

AE 340 Laboratory 8 Field Capacity

Question 1. The area you need to harvest per season is 1000 ha (2500 acres). The corn is yielding 15 Mg/ha (250 bushels/ac) and is in 800m ($\frac{1}{2}$ mile) rows. The maximum speed in the field is 8 km/h (5 mph), and average travel distance to the trucks for offloading is 400m ($\frac{1}{4}$ mile). The turn time at the end of field rows is 20 seconds. The combine travel speed to offload is 8 km/h (5 mph) when full or and 10 km/h (6 mph) when empty. A single 25000kg (1000 bu) grain wagon is available with the same travel speeds as the combine. The unloading rate of the wagon is 13000 kg/min (500 bu/min). A maximum of four, 25 tonne, (1000 bu) truck are available to move grain to the elevator which is 25 km (15 miles) from the field and the average speed of the truck is 50 km/h (30 mph). The unloading time at the elevator is 30 min. The combine is a 9860 STS combine with a 7600 kg (300 bu) grain tank and an unloading auger with a capacity of 500 kg/min (200 bu/min).

Determine the Field Capacity, Effective Field Capacity and Field Efficiency under the following conditions.

- 1). The grain wagon is not used, and the combine unloads at the trucks. (For this ignore trucking time and assume that the trucks are capable of transporting all grain harvested.)
- 2). The grain wagon is used, and the combine unloads on the go. (For this ignore trucking time and assume that the trucks are capable of transporting all grain harvested.)
- 3). The grain wagon is used, and the combine unloads on the go.. Include the effect of transportation in this analysis.

Question 2. Given: The following data were collected from a sprayer operation while applying one tankful of solution. The boom of the sprayer covered a 33-foot swath.

<u>Event</u>	<u>Time min.</u>	<u>Event</u>	<u>Time min.</u>
Fill tank	20.6	Spray	3.70
Travel	1.3	Check nozzle	2.65
Spray	7.63	Spray	3.88
Turn	0.12	Turn	0.11
Spray	7.77	Spray	7.62
Turn	0.11	Turn	0.11
Spray	7.47	Spray	7.58
Turn	0.11	Turn	0.14
Spray	7.56	Spray	7.49
Turn	0.12	Travel	2.10
Unplug nozzle	1.21		

Determine:

- a) Percent of time turning.
Percent of time unplugging and checking nozzles.
Percent of time filling tank.
Percent of time actually spraying.
- b) Field speed in mph, if the field length is $\frac{1}{2}$ mile.
- c) Theoretical field capacity, effective field capacity, and field efficiency.