BBRO Project No. 11/14 – Evaluation of novel defoliators

(A one-year study carried out in 2011)

Evaluation of commercial sugar-beet defoliation systems

1. The aim of the project was to evaluate the yield gains that could be obtained from the use of the Grimme flail.
2. Comparisons were made in commercial fields of the yields of crop areas that were lifted using with commercial harvesters set to top high with their own defoliation systems and areas that were first defoliated with a Grimme defoliator and lifted by the same commercial machine but without use of its fitted defoliator and the topping mechanism.
3. Beet from each area was piled separately and eight random samples of taken from each and weighed. The amounts of green material were assessed and losses through root breakage estimated by the 'crocodile' method.
4. In a separate exercise, eight samples of 25 beet were dug by hand and shaved to retain the whole of the crown which was incrementally sliced and weighed to establish the yield losses that occur as the diameter of the topping scar increases
5. Plant populations were counted to allow yields/ha to be estimated.
6. A total of nine such comparisons were attempted, seven of which were successful – they included four comparisons with a Vervaet harvester, two with a Holmer and one with a trailed Standen machine.
7. In two of the comparisons involving Vervaet machines and in the two involving a Holmer, the use of a Grimme flail produced statistically significant increases in beet yield of between 8 and 24%. Yields were not significantly increased with the Grimme in two other comparisons with a Vervaet machine, and were significantly smaller when compared against the trailed Standen machine (Table 1).
8. The exponential relationships between potential yield loss and the absolute diameter of the topping scar varied from site to site depending on the overall diameter of the beet. On the other hand, the ratio of the topping scar diameter to the widest diameter of the beet remained consistent across sites (Fig. 1). This ratio is therefore a useful measure of the effectiveness of the topping process that also provides an estimate of potential yield loss.
9. The frequency distributions for the topping scar diameter show that the Grimme flail uniformly removed much less of the beet crown than any of the commercial harvester systems. The mean topping scar diameters were 2.1, 4.0, 4.9 and 5.4 cm, respectively, for the Grimme, Vervaet, Standen and Holmer machines (LSD = 0.83).

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Table 1. *Yields (t/ha) of Grimme-flailed and commercially-harvested beet*

Location:		**Whittlesea**	**Cockfield**	**King's St S**	**King's St N**	**Gamston**	**Wissington**	**New York**	**Holme Fen**	**Cantley**
Harvester:		Vervaet	Vervaet	Holmer	Holmer	Standen	Vervaet	Vervaet	Agrifac	Vervaet
Method of harvesting	Grimme flail	94.7	124.4	91.0	90.7	92.9	68.9	79.3	-	-
	Commercial	76.6	115.4	81.2	72.9	105.4	67.5	90.7	76.2	80.9
	LSD (*P* =0.05)	14.5	16.2	10.3	15.8	11.7	8.6	11.8	15.6	7.0
		*	***	*	*	*	ns	ns		
Grimme as % of commercial		124	108	112	124	88	102	87		

Fig. 1. Relationship between potential yield loss and the topping scar ratio

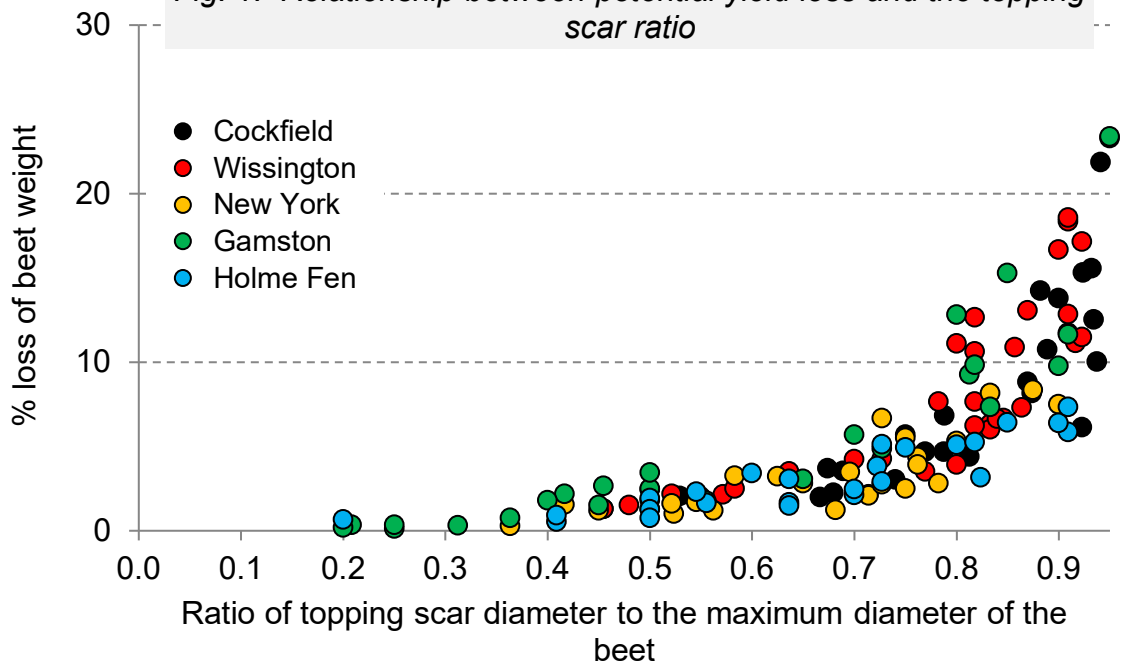

Fig. 2. *Frequency distributions of topping scar diameters (all sites)*