



Best Practices for Managing Awassi Sheep

Feed Reference Guide

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Foreword

This booklet is part of a 11-part series of technical guidelines describing the best practices for managing Awassi sheep; the dominant sheep breed in several countries across the Middle East. The series is targeted at sheep farmers and milk processors, and provides practical, easy-to-follow advice on managing Awassi sheep in dryland conditions.

Efficient husbandry, feeding and milk processing are crucial in the management of Awassi sheep in dry areas; but many small-scale producers are unfamiliar with simple productivity-enhancing practices. This series aims to fill that information gap, and thereby enable farmers to increase their income from livestock while using resources more efficiently and sustainably.

The series draws on the practical experience of researchers, as well as the extensive literature, to capture scientific and local knowledge in an easily accessible format and language. The bulletins are organized in accordance with the sheep management calendar and describe the management of Awassi ewes during important physiological stages throughout the year. Supplementary guidelines provide additional information at each stage.

These booklets were produced as part of an IFAD-ICARDA project aimed at scaling up best practices for managing Awassi dairy sheep to small-scale sheep farmers in West Asia, a project implemented in Syria and Lebanon in collaboration with IFAD development projects in both countries.

We would like to thank all those involved in the preparation of these guidelines and also for IFAD's financial support to this important project. We expect these booklets will be useful to sheep farmers, milk processors, extension staff, as well students of agricultural development for knowledge transfer purposes.



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Importance of Feed



In dry areas, sheep need large amounts of feed and this need grows every year due to the increasing number of animals and the increasing demand for animal products. At 75%, animal nutritional expenses constitute a high proportion of sheep husbandry project expenses.

In this booklet, we review the most important feeds used for sheep feeding in the Middle East and the ways to improve its use for the best results at the lowest possible cost.

Usage of Feed

For the success of a sheep raising project, all animals in the flock should be fed correctly. Keeping animals without meeting their needs will inevitably result in loss. This means that the flock size must be commensurate with both the breeder's potential and the availability of feed.



It is important to develop a plan to feed the flock, taking into account the following:

- What is the flock size (number of animals)?;
- Allowing for wasted feed, what is the amount of feed needed for the coming season;
- What is the quantity, quality and price of feed available locally?; and
- What amount of feed can be secured?

When buying feed, the followings must be taken into account:

- Feed quality, feed must be free of mold, dust and soil particles (Note that low quality cheap feed stuff might become more expensive than good top priced feed due to other consequences);
- Transport costs - loading and unloading (it is preferable to calculate the feed price at farm door);
- Ease of mixing, handling and feeding; and
- Storage and waste problems.



After purchasing feed and before starting to use it, the expiry date and the quantity required should be specified. New feed should be purchased before the full consumption of current feed to allow for a gradual change.

Storage of feed



To maintain the quality of the feed, it should be stored in appropriate conditions and the following should be taken into consideration:

- A storage facility that is dry, safely away from fire hazards, protected from rain, and well ventilated;
- Storage should be away from barns and manure collection area in order to avoid contamination and/or odors;
- Storage should be compact and secure to prevent the entry of rodents, cats, and birds, because feed pollution with remnants of these animals can lead to disease transmission;
- The warehouse roof should be inclined to reduce the impact of rain and the ground smooth, slightly inclined and free from cracks to facilitate the cleaning process;
- If there is electricity in the storage, all wiring, connectors and switches should be regular and safe in order to avoid fire.

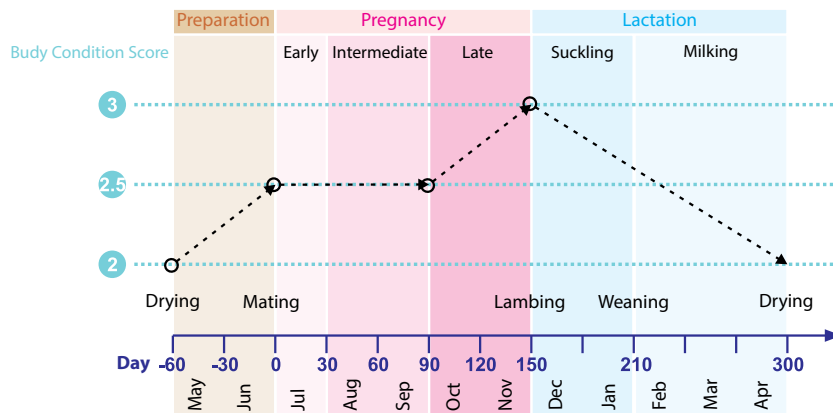
Feed storage

The following also should be observed:

- Store each batch of feed separately after ensuring its validity and quality;
- Raise the feed bags 10-15 cm from the ground by lying them on wooden pallets. This will protect them from humidity;
- Do not store pesticides, fuel or drugs in the feed storage facility;
- Close the doors after exiting the store (entry of sheep and their intake of excess feed may lead to animal loss);
- 'Filler' feed (straw or hay) can be stored in bales in open areas but must be covered to protect it from rain. After chopping, it can be stored in piles covered with a layer of straw and a layer of mud to protect it from rain;
- The period of validity of stored feed varies according to its type and storage conditions. Generally, the longer the storage period, the lower the quality of the feed;
- It is advisable to store feed unprocessed (i.e. before mashing or mixing) because whole grains are more tolerant to storage. It is preferable that a storage period does not exceed a year;
- It is recommended the sheep owner store the flock's feed supply for a whole season in order to avoid the risks resulting from an increase in prices.



Feeding program



The following points should be also observed:

- There is no specific feeding program to fit all sheep owners but each owner should develop his feeding program to suit his or her flock;
- Generally, the animals' age, weight and physiological stage should be considered and must be taken into account when calculating feed needs;
- The amount consumed by a ewe varies according to the type of feed provided; more specifically the feed's palatability, energy and protein content, the feeding method used (number of meals, nature of the feed mangers), the nature of the climate and the level of animal production.



Required feed is calculated in dry quantity. Normally, it ranges from 3-5% of the animal's weight, so an animal that weighs 50 kg can eat 1.5-2.5 kg of feed as a dry material. The allotted ration must be suitable for a ewe's physiological stage and in a fitting production stage. Therefore, the animals' body conditions should be evaluated periodically so feeding can be modified and adjusted to achieve optimality. In general, body condition scores can be used to determine the ration's efficiency in terms of quantity and quality.

Below is an example of a feeding plan for an Awassi ewe that weighs 50 kg, had one lamb delivered at the start of December and weaned the first week of February. The milking period lasted for three months after weaning. Ewes' status should be monitored and the feeding plan modified in line with body condition and the nature of the pasture.

Feeding program for a ewe that weighs 50 kg with one lamb

			Energy Mj	Crude protein g	Grazing	Roughage	Concentrate	Remarks
Preparation		May	6.8	55				Ewes have a good body condition score
		Jun	6.8	55				
Pregnancy	Early	Jul	6.8	55				
		Aug	6.8	55				
	Mid	Sep	7.0	56				
		Nov	7.8-9.5	78-95		600	800	
	Late	Oct	9.5-10.5	95-105		600	900	
Lactation	Suckling	Dec	17.3	242		1000	1100	Straw is offered ad libitum in case of no grazing Feed is offered to lambs after on month
		Jan	16.9	236		1000	1100	
	Milking	Feb	14.2	170		1000	1000	
		Mar	12	144		500	700	
		Apr	10	120		500	300	

Improving efficiency of feed use



The farmer should know the amount of feed consumed by the animal per day and the extent to which it meets the animal needs. Daily feed is calculated based on flock size.

In order to improve feed use efficiency, the following should be taken into account:

- Sheep safety against diseases, endoparasites and exoparasites;
- Divide animals into groups according to their nutritional requirements to avoid over or under-feeding that can lead to financial loss;
- It is preferable for feeding to be done twice a day (morning and evening) when the amount of concentrated feed offered exceeds 500 g per animal per day;
- Provision of drinkable water for sheep. Water is essential for production and performance and quantity needs to be increased during summer season, in the last stage of pregnancy and during the lactation period;
- Monitor the animals when they are ingesting feed. Some animals may stand away from the feeding manger and the reasons behind this must be investigated; and
- Gradually introduce the new ration. A smoother change in quantity and quality helps avoid health problems such as diarrhea, constipation and bloat. It is preferable the transfer period from one feed to another take 7-10 days.

Improving the Nutritional Value of Coarse Feed



The nutritional value of coarse feed may be improved in several ways.

Moistening, involves soaking coarse crop residues or spraying them with water so the cell walls swell; rendering the residues easier to digest and allowing for increased consumption. It has been proven that the wetting of corn residues increases the quantity consumed by 23% due to the rise in water content.



Shredding (chopping), i.e. the cutting of straw reduces the physical size of the feed and increases the ability of sheep to consume it, as well as facilitating storage and mixing.

Treatment with urea, can lead to improvements in the value of straw. It is advisable to dissolve 4 kg of urea in 40 l of water for treating 100 kg of straw. The treated straw is then tightly covered for a certain period (3-12 weeks) with the cover exposed for ventilation. Thus, the nutritional value of treated straw is improved and the quantity that an animal can ingest increased. More information on this is included in Urea-treated Straw booklet in this series.



When a new, small amount of palatable feed is introduced, the following should be taken into account:

- Provide the feed when the sheep are hung;
- Mix the new feed with a low palatability ingredient (e.g. molasses or salts); and
- If that does not work, try starving the animal before offering the feed. If they still do not take to it, look for another feed.

Importance of Water



A ewe needs between 5-10 l of water daily and their needs increase with the progress of pregnancy and during the lactation period. The requirement of water is also affected by the amount and quantity of feed as well as climatic conditions.

It is preferable to provide water all the time and if that is not possible, a good amount of water should be provided at least twice a day. Lack of hydration leads to animals being stressed and production being discontinued. Generally, when providing water, the following should be considered:

- Design the water troughs so sheep can not enter or ascend them
- Clean the troughs on a regular basis. Contaminated water should be emptied before refilling with fresh water
- Place the water troughs in a well-drained place to prevent water accumulation and to reduce the presence of insects and parasites. It is preferred to place them outside the barn
- Do not force the animal to drink mud-contaminated water, and/or hot or very cold water. The optimal temperature is 7-13 C. It is also preferable to place the water troughs under an umbrella to protect the water from sun radiation
- Keep the sheep away from muddy and stagnant water to protect them from diseases
- Use special water troughs for sick ewes to reduce disease transmission and disinfect all water troughs after any diseases are detected.

Classification of Feed



	Barley Straw	Cotton seed cake	Barley grain
Volume 1 kg	1.5	2	14.285
Apparent density	0.667	0.500	0.071
Energy (mega joule / kg)	11.8	9.6	6.4
Protein g/kg	115	304	32
Calcium g/kg	0.6	1.5	3
Phosphorus g/kg	4.2	11.8	0.5

Sheep are characterized by their ability to consume many plant materials as feed and these are divided into two categories according to their fiber content.

Coarse feed, plays an important role in the rumination process and in giving the animal a feeling of fullness and satiety. Coarse feed contains high amounts of slow digestive material and its fiber ratio exceeds 18%. It is divided into two sub-categories,

- Succulent (fresh) feed that contains more than 75% of water such as green fodder crops, tuber (root) crops and silage; and
- Dry feed that contains only 10-15% of water such as straw, hay and crop residues.

Concentrated feed, plays a key role in body-building and for completing an animal's needs. It is rich in nutrients and contains protein, sugars, fats, and a lower percentage (18%) of fiber and humidity. It is divided into two sub-categories,

- Protein-rich feed such as oilseed cake, which is often expensive; and
- Energy-rich feed including grain, seeds and mills' remnants, which are rich sources of energy and also often expensive.

Generally, the nutritional value of feed varies according to species, average rainfall and harvest method. It is preferable to conduct feed analysis to determine its nutritional value. In the absence of this analysis, tables showing approximate nutritional values are used. The following table illustrates nutritional values of some common forage species.

Nutritional value for some feed staffs

	Metabolic energy Mj/kg DM	Crude protein g/kg DM	Dry matter (DM)
Cereal straw & corn remnants	7.5-5.5	4-3	92-88
Grain	14-12	11-9	91-88
Weeds	12-9	22-10	20-15
Oil seed cakes	14-12	50-22	91-89
Green legumes	12-10	24-17	27-15

Natural Pastures and Fallow Lands



Badia pastures contain several plant species such as weeds and shrubs, that are characterized by their richness in energy and proteins, especially at the vegetative stage.

There is a general impression that milk and meat produced from animals fed on natural pasture taste better and are more valuable than milk and meat produced from animals that consume feed.

The quantity and quality of natural pastures vary from one area to another and from one year to another, according to the date of rainfall, their rates and distribution.

Badia pastures should be properly managed to prevent their degradation and to maintain their sustainability and continuity.



Cultivated Pastures



Forage crops are divided into irrigated forage (lucerne and sorghum), and rain-fed forage (barley, vetch, and grass pea) and these can be successful in areas with a rainfall of more than 250 mm. These pastures may be used at the outset of the vegetative phase and can be very useful if well managed. It is important that grazing and mowing be carried out at the appropriate stage and using the appropriate loads to ensure the best return. These crops can be harvested as hay or turned into silage to use as feed at a later date.



The following shows the nutritional values (metabolic energy and crude protein) of some rain-fed fodder crops as dry material.



Stage	Feed stuff	Metabolic energy Mj/kg	Crude Protein g/kg
Vegetative stage	Barley	9.9	87
	Lathyrus	10.6	224
	Vetch	10.8	231
Hay	Barley	8.9	69
	Lathyrus	9.5	194
	Vetch	9.2	190
	Wheat and Vetch	9.6	145

Weeds and Forests



The grasses and weeds growing as field crops and in the tree orchards are important energy-rich feed sources for the sheep, either through direct grazing or through weeding. Allowing the animals to graze on these plants or uprooting the plants and using them as feed helps reduce the occurrence of fires in roadside fields as well as covering part of the animals' nutritional needs. It is important to choose the right time for weed grazing so as to get rid of the weeds before the dispersal of their seeds and to optimize their benefit for the sheep.

Grazing on non-harvestable Crops



In some areas, in dry seasons, the harvest may be uneconomical due to low production or harvesting machines being unavailable. At such times, the grazing of crops is practiced. Cereal crops are considered a good source of feed as they are palatable and rich in energy, protein and minerals. However, the following should be considered when grazing starts:



- Provide straw to the animals prior to their entrance to pasture;
- Animals should not be hungry when they start grazing crops;
- Enter the herd for a limited period, then pull it out, and gradually increase the period of stay until sheep get used to the new pasture;
- Vaccinate sheep against poisoning intestinal disease (enterotoxemia) before they start grazing on crop residues; and
- Monitor animals during grazing and when symptoms of diarrhea or bloating are observed. In such cases, animals must be withdrawn from pasture and a veterinarian should be consulted.

Grazing on Crop Residues



Cereal crop residues are an important source of feed. These residues are what is left in the field after harvest, like straw leaving weeds and fallen grains. Sheep spend most of the day grazing, which lasts for around 4-5 months often up until the rainy season starts. The nutritional value of cereal crops' residues varies depending on the type of agriculture (irrigated vs. rain-fed, whether crop type is wheat or barley), cultivars, the nature of the soil and the precipitation rate. Generally, the productivity in rain-fed lands is between 1000-1500 kg /ha and between 2500-4000 kg/ha in irrigated areas.



The nutritional value of these residues is high during the first period of grazing, which ensures sheep gain some weight if the load was suitable (2-3 ewes/ha/month). As grazing continues, the nutritional value of these residues falls and sheep lose weight. At this point, they should be transferred to a new field or be provided with nutritional supplements, e.g. 100-150 g of cotton seed cake per day or 200-300 g of barley grain per day. Deploying these supplements can work to improve grazing efficiency and cover sheep needs.

Grazing on Harvest Residues



Cotton crop residues

Cotton crop residues are an important feed source. After the cotton harvest, a large amount of plant material (leaves, fresh branches, immature capsules, flowers left in the fields, unharvested cotton) is left. Each kilogram contains an average of 144 g of crude protein dry matter and 7.8 MJ of energy. Grazing on these residues continues for a period of 30-50 days, depending on weather conditions (rainfall and frost occurrence). It is important to ensure the cotton residues are free of pesticide residues and to inspect the suitability of the field for grazing.

Maize crop residues

Maize residues include remnants resulting from thinning, cultivation, leaves' defoliation, tops cutting, dehulling, topping and peeling. They also include leaves, husks and remnants of the grain industry.

Un-marketable crops and their Offal



Vegetables and fruits unfit for marketing, All kinds of fruits and vegetables are unmarketable and their offal can be used for feeding sheep and goats. Outputs of pruning vine and berries as well as waste from the fruit and vegetable canning industry can also be used, as can citrus and grape juices and waste remnants of broccoli, cabbage, turnips, potatoes, sugar beet, radish, eggplant, cucumber, watermelon, tomatoes, and sugar beet. These residues are often rich in sugars and their prices are appropriate – but make sure that they are free of rot.

Sugar beet residues include tubers unsuitable for processing and/or those rejected by the factory. These residues are rich in sugars.

Olive residues include pruning outputs of soft leaves and branches. They also include olive fruit bagasse post-oil extraction.

Forage Shrubs



Forage shrubs such as Atriplex and salsola can be grown in dry areas and used to feed sheep during summer and autumn. These shrubs play an important role in soil protection. Atriplex bushes are characterized by the following features:

- The proportion of edible parts consumable by sheep is 40-50% of the shrubs;
- Production varies according to the season from 500-5000 kg/ha across the year. This is related to multiple factors (plant density, soil quality, and management);
- The nutritional value of Atriplex is imbalanced with a high content of salts and medium content of energy (6-8 MJ/kg) and low quality crude protein content of 170-230 g/kg;
- Grazing on Atriplex for a long time leads to an imbalance of calcium and phosphorus content in the blood; and
- The amount an animal can eat varies according to the material's content of salts and the extent of water availability and quality. Sheep consumption is estimated at 0.650-1.5 kg and Atriplex is a supplement for straw and summer crop residues.

Feed Blocks



Many types of feed cubes can be processed using different ratios of urea, binding materials, salts and the remnants of locally available agro-industries such as molasses, sugar beet bagasse, olive bagasse, bran, tomato pulp, beer industry remnants, cotton seed cake and chopped straw. Molasses and lime are used as assembling material for cubes; rendering them compact, cohesive and making transport and storage for long periods of time easier. The following are models of energy rich feed blocks for different productive stages.



Examples for feed block ingredients

Ingredients	Mating	Pregnancy	Milking	Fattening
Urea	5	4	4	4
Olive pulp	32	25	20	25
Wheat bran	30	28	25	20
Cotton seed cake	15	15	20	15
Sugar beet pulp	0	10	13	18
Lime stone	12	12	12	12
Minerals and vitamins	2	2	2	2
Binding material	4	4	4	4

Roughage



Roughages include straw and hay

Straw is the basic feed material to feed sheep. The straw's nutritional value varies depends on species, cultivar, rainfall, and the methods of harvesting, combining and storage. It is advisable to analyze the straw to know its nutrient content and then add the concentrated feed quantity necessary to meet the animals' needs. Straw is characterized by a slow and difficult digestibility and reduced nutritional value; containing a high ratio of fiber.

A ewe needs a minimum quantity of straw, ranging between 250-500 g/day. A ewe can consume up to 1000 g/day if a suitable pasture is not available. The greater the consumption of straw is, the lower the need for concentrates (noting that supporting straw with a protein-rich source increases its consumption). Straw can be fed as it is or chopped. It is preferable dry, clean and free of rot and dust. Straw is offered in open quantity (satiety level) if its price is reasonable compared with that of concentrates and, in the absence of pasture, it can be offered in the manger.



Hay is a dried green feed from cereals or leguminous plants or their mixtures. These plants are mowed at the flowering stage, then dried in nature. Hay is one of the good roughage feeds in that it is high in nutritional value and rich in protein (up to 15%). Hay can be used successfully in lamb fattening.



Straw can be divided into two categories: cereals straw (white straw) such as barley and wheat straw and legumes' straw (red straw) such as lentils, faba beans and chickpeas straw.

Barley straw is the best grain straw in rain-fed grown barley. It covers the animal conservative need when offered as the sole feed for a limited period. However, animal consumption of straw decreases gradually. Supporting the ewe with a limited amount of protein material increases animal consumption of straw and improves body condition.

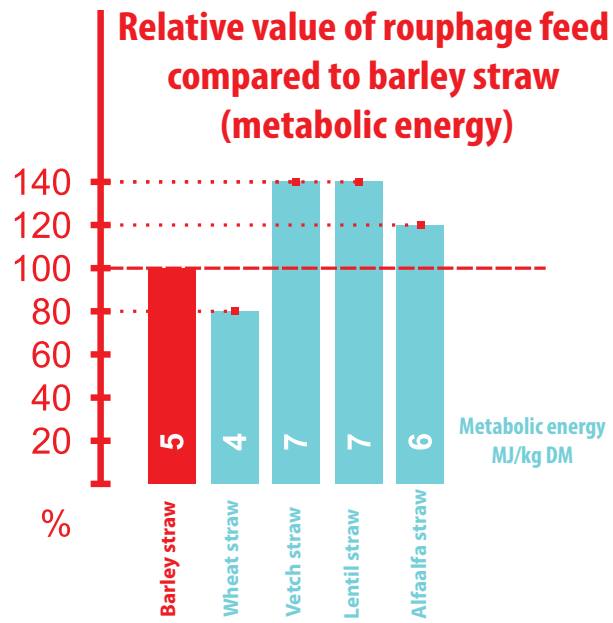
Wheat straw has less nutritional value than barley straw and its nutritional value varies according to the varieties grown, rainfall rate, and the type of agriculture. Straw of rain-fed crops is more palatable and has a quicker digestion rate.

Lentil straw is an excellent feed material; easy to digest and containing protein, calcium and phosphorus at a rate higher than that of cereal straw.

Chickpea straw has higher nutritional value than wheat straw and is more palatable, but animals must be adapted on this feed before submitting it in large amounts.

Faba beans straw has lower nutritional value than straw. It can be used by mixing it with wheat or barley straw.

Feed Stuff	Dry matter %	Energy Mj/kg	Crude protein g/kg
Barley straw	92.2	5	40
Wheat straw	92.4	4	32
Lentil straw	93.1	7	75
Vetch straw	92.3	7	71
Lathyrus straw	92.2	6	42



Energy – rich Feed stuff



These types of feed provide sheep with energy and deposits of fat. The deficiency leads to reduced growth, weak reproductive efficiency, and lower resistance to disease.

Barley grains are easy to digest, rich in energy, and fit various stages. Sheep accept them when they have an appetite and they can be used at up to 80% of the ration. They are preferably fed without crushing.

Maize grains are energy-rich but low in protein content – especially lysine. Their use is rather limited due to high prices, so they are more often used for poultry and high productive cattle.

Sorghum grains are similar to maize in composition but more rich in cellulose and contain less in fat. Its protein content varies according to cultivar grown. It is preferable to be mashed before serving.

Wheat grains can be used as feed if available at a reasonable price. Usually, shoddy samples such as broken or immature grains are used. Wheat grains in sheep rations should not exceed 50% in order to avoid digestive problems.

Bread and remnants of bakery and mills can be used in the sheep ration and are a good source of both energy and protein. It is easy to digest but to avoid digestive problems, bread ratio in the mixture should not exceed 20%.

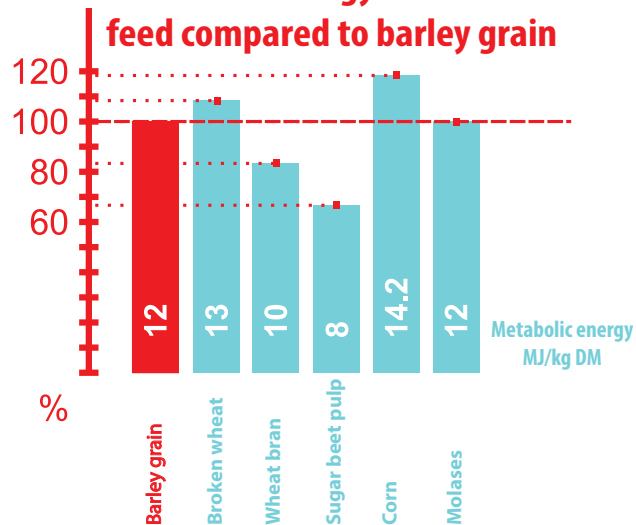
Sugar beet bagasse is energy-rich feed – excellent if it has been dried in a correct manner. Its nutritional value is estimated at 5 MJ/kg and it contains 80 g of protein per kilogram. It can be fed wet or dry or processed as silage after mixing it with other feeds.



Molasses is a good source of energy. It can be mixed with other feed and processed as fodder cubes. It is considered a carrier of urea, vitamins and minerals when used with dry feed. Its ratio in the ration should not exceed 10-15%.

Feed stuff	Dry Matter %	Energy Mj/kg	Protein g/kg	Calcium %	Phosphor %
Barley grain	89.5	12	120	0.06	0.42
Wheat brocken grains	89	13	130	0.05	0.35
Wheat bran	89	10	170	1.30	1.40
Sugar beet pulp	92	8	75	0.8	0.10
Corn	89	14.2	98	0.004	0.30
Molasses	77	12	76	2.42	0.19

Relative value of energy rich concentrated feed compared to barley grain



Protein – rich Feed Stuff



These feed types are necessary for growth and muscle building. They work to restore damaged tissues. The need for these feed types increases in the late phase of pregnancy, during lactation period, during lambs' growth and when the pastures are very poor. Protein deficiency in the ration leads to reduced appetites and low reproductive efficiency. Adding protein-rich feed increases the extent of the benefits from energy. The following are among the most important protein-rich feed types in Syria and the Middle East.

Cotton seed cake is the remnants of cotton seed after oil extraction. Its nutritional value varies according to what method was used to extract the oil. There are two types of cotton cake. These are

- Hulled cake, which is rich in crude protein (30-36%) and phosphorus but poor in calcium; and
- Shelled cake, which has a lower crude protein content of 20-30%. Cotton cake is an important source of feed for ruminants.

Soybean cake is highly nutritious and protein-rich (40-50%) feed and is the highest source of vegetable protein available. It is locally produced in limited quantities and is often used for poultry.

Sunflower cake has a nutritional value that varies according to its oil's extracting method. It is suitable for all animals and its content of crude protein is around 35-40%.



Wheat bran is the husks of wheat resulting from sifting the flour. It is rich in protein, vitamin B1, phosphorus and iron. It has a laxative effect if fed in large quantities and is considered as supportive feed in the ruminants ration. It is preferable to avoid storing it for a long period. It can be mixed with other feed materials and entered in the feed cubes industry. It can be used at a rate of up to 30% of the ration.



Faba beans include faba beans' and lentils' broken seeds and some exotic materials. It is of a high nutritional value if free from impurities.



Legumes grains (vetch and grass pea) are considered excellent forage materials. They are rich in energy and protein, highly palatable and easy to digest, fed with straw and form a balanced ration. They contain most of the rare minerals and vitamins needed by sheep.

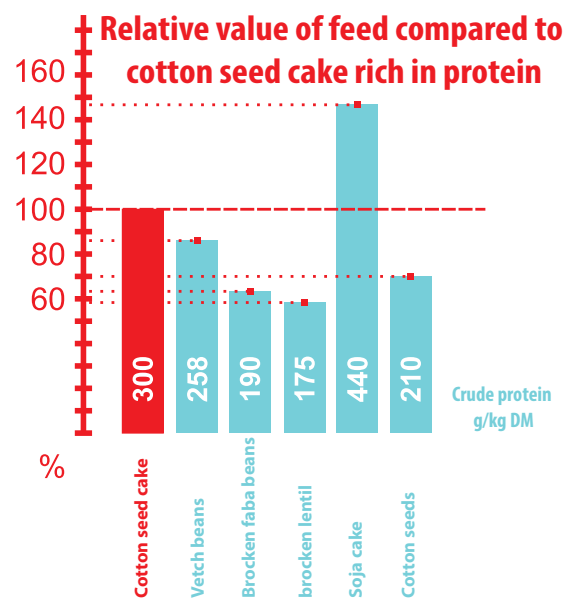


Urea Urea is a nitrogen source that can be used by microorganisms present in the rumen for protein synthesis (usually 45% urea fertilizer is used when the nutritional urea is not available). It contains the equivalent of 281% of crude protein. Urea is added at a rate of 1-2% of the ration. Care must be taken when using urea in the sheep's ration; taking into account good mixing and gradual introduction. It is not permitted to use urea in the lambs' ration.



The nutritional value of protein - rich feed concentrates as compared to cotton cake

Feed stuff	Dry Matter	Energy	Protein	Calcium	Phosphor
	%	MJ/kg	g/kg	%	%
Cotton seed cake	90.8	9	300	0.15	1.18
Vetch grain	90	11	258	0.13	0.64
Grass pea grain	90	11	262	0.13	0.64
Broken faba bean	90	11	190	0.13	0.64
Broken lentil	90	10	175	0.13	0.64
Soybean cake	90	12	440	0.32	0.68
Cotton seed	90	14	210	0.14	0.64
Urea	0	0	2810	0	100



Salts, Minerals and Vitamins

Salts, minerals and vitamins are necessary for regulating the body's functions, bones' formation, protecting the body from diseases and performing its vital functions.

Feed contains many minerals and vitamins that the sheep need but they may not meet ewes' full needs at some productive stages, when they show symptoms of undernourishment such as licking walls, eating wood, weight loss, loss of appetite, or the appearance of diseases such as puerperal fever, wool loss, rickets and night blindness. This is why mineral elements and vitamins must be added to the ration in order to ensure the productivity of the herd and prevent it from malnutrition diseases. Identification of minerals and vitamins needed by the herd requires experience and knowledge.

When preparing the feed mixture, the followings should be observed:

- Add salts and vitamins mixture (2 kg) to 20 kg of barn or fine cake and mix them well;
- Add fine table salt, mix well and then add dicalcium phosphate, re mix, and then mix with other material forming ration;
- Consult the veterinarian in the region before purchasing salts and vitamins because he is the expert in the disease symptoms that prevail in the region; and
- Table salt is often added at a rate of 10 kg/tonne, dicalcium phosphate at a rate of 10 kg/tonne and mixture of rare elements and vitamins specific for sheep at a rate of 2 kg/tonne. It is worth noting that an increase, decrease or mineral imbalance could mean lower growth in lambs, reduced milk production in ewes, and reduced fertility in rams. It may also lead to health problems such as nervous disturbances, wool loss, and poisoning and increased cases of death.





For the late phase of pregnancy and milk production period, the following is a mixture of rare elements and vitamins that can be added to the concentrated ration at a rate of 2-2.5% or according to the manufacturer's instructions.

When preparing a feed mixture the following should be considered:

- Add the mixture of rare minerals and vitamins in the recommended amount (1-2 kg) to up to 20 kg of bran or fine cake and mix them well together, then add the table salt and remix well. Finally, add dicalcium phosphate and remix again. These substances can then be added to the rest of the ration's components; and
- Limestone can be used as a source of calcium if it is pure and fine. Dicalcium phosphate can also be used. The accompanying table shows the composition of these two materials.

Mineral and vitamins mixture for the last pregnancy phase and lactation period

Material	Quantity	Unit
Mg	12	%
Mn	4000	ppm
Fe	3000	ppm
Zn	1000	ppm
I	40	ppm
Co	20	ppm
Si	4	ppm
Vit A	400	IU/g
Vit D3	40	IU/g
Vit E	0.8	IU/g

Material	Ca %	P %
Dicalcium phosphate	25	18.5
Lime stone	38	0
Sodium phosphate	0	22

Balanced Ration



Balanced ration is defined as the amount of feed needed by an animal for 24 hours; containing carbohydrates, proteins, salts and vitamins at specific ratios to ensure the highest return at the lowest possible cost. The ration varies according to animal age, body condition, and the level of its production. When composing the ration, the following should be taken into account:

- Use locally available feedstuffs where possible;
- Use knowledge of the nutritional value of these materials; and
- Use knowledge of the animal needs and its ability to intake feeds.

When preparing the ration, the followings should be carried out:

- Weigh the required components;
- To ensure the homogeneity of the mixture, mix small quantities of minerals and vitamins with a small quantity of cake or bran and then mix these with remaining components; and
- Enter the ration gradually over a period of ten days.
-

Following is a combination of a ration containing 11 mega joule energy per kilogram and 14 % of crude protein

Feed	الكمية غ/كغ	الطاقة ميكا جول / كغ	البروتين الخام غ / كغ	الطاقة ميكا جول	البروتين الخام غ
Grain Barley	784	11.6	119	9.1	93.3
Cotton seed cake	98	8.2	300	0.8	29.4
Wheat bran	98	11	177	1.1	17.3
Table salt	9	0	0	0	0
Dicalcium phosphate	9	0	0	0	0
Salts and vitamins	2	0	0	0	0

The level of protein in the ration may be increased by changing the ratio of other feed components. Below are the composition of rations with different protein rates, using the same feed ingredients.

Suggested rations (kg/ton)

	Ration 1 12.5% protein	Ration 2 14% protein	Ration 3 15% Protein	Ration 4 16% protein
Barley grain	730	630	580	530
Cotton seed cake	50	100	150	200
Wheat bran	50	150	150	150
Sugar beet pulp	150	100	100	100
Salts & vitamins	20	20	20	20

Imbalance in the ration's composition can lead to malnutrition, reduced growth, lower milk production, impaired fertility and inability to resist diseases. Ewes should be fed properly throughout the year; unbalanced nutrition at one stage adversely affects subsequent stages. Generally, the ewe should obtain its nutritional needs especially prior to and during mating, in later phases of pregnancy, and during lactation.

The following should be observed:

- Change the ration gradually to avoid digestion problems;
- Provide whole grains, without mashing, except for newborn lambs;
- Grind cake material for better mixing;
- Provide straw first, then provide the concentrated ration; and
- Provide the concentrated ration in two meals when it exceeds 500 g.

Please Remember



- Secure the necessary feed for the herd for the entire season in order to minimize risk;
- Ensure feed is stored and preserve effectively;
- Secure adequate mangers for all members of the flock;
- Only keep the sheep that you may be able to feed;
- Divide the herd into groups of similar needs and feed them in accordance with those needs;
- Provide a balanced ration;
- Provide fresh water; and
- Apply the health program.

Best Practices for Managing Awassi Sheep

- 1 Mating Period
- 2 Pregnancy
- 3 Lambing
- 4 Lactation Period
- 5 Milking and Milk Processing
- 6 Sheep Selection
- 7 Health Care Guide
- 8 Feed Reference Guide
- 9 Preparing Urea Treated Straw
- 10 Body Condition Scale
- 11 Lamb Fattening



المركز الدولي للبحوث
الزراعية في المناطق الجافة



الصندوق الدولي للتنمية الزراعية



وزارة الزراعة والإصلاح الزراعي
الجمهورية العربية السورية