The Effect of Silage Harvester Type on Harvesting Efficiency

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Introduction Choice of harvesting system can significantly influence production costs. Whether a tractor-powered or self-propelled forage harvester or a self-loading forage wagon system is used will depend on particular circumstances. However, in order to make an informed choice relevant information has to be available. A trial was commissioned by Landmec Pottinger (Ivybridge, UK) and Traynors (Clonmel, Ireland) at this Institute to investigate the performance of a self-propelled forage harvester system and a self-loading forage wagon system.

Materials and methods Wilted grass cut from a predominantly perennial ryegrass sward was rowed up and alternate swaths were harvested either by a John Deere 6850 self-propelled forage harvester (SPFH) or a Pottinger Torro 5100 self-loading forage wagon (SLFW) powered by a Fendt 716 tractor. The SPFH was serviced by 3 tractors with 12 t trailers and 1 tractor with a 10 t trailer; the standard harvesting team at this Institute. The sward was cut on the 1 June 2004 and harvested on 2 June. Transport distance from field to silo return was 3.4 km. Herbage from each system was ensiled in identical roofed concrete silos (80 t capacity). Representative samples of herbage taken from each load were used to determine DM concentration of the herbage. The Hillsborough Feeding Information Service was used to assess ensilability of herbages and quality of the resultant silages. Chop lengths of the herbage ensiled were determined by hand separating a 50 g sample from each load into 5 length categories (0–20, 21–40, 41–60, 61–80, 81–100 and >100 mm). The herbage in each length category was dried, weighed and the percentage distribution in each of the categories calculated. For each load of herbage the times taken to harvest, transport and turn-round at the silos were recorded. Also recorded were the times taken to fill and roll the herbage in the silos. Forward speeds of the two harvesters during harvesting were recorded, as was fuel consumption by all vehicles in both systems.

Results and discussion Herbage harvested averaged 23.4 t/ha and 286 g DM/kg. There was no treatment effect on the analyses of the herbages as ensiled or on the analyses of the resultant silages. Particle size distribution in the 21–80 mm range was similar for both systems being 66.6 and 66.2% for the SPFH and SLFW respectively. Particles in the 0–20 mm category were greatest in SPFH harvested herbage (22.1 vs. 6.6%) while particles >81 mm were greatest in herbage harvested by the SLFW (27.3 vs. 11.3%). Harvesting and transporting the herbage to the silos by the SPFH required 5 people for the 10½ loads compared with 1 person for the 8 loads with the SLFW. The quantity of herbage harvested and transported per person per hour with the SLFW system was more than double that of the SPFH system (Table 1). The fuel used to harvest and transport herbage to the silo with the SLFW was half of that required by the SPFH (0.67 vs. 1.32 l/t). Data relating to some of the other parameters measured are presented in Table 1. Factors influencing the choice of silage harvesting system for a particular farm include availabilities of labour, machinery, time and finance as well as transport distance. Potential outputs and resource requirements for the SPFH and SLFW systems for circumstances at this Institute are given in Table 1. These data should assist when choosing an appropriate silage harvesting system to suit different circumstances. For example, data in Table 1 indicate that 2 people, each with a SLFW, could harvest and transport almost as much herbage in a given time as 5 people with a SPFH system.

Table 1 Comparison of self-propelled forage harvester (SPFH) and self-loading forage wagon (SLFW) systems

	SPFH	SLFW		
Number harvesters/number of operators	1/5	1/1	2/2	3/3
Harvester power available (kW)	330	103	206	309
Transport power available (kW/unit)/number of units	95.5/4	103/1	103/2	103/3
Total power available (kW)	712	103	206	309
Output (t fresh herbage/h)	53.4	24.8	49.6	74.4
Output per person (t/h harvest and transport)	12.4	24.8	24.8	24.8
Output (t fresh herbage/10 h d)	534	248	496	744
Fuel used (l/t harvest and transport)	1.32	0.67	0.67	0.67
Weight herbage per load (t)	6.6	8.5	8.5	8.5
Average transport speed (km/h)	21.5	22.2	22.2	22.2

Conclusion Data presented indicate that, compared to SPFH silage harvesting systems, there is significant potential for SLFW silage harvesting systems to maximise output per person and improve fuel efficiency.