A comparison of two systems for harvesting herbage for silage

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Introduction

Producing high quality silage can be an expensive operation and the choice of harvesting system can significantly influence production costs and hence profitability. Choice of silage harvesting system depends on many factors. 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 and Traynors at ARINI 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 headland swaths did not form part of the trial. The SPFH was serviced by 3 tractors with 12t trailers and 1 tractor with a 10t trailer. The sward was cut on the 1 June 2004 and harvested on 2 June. A one-way system of traffic to and from the field was used in order to avoid congestion on the narrow farm roads. Distances from field to weighbridge, where the weight of herbage in each trailer was determined, and from the silos to the field were 1876 m and 1470 m respectively. Herbage from each system was ensiled in identical roofed concrete silos (80 t capacity). Representative samples of herbage were taken from each load as the herbage was being filled into the silo and 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, 20–40, 40–60, 60–80, 80–100 and >100 mm). The herbage in each length category was dried, weighed and the percentage distribution in each of the categories calculated. The time taken to harvest and transport each load of herbage to the weighbridge, turn-round time at the silo and the time taken to return to the field were recorded. Also recorded was the time 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. Not all data are presented here.

Results and Discussion

Fresh herbage harvested averaged 23.4 t/ha and 286 g/kg DM. 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 20–80 mm category 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 >80 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 ARINI are given in Table 1. These data should assist when choosing an appropriate silage making system to suit different circumstances. For example, data in Table 1 indicate that 3 people, each with a SLFW, could harvest and transport 39% more herbage in a given time than 5 people with the SPFH system.

Conclusion

The data are unique to the particular circumstances of the trial reported. Nevertheless, there is significant potential for SLFW silage harvesting systems to maximise output per person and make more efficient use of fuel.

Table 1. Comparison of SPFH and SLFW silage harvesting systems for harvesting and transporting herbage a total field to silo return distance of 3.4 km with a yield of 23.4 t/h at 286 g/kg DM.

	Self-propelled forage harvester	Self-propelled forage wagon		
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	96/4	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 & 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 & 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

* Assuming hourly outputs can be sustained over a 10 h day