Weed management of grassland and harmful effects of weeds in swards - on-farm experiences

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Introduction One argument to control weeds from grassland is the harmfulness or toxicity of weeds to the cattle. Animals can reject and leave some of these weeds uneaten at pasture, but precise selection is difficult when cattle are feeding on silage. The toxicity of some weed species has been proven and it is clear that the growth of these species in pastures must be restrained by management. However, it is unclear if the toxicity of e.g. *Ranunculus* ssp. or the harmful effects of numerous weeds to milk and meat quality are endured during the process of pre-wilting and ensiling the silage, or if these problems are connected to pastures only. Nevertheless, herbicide manufacturers do still use these arguments to encourage herbicide use on grassland.

Material and methods To evaluate the weed management practices and real-life harmful effects of weeds noticed by farmers, an enquiry survey was performed for milk and meat producers in North Savo and North Ostrobothnia, which are the two most important regions for cattle and grassland production in Finland. Contact information for the farms was given by ProAgria advisory centres of these regions. The survey was carried out with Webropol 1.0 Survey Software during growing season 2011 as a part of KARPE project (Profitable Field Management on Cattle Farms). Results were analyzed by SAS 9.2 with procedure Univariate and Freq for frequencies and with procedure Mixed for analysis of variance, depending on the best applicability of these methods.

Results and discussion A total of 287 answers were collected, which we distributed quite well to the area (56 % from North Savo and 44 % from North Ostrobothnia) and both conventional and organic farmers answered (Table 1). Two-thirds belonged to age class 40–59 years and virtually all (97 %) farmers were male. Nearly 80 % of them had some kind of agricultural education. Dairy farms (Table 1) produced on average 9360 kg milk $year^{-1}$ cow^{-1}. Beef producers reported to have on average a 610 g day^{-1} $animal^{-1}$ net weight gain. Around 10 % had suckler cow production. For fifteen answerers the main farming was something else than dairy or meat production (recently retired, only grassland production etc.) and these were excluded from the analyses concerning effects on cattle.

There were slight differences between the farm types in their grassland management practices. Farmers had on average 65 ha of field, of which, on average 73 % was grassland (Table 1). Most of the grassland was used for silage (approximately 78 % of the grassland), but nearly all farms (95 %) had notable acreage of pasture, too. Typically, farmers gave less information about their practices with pasture than with silage. The most typical ways to renew silage and pasture swards were having cereal as an cover crop or harvesting the stand for whole-crop silage during the renewal year. Permanent re-seeded silage swards were not very common, but with pasture this was more typical. Swards were most commonly renewed at 3–4 year intervals; milk producers were the most likely to have this practice (Table 1). Renewing interval was perhaps a bit longer for pastures, but there was an uncertainty because every third farmer did not report the renewal interval of their pastures.

Table 1. Farming practices, herd and farm sizes and the proportion and age of grassland of different farm types.

	Answers	*Practices*	*Herd size*	*Total field*	*Distribution of renewal interval: 1-2 yr / 3-4 yr / 5-6 yr*	
Farm type	*n (%)*	*conventional/ organic (%)*	*average (median)*	*(ha)*	*silage swards*	*pasture swards*
Dairy	200 (71)	94 / 6	35 (26)	63	1 / 86 / 13	4 / 75 / 21
Beef	44 (16)	91 / 9	189 (140)	90	0 / 79 / 21	17 / 33 / 50
Suckler cow	28 (10)	57 / 43	37 (35)	62	4 / 64 / 32	4 / 68 / 28

Farmers were asked to evaluate the occurrence of weeds in all swards and the most common weed species on their most weed-rich swards. There were seldom significant differences between farm types or between organic and conventional farms. Farmers reported to have a spectrum from clean swards (zero infestation with weeds; this comprised 15 % of the grassland area on conventional farms and 7 % on organic farms, P 0.03) to swards with heavy infestation (>20 % of the herbage).
The most common species in silage swards were couch grass (*Agropyron repens*) and dandelion

(*Taraxacum* spp.). The proportions of these two species in the most weed-rich fields were typically assumed to be 10–20% or even more. The probability of having high proportion of dandelion in swards increased ($P < 0.05$) as the renewal interval was prolonged to 5–6 years.

In the most weed-rich pastures, couch grass, dandelion and *Rumex* spp. were the most common species. In pastures, typical proportions of the most invasive weeds were slightly lower than in silage swards, usually 10–20 % of the herbage, and there was a tendency (P 0.06) for dandelion to increase if the pastures were older than 4 years. The proportion of poisonous species, such as *Ranunculus* spp. was on average estimated to be below 10 % in both silage and pasture swards. Less than 7 % of the farms had more than 20 % of *Ranunculus* spp. in the herbage of silage or pasture swards, but the occurrence of cattle poisonings inside this group did not differ from other farms.

The farmers were asked to specify their reasons for controlling weeds and to answer in survey claims about the effects of weeds on animal health and productivity. Only about 5 % of the farmers reported not to control weeds in their swards at all. Usually farmers specified many reasons and means to perform weed control on their farm. They agreed considering weeds to have harmful effects on animals and on yield potential of fields; conventional milk producers agreed most uniformly with these kind of survey claims. The most common reason for controlling weeds (chemically or otherwise) was the high amount of weeds in the swards (75 % of the farmers). More than half mentioned that the inferior feeding value of weeds is a reason for weed controlling. In agreement with this, farmers claimed that high proportion of weeds in pasture and silage decreased the intake of forage and that weed controlling practices have increased the feeding value (digestibility, palatability) of forage, although organic farmers and suckler cow farmers differed from others in being not so convinced with these changes. On average 40 % of the farmers considered weeds to impair yield potential so that controlling is necessary, but again the suckler cow farmers and in some cases organic farmers did not see this as harmful as others. 20–30% of the farmers also considered the economic reasons and better looks of the non-weedy sward to be reasons to start weed control practices.

Some 25 % of the farmers reported the toxicity or harmfulness to be the reason for weed control. Typically these were milk producers with conventional farming practices; beef and suckler cow farms and organic farmers rarely saw associations between health problems and weeds and seldom reported to suffer from fertility and calving problems. While more than 40 % of the farmers assume weeds being able to cause poisonings, only 3 % of the farms have experience of them and only one was blaming these problems to be caused by toxic weeds. More than 50 % of all farmers accuse weeds being the source of taste or colour defects in milk or meat, but none of the milk producers and only a couple of beef producers reported quality problems in end products that might be connected to the feeding of weed containing silage. Interestingly, organic farmers (especially in organic suckler cow farms) did not agree that weeds cause poisonings or taste and colour defects in end products.

Farmers claimed to control weeds from their rented fields as eagerly as from their owned fields. They all reported that farm advisory work and articles by agronomists or other experts have affected their weed controlling decisions, although organic farmers seemed to be more immune to these external influences. Nearly all farmers have observed advertising about weed controlling agents, but they refused to be influenced by it.

Conclusions Most farmers assume weeds disadvantageous for both yield potential and feeding value of the forage. Farmers are keen to control the weed proportion in their swards and they usually use several methods to do that. Milk producers seem to be the most enthusiastic in weed controlling and they sometimes take the potential risks more seriously than other producers. Organic and suckler cow farmers do not consider weeds as harmful as conventional farmers. This could be because they have more limited means to control the invasion of weeds in their swards, or they are convinced by their own experiences with slightly more weedy forages which have not caused serious harms. Many health and productivity problems do occur on milk, beef and suckler cow farms, but are only rarely connected to high proportion weeds or occurrence of toxic species in the forage. From the farmers' point of view, it seems that the main arguments to control weeds are better productivity of the field and enhanced palatability and feeding value of the forage.

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