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 spaying) 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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