

# Effects of grazing previously abandoned grassland on performance in sheep

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## Abstract

Large areas of cultivated grasslands have been abandoned in Norway and are no longer used for production. Knowing that access to spring and autumn pastures is a limiting factor for sheep farmers, this study aims at testing the effect of introducing abandoned farmland into sheep production. One sheep flock with 83(88) ewes (lambs) in 2014 and 77 (106) ewes (lambs) in 2015 was each year assigned to three treatments: (1) control; common farm procedure with a short spring grazing period before summer grazing on range pasture; (2) spring extended; a four-week extended spring grazing period on abandoned cultivated grassland before summer grazing on range pasture; (3) whole season grazing on abandoned cultivated grassland. Weight gain from spring to autumn, slaughter weight and carcass value were significantly ( $P < 0.05$ ) higher in lambs assigned to treatment 2, with four weeks extended spring grazing period (255 g day<sup>-1</sup>, 15.7 kg, 699 NOK), compared to treatment 1 (229 g day<sup>-1</sup>, 14.3 kg, 615 NOK) and treatment 3 (206 g day<sup>-1</sup>, 13.2 kg, 548 NOK). The use of abandoned cultivated grassland for extended spring grazing improved weight gain and slaughter weight, while whole season grazing on abandoned grassland was the least productive option tested.

**Keywords:** grassland, sheep, weight gain, performance

## Introduction

Common sheep husbandry practice in Norway is to keep sheep indoors during winter and free-ranged on unfenced mountain or forest pastures in summer until slaughter in autumn (Skurdal, 1997). In spring and autumn, the sheep commonly graze on fenced pastures and arable land at the expense winter feed yields. Access to grassland, particularly for spring and autumn grazing, is therefore a limiting factor in Norwegian sheep farming. Further, a general change from small to larger sheep flocks implies an increased need for access to land. Weight gain in lambs is affected by a number of different factors i.e. sex, litter size, maternal effects, as well as management and climatic factors (Dimoski, *et al.*, 1999, Steinheim *et al.*, 2004). Most lambs are born indoors during spring and kept for a few weeks on spring pasture with the ewes before being turned out on summer range pasture. The weight of lamb when turned out on range pasture is known to affect performance (Steinheim *et al.*, 2008, Dwyer, 2009).

In Central Norway, the total farmland area was reduced by 4.9% (11,100 ha) between 2002 and 2012, of which grassland accounted for 80% of the decrease (SSB 2016). The abandoned areas will over time be encroached by shrubs and trees. This is regarded as undesirable as the quality of grasslands for sheep grazing is lost, they are important cultural landscape elements and agricultural land is scarce. Grassland is the main asset for sheep farmers and availability to grasslands is decisive for performance of production on sheep farms. In a research project, we elaborated the grass and animal production potential of abandoned grassland and the societal constraints that obstruct sheep farmers from using or getting access to such areas. The objective of this study was to test the effect of introducing abandoned grassland into sheep production.

## Materials and methods

The experiment was conducted with a flock of Norwegian white spæl sheep breed with 83 (88) ewes (lambs) in 2014 and 77 (106) ewes (lambs) in 2015. The sheep farm and range pasture is situated in Tingvoll municipality in Møre and Romsdal County (N 63° 1', E 8° 8'). The sheep flock was each year assigned with respect to age of ewe and number of lambs born into three treatments: (1) Control; common farm procedure with a short spring grazing period close to the farm before summer grazing on range pasture; (2) Spring extended; a four-week extended spring grazing period on abandoned cultivated grassland before summer grazing on range pasture; (3) Whole season grazing on abandoned grassland. The abandoned cultivated grassland area selected for this study was a 15.3 ha grassland that had been unmanaged for 12 years, located in Sunndal municipality (N 62° 51', E 8° 26'). Before abandonment, the area was used as pasture for dairy cows.

All lambs were weighed at birth, at the start of spring-extended pasturing (May 23/20 in 2014/2015), after the spring-extended pasturing (June 20/19 in 2014/2015), and in autumn (Sept 14/15 in 2014/15). Lambs were 27( $\pm 6.7$  std. dev.) / 25( $\pm 4.3$  std. dev.) days old at start of spring-extended pasturing. Ewes and lambs in treatments 2 and 3 were transported to the abandoned cultivated grassland, a distance of 55 km, after weighing in spring. Ewes and lambs in treatment 1 were turned out on range pasture close to the farm. The animals were inspected regularly and approximately three times a week. Ewes and lambs in treatment 2 returned to the summer grazing on farm range pasture. Slaughter weight, carcass quality characteristics and carcass value were obtained from the slaughterhouse. This information was obtained from 47/77 of the lambs in 2014/2015. Ewes and lambs were monitored regularly for internal parasites. All lambs were treated with tick repellent at the beginning of the spring-extended grazing period.

Weight gain, slaughter weight and carcass confirmation were analysed by using the MIXED procedure in SAS (SAS, 2011) to distinguish between sex, parity and age effects on weight. The initial model included fixed effects of sex, parity and age, and their interactions. There were no significant effects of the interactions, so all interactions were omitted as fixed effects from the analysis. The initial model also included year and mother by year interactions as random effects. There were no significant effects of year, and year was therefore omitted as a fixed effect from the final analysis.

## Results and discussion

Weight gain, slaughter weight, carcass confirmation and carcass value were all significantly ( $P < 0.05$ ) higher in lambs assigned to treatment 2 compared to treatment 1 (Table 1). Weight gain, slaughter weight and carcass value were also significantly ( $P < 0.05$ ) higher in lambs assigned to treatment 2 compared to treatment 3 (Table 1).

Table 1. Means of lamb weight gain spring to autumn, slaughter weight, carcass-classification of meat and fat, and carcass value of lambs with three different grazing treatments for two consecutive years of a previously abandoned grassland.<sup>1</sup>

Treatment	Weight gain spring to autumn (g day <sup>-1</sup> )	Slaughter weight (kg)	Carcass classification meat	Carcass classification fat	Carcass value (NOK lamb <sup>-1</sup> )
Control (1)	0.229 <sup>a</sup>	14.32 <sup>a</sup>	5.78 <sup>a</sup>	1.68 <sup>ab</sup>	616 <sup>a</sup>
Spring extended (2)	0.255 <sup>b</sup>	15.71 <sup>b</sup>	6.31 <sup>a</sup>	1.90 <sup>a</sup>	699 <sup>b</sup>
Whole season (3)	0.206 <sup>c</sup>	13.23 <sup>a</sup>	5.18 <sup>b</sup>	1.51 <sup>b</sup>	548 <sup>a</sup>

<sup>1</sup>Values followed by different letters were statistically different ( $P < 0.05$ ).

Extending the spring grazing period by grazing on abandoned cultivated grasslands for approximately four weeks (treatment 2) improved the performance of lambs compared to the regular farm practice of turning ewes and lambs onto range summer pasture after a short spring grazing period. Extending the spring grazing period implies that lambs are older and heavier when turned out onto summer range pasture, and the age, weight and condition of lambs at turnout on range pasture is known to affect the performance of lambs (Warren and Mysterud, 1995, Steinheim *et al.*, 2008, Dwyer, 2009). Moreover, in spring, grass growth starts earlier at lower altitudes and the extension of the spring grazing period in this study may have provided access to high quality grass for a longer period in spring, thus explaining the improved performance of lambs in treatment 1. Keeping lambs on abandoned cultivated grasslands for the whole summer grazing season (treatment 3) gave the lowest weight gain in lambs of all treatment groups. Grass quality on such land deteriorates during summer and thus poor performance is expected compared to range pasturing.

Grazing unfenced mountain and forest rangelands provides the opportunity for natural behaviour and therefore has the potential for a high level of animal welfare. It is however, also associated with factors such as disease and predators which cause animal welfare concerns and risks of high lamb losses. Providing ewes and lambs with an extended spring grazing period, and thus a farming system where older and heavier lambs are allowed on range pasture, has potential to improve performance, condition and thus animal welfare in sheep farming (Warren and Mysterud, 1995, Dwyer, 2009). Cultivated grasslands are commonly located at lower altitudes than range summer pastures. In spring, grass growth starts earlier at lower altitudes and the effect of extending the spring grazing period in this study may be explained by the access to high quality grass for a longer period in spring.

Range pastures in Møre and Romsdal are considered to be of medium quality with average lamb weight gain of 248 g day<sup>-1</sup> compared to national average of 259 g day<sup>-1</sup> (Norwegian Sheep Recording System, 2014). Variation in weight gain implies that there is potential for improvement and including abandoned cultivated grassland into the farming system in this study showed an increased weight gain from 229g day<sup>-1</sup> to 255g day<sup>-1</sup>, and an increase in the carcass value from 616 NOK to 699 NOK per lamb. One third of available rangeland grazing resources are unexploited (Rekdal, 2008). Use and access to abandoned cultivated grasslands, close to arable farm land, allows farmers to increase flock size and thereby also increase stocking rate on rangeland areas.

## Conclusions

The use of abandoned cultivated grassland for an extended spring grazing period improved weight gain, slaughter weight and carcass value of lambs. Including such grassland has potential to improve animal performance and farmers' economy in Norwegian sheep farming.

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