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Direct sowing of maize in a grass sward

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Introduction On dairy farms in The Netherlands, grassland (mainly based on *Lolium perenne* L.) and maize (*Zea mays* L.) are the main crops. For economic reasons, both crops are continuously cropped. However continuous maize cultivation leads to a loss of organic matter, soil structure and soil fauna (Van Eekeren et al., submitted). A crop rotation of grass with maize can partly overcome the loss of soil quality caused by continuous cropping but leads on farm level either to a decreased area of maize or to a decreased area of permanent grassland. Maize cultivation after ploughing a perennial grass sward causes nitrate leaching due to high mineralization (De Wit et al., 2006). Direct sowing of maize in a grass sward without ploughing can possibly maintain the soil quality and minimize nitrate losses. Our initial goal in our search for direct sowing techniques was to keep the sward alive by mowing the grass regularly. Experiments in 2004-2005 showed that even with intensive cutting, yields were suppressed considerably (20-40% compared to the control) (Prins et al., 2006). The objective of the present experiment was to determine the yield potential of direct sowing when the grass sward is killed by spraying herbicides before and/or after sowing.

Materials and methods In both years (2006 and 2007) the experiment was carried out on a perennial grass sward on a peat soil. Next to a ploughed control, four treatments were established in the direct sown maize; mowing the grass regularly, killing the sward before sowing (early spraying), killing the sward when the maize is in the V3 growth stage (late spraying) or combining the two sprayings (double spraying). Killing the sward was done by spraying glyphosate (early spraying) and/or a mix of Samson/Mikado/Frontier Optima (late spraying). The experiment was arranged as a block design with four replicates. The direct sown maize was fertilized with 20 m⁻³ ha⁻¹ of slurry in 2006 and 40 m⁻³ ha⁻¹ slurry and 150 kg (CAN) (41 kg N ha⁻¹) in 2007. The control was not fertilized since former research has shown that the N-mineralization is sufficiently high after ploughing a permanent grassland (Nevens and Reheul, 2002). Whole plant silage maize was harvested when the grain was at the 50% kernel milk line stage. Maize was chopped, weighed and a 1-kg sub sample was taken to calculate dry matter yields.

Results The yield over the years 2006 and 2007 was not significant different (see Table 1). The control and the treatments with a early and double spraying had a significant higher yield than the mowing and late spraying.

Table 1 Yields of whole-plant silage maize with different treatments of the sward with direct sowing of the maize in a grass sward or in a ploughed sward.

Sowing technique	Treatment of the grass sward	Yield ton DM ha ⁻¹		
		2006	2007	Average
Direct sowing	Mowing	9.5	10.8	10.1 ^b
	Late spraying	9.4	10.3	9.8 ^b
	Early spraying	14.0	12.8	13.4 ^a
	Double spraying	15.9	15.0	15.2 ^a
Ploughing		16.0	13.5	14.7 ^a
Average		12.8	12.4	

Values indicated by the same letter within a column are not statistically different at the 5% error level.

Conclusions Comparable maize yields to a ploughed sward are possible when direct sowing of maize is practised with a spraying of herbicides before sowing, preferably combined with a second spraying when weeds are emerging in the dying sward. Late spraying of the grass sward still suppresses the maize yield.

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