

REDUCING THE EMISSIONS INTENSITY OF LIVESTOCK PRODUCTION: CASE STUDIES OF SUCCESS

GLOBAL
RESEARCH
ALLIANCE

ON AGRICULTURAL GREENHOUSE GASES

CHILE

Scale: Regional
System: Pastoral
Sector: Dairy

Using fodder turnips as a supplement feed in dairy grazing systems

In Southern Chile, dairy production is based on direct grazing of permanent pastures. Currently, one of the main limitations is the low dry matter availability during summer. To overcome this, fodder turnip can be used as supplementation as its inclusion results in a 21% increase in daily milk production over the summer period (60 days), at a 2.8 times lower cost than the use of a traditional concentrate.

Background

In Southern Chile dairy production is based on direct grazing of permanent pastures. The main limitation in this system is that pasture yield and quality are variable throughout the year with feed deficiency times, especially during winter and summer. Of these two periods, summer (January-February) is the most critical time as there is also a reduction in pasture nutritional quality.

There are different alternatives to overcome this deficit, being supplementation with either concentrates, preserve forages or fresh forages a key factor to increase milk production. Among these, fodder turnip represents a good alternative for farmers because in a short period of time (70-80 days) this crop provides a high yield (10-13 ton dry matter/ha). This yield, although with low dry matter (DM) concentration (8-10%), has high digestibility (88-93%) and metabolizable energy values (2.9-3.03 Mcal/kg DM), of which 90% is available in the rumen.



Key actions & their effects on productivity, income & food security

Since the early 2000s, and because of the low quality and yield of permanent pastures during summer months, farmers have incorporated the use of fodder turnip as a supplementary feed. This supplementation has been slowly introduced in dairy systems in response to the reduction in summer rainfall, which in turn reduces pasture yield and quality. The total amount of imported seed has increased nearly 10 times over the 2003-2014 period, varying between 1,400 kg seed in 2003 and 11,000 kg in 2014, covering over 2000 ha last summer.

Holstein Friesian dairy cows are usually fed at this time of the year with: 4.5 kg dry matter as permanent pasture + 8 kg dry matter as pasture silage + 1 kg dry matter as concentrate as their base diet. Farmers are supplementing this base diet with 5 kg dry matter as turnip. Turnip is traditionally offered as direct grazing, reaching up to 88-95% of grazing efficiency.

The impact on milk production and quality (protein, fat, lactose, urea and milk solids) has been recorded as a result of this feeding strategy. Thus, dairy production over the two summer months can be 21% higher in the turnip supplemented cows in relation to those eating the base diet only, with no differences if compared to the supplementation with traditional concentrates. Milk solids also increase. The cost of 1 kg of dry matter in the turnip crop was 2.8 times lower than that of the concentrate (9.1 and 26 cents US\$/kg DM). These results favour the adoption of turnip as the main supplementation option for summer periods.





Effect of actions on emissions intensity of livestock production

Although direct animal emissions associated with this feeding strategy have not yet been measured, a reduction in emissions intensity is expected from this supplementation during the summer period based on increased milk yield and improved ratio of emissions related to milk production vs animal maintenance. This is associated mainly with the availability of adequate quantities of feed for animals over the summer period. The nutritional characteristics of this forage have also been reported to reduce direct enteric methane emissions but this is not yet quantified for Chilean systems.

Co-benefits and trade-offs

Turnip can be directly grazed with high utilization efficiencies, reducing labour and harvest costs for farmers. Turnip quality does not change significantly during the summer season, in comparison to the traditional changes observed in permanent pastures. Its inclusion in the diet could reduce enteric methane emissions. Also, turnip is a good alternative as the first crop in a rotation, increasing soil fertility and reducing the weed population prior to new pasture implementation.

However, there are some limitations in animal consumption of turnips meaning the cows have to be gradually introduced to this feed and farmers should monitor and control the quantity of intake. Also, this forage has an imbalance between the high soluble sugar content and low fibre concentration, so hay, straw or silage should be also part of the diet to stimulate chewing and rumia and to increase saliva production. The experience gathered so far indicates that access to the feed is easily controlled with rotational grazing, in which the dry matter available per cow is associated to a calculated area available per cow, which is provided to the herd after milking. It is recommended that no more than 5 kg dry matter is given per cow per day, over a 3 hour grazing period.

Implications for adaptation

In wet summers, permanent pastures can cover cow nutritional requirements. Nevertheless, climate change models project a 10-20% rainfall reduction in southern Chile by 2050. This means that extreme dry summers will become more common. As an example, the 2014/15 summer period registered the biggest drought of the last 50 years in the Southern region of Chile, with no rainfall at all between October 2014 and April 2015, resulting in significant reductions in milk production at the farm level (up to 40%). The use of turnips is especially crucial under these conditions as it has a greater water use efficiency at a time when the implementation of irrigation systems for dairy and beef production systems is limited due to cost constraints.

Challenges to implementation and adoption

Extension is required to reduce uncertainties associated with the establishment of this summer crop, especially in terms of weed and pest control and also nitrogen fertilizer application. When a full agronomic package is considered, the cost of seeding this crop is estimated at \$880 US\$/ha, with a dry matter cost of 0.09 US\$/kg DM. This makes turnips nearly one third of the cost of supplementation with concentrates. This cost-efficiency relationship has been the main driver for farmer up-take. Research and innovation is currently focussing on testing turnip specific cultivars that are more adapted to Southern Chilean conditions.



Further information

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