photo 8 in Fig 2). The Hay House should be connected by using some tools as in photo 3 in fig 2.

In a large farming system, Egyptian clover hay can be produced using mechanical mowers, sun curing, and balers.

![Image](image_url)

The old way of making hay from alfalfa and local clover by drying the forage plants on the walls of farms in Balkh Province, Afghanistan, July 2009 (Oushy 2009). Note the mechanical losses of the leaves underneath the walls

**Pests and Disease**

The main disease affecting Egyptian clover is clover scorch. Varieties differ in tolerance, but even tolerant varieties may require chemical applications to control outbreaks. The crop can also be affected by root rot and is susceptible to attack by red-legged earth mites, blue-green aphids, spotted alfalfa aphids, blue oat mites, and *heliothus* (a grub).

Even so, Egyptian clover is not seriously affected by pests. *Heliothus armigera* may attack clover, but can usually be controlled by harvesting the crop. Nematodes can reduce yield; *Meloidogyne arenaria* is reported from Egypt and *M. incognita* from Egypt and the US. *Tylencorrhynchus vulgaris* and *Heliotylenchus dihystera* are reported from Pakistan.

Kennedy and Mackie (1925) report that many (unspecified) pest insects can build up on Egyptian clover with potential adverse effects to other crops should these pests disperse. To prevent excessive build-up of pests in Egyptian clover in Egypt is controlled by regulations that halt irrigation in April. Weevils, which aggressively attack the clover in Egypt, have not yet appeared in most other countries. Egyptian clover can be heavily damaged by feeding rabbits.
REFERENCES


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- Hamdy Oushy