

Performance of Ewes Grazing Stubble Turnips
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Stubble turnips are grown as a fall and winter grazing crop for sheep. They are commonly used in the UK and New Zealand and to a lesser extent in Atlantic Canada and parts of the USA. Stubble turnips are used on a very limited basis in Ontario at present.

In 1998 and 1999, a small acreage of stubble turnips was grown at New Liskeard and grazed in the fall by sheep. In 1998, three varieties were grown and in 1999 five varieties were grown (Table 1). The sheep were strip-grazed at right angles to the direction of planting, so that the sheep had access to all varieties at the same time. This allowed for a subjective assessment of palatability or preference. Each year, annual ryegrass (Westerwold type - variety Aubade, Speare Seeds, Harriston, ON) was sown with the turnips at 12-15 kg/ha. Nitrogen was incorporated at 50 kg/ha actual N.

Table 1. Varieties and suppliers of stubble turnips in 1998 and 1999.

Year	Varieties	Seeding Date	Seeding Rate
1998	Barkant, (Emerald Seeds, Dobbinton, ON) Laurentian, (Labonte Seeds, New Liskeard, ON) Common (Bishops Seeds, Belleville, ON)	June 22	4 kg/ha through Gandy seeder, than packed
1999	Barkant, (as above); Laurentian, (as above) Purple Top, (Ontario Seed Co., Waterloo, ON) Dynamo, (Advanta Seeds Pacific, Albany, OR) Samson (Advanta Seeds Pacific, Albany, OR)	June 28	

Results:

In 1998 a portion of the total area was sown with ryegrass and a portion without. There was no visual difference between the two areas as the ryegrass did not establish at all with the turnips. Although the growing season was generally dry, one significant rainfall shortly after planting the turnips was sufficient to get the crop started. Disease hit the turnips in late July and August, with circular patches throughout the field becoming yellowed and stunted, and eventually dead in the centre of the patch. This was suspected to be alternaria but this was not confirmed. The prevalence of canola production in the New Liskeard area may have influenced the disease on the turnips.

The 1999 seeding was on a field that had been broken from old sod the previous fall. The entire area had ryegrass sown with the turnips but, despite adequate moisture, the ryegrass only thrived in areas where the Gandy seeder ran low on turnip seed. The headlands were sown to pure ryegrass and a very thick stand resulted. The seeding rate on the turnips was variable in 1999, although the average sown was 4 kg/ha. Observations of the resulting stands have led us to consider a seeding rate test as turnip root growth on the low seeding rate areas was exceptional.

The ewes grazed for 58 days in 1998 and for 42 days in 1999 (Table 2). A strip grazing system was used, whereby the sheep had access to all varieties at the same time (3 varieties in 1998 and 5 varieties in 1999). The field was grazed in two passes, on the first pass, each strip had only the turnip tops grazed, on the second pass the roots were eaten. Once the sheep were consuming mostly turnip roots, the equivalent of about 1 pound of dry hay was offered per ewe per day. This was intended to compensate for the very high moisture content of the turnip roots.

During the 1998 grazing period, the weather was relatively warm during November and the soil surface did not freeze as expected. A similar trend occurred in 1999, except that rainfall was unusually heavy during October and November. This resulted in mud problems on the clay soils. In 1998 straw bedding was used when mud was a problem but in 1999 some patches of annual ryegrass provided a dry area for sheep to lie down.

Table 2. Performance of ewes grazing turnips in 1998 and 1999.

Measurement	1998	1999
# ha sown to turnips	0.84	1.24
# ewes grazing	21	31
Start of grazing	October 20	October 05
End of grazing	December 17	November 16
# of Grazing Days	58 days	42 days
Ewe Gain: Period 1	143 g/hd/day (Oct 20-Nov.10)	363 g/hd/day (Oct.05-Oct.26)
Ewe Gain: Period 2	70 g/hd/day (Nov.20-Nov.26)	-48 g/hd/day (Oct.26-Nov.16)
Ewe Gain: Period 3	19 g/hd/day (Nov.26-Dec.17)	na
Ewe Gain Total	78 g/hd/day (0.172 lb/hd/day)	158 g/hd/day (0.348 lb/hd/day)
BCS Change Total	0.00 (no change)	0.56
Ewe Gain per ha	113 kg (102 lb/ac)	166 kg (149 lb/ac)
Ewe grazing days/ha	1,450 (580 days/acre)	1,050 (420 days/acre)
Subsequent Lamb Crop	95% conception; 200% crop	n/a

In both years, open mature ewes were used for grazing. In 1998, the ewes were good quality commercial ewes (2 years old; from Rideau x Dorset rams bred to Suffolk x Dorset ewes) intended for breeding in December. In 1999, the sheep used were cull ewes that included a few older, thinner ewes but were otherwise in sound condition for grazing (good teeth and feet). In 1998, sheep gained weight in each of the three weigh periods (Table 2) for an average gain of 78 grams/head/day over the 58 days of grazing. In 1999, the ewes gained an extraordinary 363

grams/head/day in the first weigh period, then lost 48 grams/head/day in the second weigh period, for a average gain of 158 grams/head/day over the 42 day grazing period. It is possible that an unusually heavy gut-fill influenced the weights in the first weigh period in 1999.

Over the entire grazing period, body condition score (BCS) did not change in 1998, but increased by 0.56 points (1-5 scale) in 1999. Liveweight gain per ha was 113 kg in 1998 and 149 kg in 1999. Carrying capacity was 1,450 ewe days/ha in 1998 and 1,050 ewe days/ha in 1999. In 1998, the ewes were bred within 10 days of being taken off the turnips and had a conception rate of 95% and a subsequent lamb crop of 200% (including the 1 open ewe).

No measurements of palatability were made, but observations in both years clearly showed that sheep graze Laurentian first if given a choice. Laurentian is a yellow-fleshed rutabaga intended for human consumption and is sweet. In 1999, it appeared that Purple Top was grazed last when a choice was given. No other grazing preferences were apparent. In 1998, any patches or ryegrass were grazed completely before any turnips were grazed but this was not particularly apparent in 1999.

Summary and Interpretation:

Ewes gained weight while grazing stubble turnips in both years. In 1998, gain per animal was greatest in October and declined (but remained positive) as the fall progressed, while in 1999, all gain was recorded in the first three weeks and a small loss was recorded in the second three weeks. Very wet conditions in November of 1999 may have affected animal performance. In any case, total gain per animal was almost twice as high in 1999. Body condition score was unchanged in 1998 but increased by over 0.5 points per animal in 1999. The gain in condition also reflects the fact that thinner ewes were used in 1999, thus there was more likelihood of increasing BCS scores.

Some practical points were learned from this project. First, the site chosen for stubble turnips should be a medium or lighter soil if possible. During two rather wet falls, mud was a concern although no evidence was found that the mud affected animal health or performance. Sowing annual ryegrass was intended to provide some sod to avoid mud problems, but ryegrass did not grow in either year except in areas where there was a thin stand of turnips.

On heavy soils, it might be worthwhile to graze the turnip tops early, perhaps in September when the soil is drier, then graze perennial pasture in October and November until the ground is frozen, then shift to grazing the turnip roots. In 1998, the sheep grazed frozen turnips with no problems. Based on the breeding and lambing performance of the ewes following turnip grazing in 1998, it appears that turnips make a good flushing ration, although it is important to consider that the ewes started the trial in good condition.

While the sheep on these trials gained weight and maintained good health, it is questionable if they utilized the crop as efficiently as desired. Based on yields from small plot trials on the same farm and expected intake, it is likely that only 50% of the crop was eaten. This figure should be

close to 80% under conditions of good utilization. With better utilization, the carrying capacity of the crop would increase greatly and lower the cost per ewe per day.

The cost of growing the turnips must be relatively low to justify the crop economically. If we assume a conventional fall herbicide treatment plus primary tillage followed by spring tillage and seeding, an establishment cost per acre of at least \$100.00 will result (Table 3). At 600 ewe grazing days per acre (optimistic given our results on Table 2), this gives a cost per ewe per day of 16.7 cents, while dry hay can be fed for about 11 to 18 cents per day depending on hay costs. If we could establish the crop no-till, the cost per acre and per ewe could be reduced to around \$70 and 11.7 cents, respectively. If we could simply broadcast seed onto the stubble of another crop like winter wheat or processing vegetables as is done in Michigan, the cost per acre and per ewe could be reduced to \$35.00 and 5.8 cents, respectively. While we do not have experience with broadcasting turnip seed onto grain stubble, it seems likely that this would work if a good rain (perhaps 1 to 2 cm) occurred within a week of broadcasting the seed. This production system might allow sheep producers to make grazing arrangements with neighbouring cash croppers, who should see a benefit from the extra fertility and organic matter returned to their land by the turnip residue and sheep manure.

Table 3. Some possible turnip production systems and sample costs per acre and per ewe.

Production System	Sample production cost* (\$/acre)	Sample cost (cents/ewe/day) @ 600 grazing days/acre
Fall herbicide, conventional tillage, 50 units N	100	16.7
Fall herbicide, no-till drill, 50 units N	70	11.7
Broadcast onto grain stubble, 50 units N	35	5.8
Broadcast on grain stubble, no N	20	3.3
Dry hay @ 5 lb/hd/day	\$50 to \$80 per tonne = 11.3 to 18.1 cents per ewe per day for hay alone	

* **Assumptions:** Fall herbicide plus application = \$20/acre; fall and spring tillage plus seeding = \$50/acre; No-till seeding = \$20/acre; Broadcast seeding = \$5/acre; 50 units N = \$15/acre; Turnip seed = \$15/acre (will vary with variety and seeding rate)

Costs may be higher in some areas of the province, especially for tillage and seeding. Additional costs will be incurred if phosphorous or potassium fertilizer is needed. Given a fixed set of input costs, the only other way to lower the cost per ewe is to increase the grazing days per acre, which requires one or both of a higher yield per acre and a higher utilization efficiency of the crop. When attempting to increase crop utilization, one must regularly check ewe body condition to ensure nutrient intake is adequate to maintain the sheep in the desired condition.