

Fodder Beet for Beef Systems

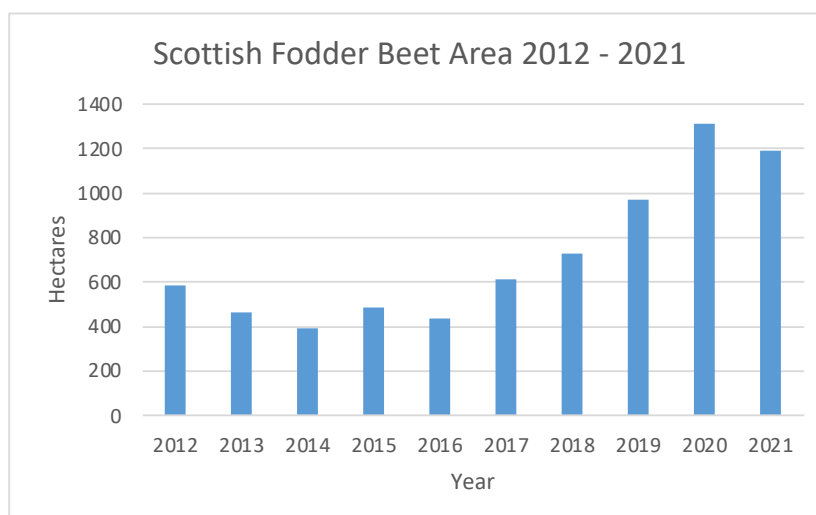
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Summary

- Fodder beet is a high yielding root crop and has excellent nutrition. However, it does have a high sugar content and requires careful management.
- The transition of stock on to the crop requires planning and careful monitoring for cattle.
- Cattle should be vaccinated for clostridial infections prior to being introduced to high levels of fodder beet.

1. Introduction

Fodder beet has grown in popularity across Scotland over the last 10 years. Producers use the crop to outwinter cattle and reduce over wintering costs. The crop has good yield potential, digestibility and greater agronomic options for weed control. Fodder beet can be an alternative for producers who typically grow swedes, which can be lower yielding and have variable success at establishment due to pests such as the flea beetle.



The high sugar content of fodder beet requires careful management, especially for cattle. Care over introducing cattle to the crop is required, using a timed, rigid stepped up method to allow the rumen to adapt from a typical grass-based ration to a high water soluble carbohydrate ration.

Why Grow Fodder Beet for Cattle?

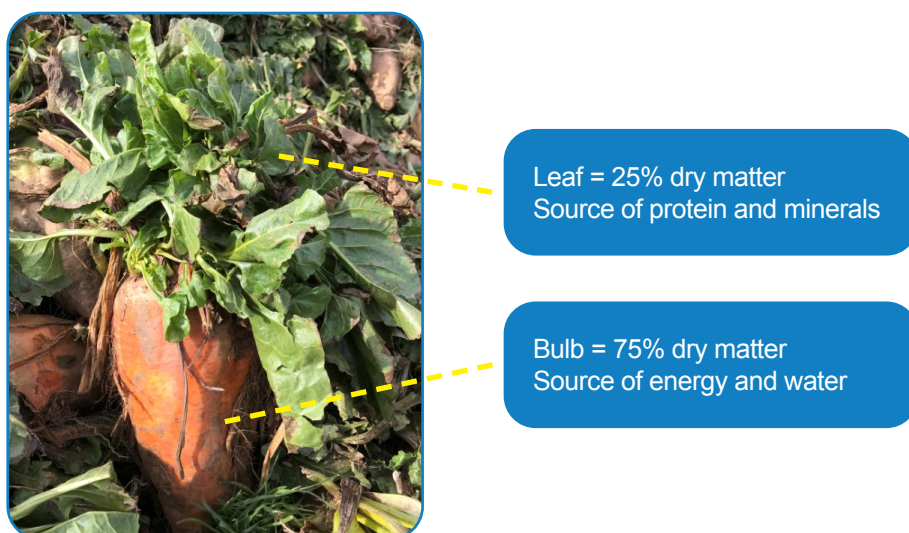
Fodder beet is one of the highest yielding forage crops grown in Scotland, with root and leaf yields of 65-90 tonnes/hectare (26-36 t/acre). Dry matter content varies from 15-22% therefore the dry matter yield can be substantial. With the high yield potential, the crop offers a low cost per kg of dry matter and cost per kg of energy. The crop is a high quality forage with good palatability due to its high sugar content, however this means it requires careful management for cattle that are rationed on it.

Fodder beet is a member of the Beta vulgaris family, and not the brassica family, giving it good crop rotation value to minimise the risk of brassica related diseases such as club root. It is a deep rooting crop, meaning it's an ideal break crop before or after a grass ley.

Growing a crop such as fodder beet for utilisation through the winter, reduces the requirement for conserved forages, purchased feed stuffs and cereals increasing efficiency on farm. Feeding fodder beet through the winter offers a low-cost solution to rationing livestock through the winter period, while reducing pressure on bedding, housing and machinery costs. If the agronomy is correct the crop is high yielding in terms of dry matter and energy. It is an expensive crop to establish, but with a well looked after crop the yield achieved allows for a good return on investment and is a cost effective winter forage.

Feeding Fodder Beet to Cattle

A fodder beet plant includes both bulb and leaf, both of which have different nutritional properties. Typically a plant is made up of 25% of the dry matter in the leaf, with the remaining 75% of the dry matter being in the bulb.



The bulb is an excellent source of energy and water, whereas the leaf is a source of protein and minerals. As the winter progresses the leaf will die back, which may leave the animals nutrition imbalanced, which requires monitoring. It is important to factor in the production stage of the animals being fed, for example growing cattle or pregnant cows.

The nutritional value of fodder beet can vary depending on the variety grown and the agronomy (fertiliser applications, disease and pest control, etc.) the crop has had. The below table shows a guide of the difference between roots and tops. It is recommended that bulbs are analysed on an annual basis, as they will vary year on year.

	Fresh Yield (t/ha)	Dry Matter (%)	Crude Protein (%)	D value	Metabolise Energy (MJ/kg DM)
Fodder Beet Bulbs	65-80	10-20%	6%	80	13.2
Fodder Beet Tops	10-20	10-13%	15-20%	65	10.4

Fodder beet can be fed in situ in the field or lifted and fed to housed animals.

Transition and Feed Allocation

A gradual, planned and timed transition is essential for cattle for the following reasons:

- 1) **High sugar content – Fodder beet is a sugar rich feed, making it a soluble carbohydrate like barley. The rumen bacteria of cattle require time to adapt to this carbohydrate source and the acid load the fermentation process produces.**
- 2) **High intake of water – The dry matter of the crop is low, meaning it is high in water. When the animals are eating a large proportion of fodder beet in the diet, they have a vast increase in the level of water in their body. An example of this would be a 450kg steer's typical water intake would be around 25 litres per day, when eating 90% of the diet as fodder beet this intake can be as high as 120 litres per day (data from Dr Jim Gibbs). It takes time for the rumen to adjust to this higher water volume and emptying it while maintaining a stable concentration of pH.**
- 3) **Teach to eat – It takes the animals a period of time to be accustomed to eating the bulb from the ground. They will take about a week to learn how to eat the beet compared to the natural instinct to graze grass.**

A successful transition is similar to how a high concentrate diet would be introduced, giving the animals a limited exposure to the crop, which is then increased over a period of time. The key components of a transition include,

Space

Yield and Allocation

Timing

Space

With the crop being high yielding every hectare of the crop could contain ~20-30 tonnes of dry matter (average Scottish crop yield = 20t DM). With such a high yield the size of the feed face is relatively small. This is to ensure that the level of feeding is restricted during transition. All animals should have access to the feed face at the same time, allowing **1 metre of linear fence per animal**.

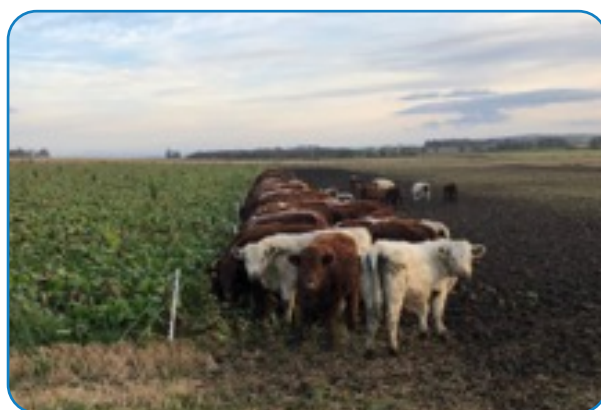
To expand the area available to animals a headland can be offered. This is ideally 6-10 metres wide, and gives the animals more space, which is especially useful for shy feeders, who can then walk behind more dominant animals and find a feed space. A headland can be created at sowing, or by lifting beet to start transitioning animals at grass prior to going onto the field.

It is advisable to set two breaks of electric wire at a time. If cattle do manage to break through the fence, then they will be stopped at the next break, limiting the intake from fodder beet and potential problems from over-eating such as acidosis. Fences should be set up along the rows, to assist with daily allocation.

Yield and Allocation

To calculate the daily allocation for animals grazing fodder beet, you must know the yield of the crop. With most crops being precision planted in rows, a yield measurement method can be used along these rows.

Within a field there will be variation of bulb size, plant emergence and the balance of leaf to bulb, for this reason numerous yield sites are required to achieve an average.



Yield measuring method

Equipment required:

- Measuring tape
- Knife to separate leaf and bulb
- Weigh scales
- A seed bag or bucket
- Paper and pen



Step 1) For row spacing of 50cm between drills, measure 5 linear metres along a row and pick the beet from both sides of the tape (from two drills). Giving a measurement from 25 square metres. Spacing of 45cm will be 5.5 metres.

Step 2) Separate bulb from leaf and weigh these separately

Step 3) Repeat over the field giving you 5 samples of 25 square metres and weigh bulb and leaf separate

Step 4) Take the total bulb weight $\times 400 / 1,000 =$ Fresh Weight per Hectare

Step 5) Take the total leaf weight $\times 400 / 1,000 =$ Fresh Weight per Hectare

Step 6) To convert to dry matter you must know the dry matter of a sample which can be analysed at a lab, at a cost of £15-20 per sample (2022)

To take a dry matter sample for analysis, quarter the plant, to ensure the sample has material from the top and the bottom, from the inside to the outside, giving a representative sample.



Once you know the yield the allocation can be calculated. An example of this would be as follows,

	Total kg DM	Kg DM/m ²	1 Metre Beet Equates To
20 ton DM crop	20,000	2kg DM/ m ²	1 kg DM
30 ton DM crop	30,000	3kg DM/ m ²	1.5 kg DM

With the 20 tonne crop every 1 metre of beet (2 drills at 50cm planting) would equate to 1kg DM.

Adult stock should be started on a low rate of beet at 1kg DM per animal per day, and this should not be increased until all the cattle are eating the bulbs readily. At this point the allocation can be moved up by 1kg DM every two days until the cattle start to leave it. Once fully transitioned, a dry suckler cow will need to have at least 2kg DM of her ration coming from forage along with the beet and a weaned calf at least 1kg DM of forage.

For weaned calves the amount they start on should be lower at 0.5kg DM per animal per day, and this should not be increased until all the cattle are eating the bulbs readily. These young animals will take longer to transition on to the beet. At this point the allocation can be moved up 0.5kg DM every two days until the cattle start to leave it. For weaned calves there is a benefit to train them behind an electric fence at grass prior to being transitioned onto beet. Beet can be lifted and smashed with tractor tyres and offered to the calves, allowing them to start learning how to eat it at grass.

The speed of transition is determined by when all animals are readily eating bulbs. The fence should be moved in the morning and the supplement offered after to ensure animals don't take their intake from forage and are instead encouraged to eat the beet. If they do not eat the beet then the daily allocation cannot be increased, as it requires all animals to be eating the bulbs to ensure a uniform move. An example of how transition may look for different classes of animal is shown below.

Day	Dry suckler cows (700kg)		350kg weaned calves	
	Fodder Beet	Forage	Fodder Beet	Supplement
01	1kg DM	9kg DM	0.50 kg DM	6.5 kg DM
02				
03				
04	2kg DM	8kg DM	1kg DM	6kg DM
05				
06	3kg DM	7kg DM	1.5kg DM	5.5kg DM
07				
08				
09	4kg DM	6kg DM	2kg DM	5kg DM
10				
11	5kg DM	5kg DM	2.5kg DM	4.5kg DM
12				
13				
14	6kg DM	4kg DM	3kg DM	4kg DM
15				
16	7kg DM	3kg DM	3.5kg DM	3.5kg DM
17				
18				
19				
20				
21				
22				
23				
	8kg DM	2kg DM	4kg DM	3kg DM
	8kg DM	2kg DM	4.5kg DM	2.5kg DM
	8kg DM	2kg DM	5kg DM	2kg DM
	8kg DM	2kg DM	5.5kg DM	1.5kg DM

Straw is not recommended in transition, due to being less palatable than silage and hay. High intakes of forage are required at the start of transition.

Timing

Cattle require a period of time to learn how to eat beet on an annual basis. This is also the case even if animals have grazed beet in the past. They will take about a week to learn how to eat the beet compared to grass and the rumen needs time to adapt every time the diet is changed.

The whole group of cattle should be eating the beet bulb before the allocation is increased, so the group can be moved uniformly.

Summary

- **Space – allow 1 linear metre per animal**
- **Headland – Offer a headland of 6-10 metres to aid transition**
- **Time – Allow time for cattle to learn how to eat the beet and time for their rumen to adjust to the high levels of soluble carbohydrate and extra water in the diet**
- **Analyse – analyse the dry matter of the crop**

Methods of Feeding Supplementary forage

It is very important that all animals have access to supplementary forage throughout transition. Transitioning animals with a grass headland or run back ensures all animals have access to the forage. In situations with an arable headland additional forage must be supplied. Ring feeders and silage trailers can be used but it is vitally important there is head space for all animals to eat at once. A cattle feed ring typically has head space for 20 animals, therefore a field of 100 cattle five rings are required. Supplementary forage must not be restricted, this could result in acidosis due to over-eating beet in the transition phase.

To ensure all stock have access and the forage is presented clean to them, a method that works well is either rolling out hay or blowing silage under the wire.

Health

There are some potential health conditions to be aware of when feeding fodder beet to cattle. These include:

- **Rumen Acidosis**
- **Clostridial Diseases**
- **Choking on the bulbs**
- **Trace element deficiencies**

Rumen Acidosis

As fodder beet is high in available sugar (soluble carbohydrate) this can lead to acidosis if feeding is not correctly managed. Acidosis occurs as a result of large accumulation of short chain volatile fatty acids produced by carbohydrate fermentation. This in turn lowers the rumen pH, this low pH favours the growth of lactic acid producing bacteria, which intensifies the problem.

Acidosis most commonly occurs between 7-10 days into fodder beet transition if it is not managed correctly. The first week of transition the animals are learning to eat the beet, with generally low intakes of the crop. After one week their intakes rise considerably and if they are offered too much beet before the rumen fully adjusts or break through the fence and gorge themselves on the crop, acidosis can occur. Signs of acidosis to look out for:

- **Reduced feed intake**
- **Animals not thriving/lacking interest in their surroundings**
- **Lameness**
- **Diarrhoea**
- **Death**

If signs are evident of mild acidosis, the cattle should be removed from the crop to help restore rumen pH or the allocation should be reduced by 75% for 2-3 days to allow recovery and then gradually increase the allocation of beet in their ration. In severe cases where deaths are noted, animals should be removed from the crop altogether and the transition process restarted.

Clostridial diseases

High intake fodder beet rations, which are typically fed in in situ systems are high risk for clostridial diseases. For this reason, animals should be fully vaccinated (including boosters) prior to transition.

The most common clostridial disease found is clostridial perfringens type D, which is the same clostridial disease that causes pulpy kidney in lambs. The high sugar load allows for an overgrowth of the clostridial species in the first part of the intestine, this then produces a toxin and spreads through the body usually resulting in sudden death. The clostridial spores can stay in the soil through being passed in the faeces and be re-ingested by the livestock from the soil. The best route of prevention is to vaccinate livestock prior to transition on to the crop, this is a very cost effective control measure.

Trace elements

Trace elements (such as copper, selenium, iodine and zinc) are very important for growing animals. On beet rations, the intake of soil can be high, but with a low dry matter crop, there is a vast amount of water in the rumen which washes this soil through, causing no harm to the animals. If the soil is high in molybdenum, then the copper availability can be affected. Routine trace element monitoring is recommended, with any deficiencies being corrected whilst grazing the beet, to ensure maximum growth rates and health and welfare.

Choking on Bulbs

Choke is very occasionally seen in cattle, and is more likely in poor yielded crops with small bulbs. Cattle eat the beet in a timed manner, where they select their beet, knock them over, and start eating the middle of the bulb and working their way down to the bottom of the root. The crown is often left to the end, if the crown is small, it may not be chewed correctly which can lead to choke. However, this is very rare in cattle, prevention includes good agronomy of the growing crop and a managed transition, so the cattle learn how to eat the crop.

Importance of Shelter and Water

Grazing fodder beet in the field can expose animals to environmental challenges from the weather. It is essential that when choosing a field to grow beet in, that both shelter and water are provided, and a provision is made to ensure the animals have a dry lying place if weather conditions turn e.g. extreme wet, extended snow cover, etc.

If cattle are unable to access the beet due to snow, or if the fields are waterlogged, then animals should be removed from the crop to either a stubble field, a sacrifice grass field, a woodland area or a shed until the ground conditions improve. In this scenario it is important to avoid any sudden dietary changes which can upset the rumen. For example, if housing animals that were grazing fodder beet, lift some fodder beet and feed indoors. However, if conditions do not allow for lifting, then alternative forages can be fed e.g. silage.

Alternatively straw could be put down to offer the animals a dry lie if natural shelter is not available in the form of trees or hedgerows. An innovative idea to assist in managing extreme weather would be to provide a stone pad area, using pebble type stones along the headland of a field. This would allow the cattle a dry lie, as well as benefit from better drainage due to the stones. This would be enhanced if along this pad was a woodland or hedge providing additional shelter for the cattle.

Prior to cattle being transitioned to beet they should be condition scored. Any cattle below the target score for the time in their stage of production should be managed separately. This condition of the cattle should be monitored throughout the winter, and action taken if animals are losing condition, this may be due to poor transition.

Fresh water must be available for stock, ideally with a hard standing to reduce poaching and nutrient run off into watercourses. The water requirement for the animal, will vary depending on the dry matter of the beet crop and the climate.

To enhance productivity, the health and welfare of the cattle is essential. A plan should be made for extreme weather conditions.

Top Tips for Grazing Fodder Beet with Cattle

- 1) The agronomy of the crop is vitally important to ensure a high dry matter yield and leaf retention throughout the winter months
- 2) Leaf retention into the winter, ensures a balanced ration for the cattle, without the leaf, the ration will be low in protein minerals
- 3) Transition ON to the crop is vitally important, this should be timed, rigid and follow a plan over 21 days
- 4) Ensure you have an understanding of:
 - a. Space – 1 linear meter per animal and +6m headland
 - b. Yield and allocation – calculate the yield and allocate
 - c. Timing – learn to eat the beet over 21 days
- 5) Strip graze in a long narrow fence to balance the leaf and bulb
- 6) Access to supplementary forage is vital, ensure adequate space at feeders or feed under the wire



For more information and discussions on fodder beet visit:

<https://www.fas.scot/livestock/beef-cattle/beef-nutrition/fodder-beet/>

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