

AE 330 Laboratory 9 Costs**Question 1.**

a) Assume a farmer starts has to plant 1000 acres (400 ha) of soybeans. The farmer operates a 24 row planter planting on 15 inches (0.381 m) rows at 4.5 mph (7.2 km/h), working 10 hours a day and a field efficiency of 0.70. Maximum bean yield in the location occurs when planted from May 1 to May 15. The farmers starts planting on May 1. The timeliness coefficient after May 15 is .006. The probability of a working day during this period (May 1 to end of planting) in Iowa, is approximately 0.50 at a 90% probability level.

- i) Determine the theoretical Field Capacity, and Effective Field Capacity in terms of ha/hr (ac/hr).
- ii). Determine the total area of the field planted before any timeliness costs are incurred.
- iii) Determine the total timeliness costs associated with this planting operation.
- iv) If the price of beans is \$6.00 per bu (\$220 per Mg) what is the average timeliness cost in \$/ac (\$/ha) for the whole area.

Question 2.

b) A 400 kW (500 Hp) combine is purchased for \$500,000. The combine is partly used to harvest 400 ha (1000 acres) of soybeans, and 800 ha (2000 ac) of corn per year. The theoretical field capacity in corn is 6.5 ha/hr (16.25 ac/hr) with a field efficiency of 0.60 and the theoretical field capacity in beans is 7.0 ha/hr (17.6 ac/hr) with a field efficiency of 0.70, with a ten hour working day for both crops. The life of the machine is 2000 hours, and is sold the winter after this threshold is reached. The interest rate is 8% per annum and inflation is 1% per annum. Assume the annual charge for housing, taxes, and insurance is 2% of the purchase price. The labor costs are \$10/hr and diesel fuel cost \$0.50/l (\$2.00/gallon). The engine operates at 60% of rated power and you may assume that the cost of oil and lubrication costs may be ignored. Assume that for repairs and maintenance $RF1 = 0.007$ and $RF2$ is 2.0. Assume that the salvage value of the machine is 10% of the purchase price.

- i) Estimate the total average ownership costs per annum for the combine
- ii) Estimate the total ownership costs per ha for planting the soybeans and corn
- iii) Estimate the combine operating costs per hour for the combine.
- iv) Estimate the operating costs per ha for both corn and soybeans (Cost per ha for corn and cost per ha for beans)

Question 4. A self-propelled combine rates at a maximum power of 400kW (500Hp) with a sixteen-row corn head, is capable of harvesting corn at 7.2 km/h (4.5 mph). The corn is yielding 10 Mg/ha (160 bushels/ac) and in 0.762 m (30 inch) row spacing. The field efficiency of the combine is 65%.

- a) Determine the theoretical and actual field capacity of the combine (ha/hr, ac/hr).

The combine purchase price is \$450,000 and has an expected life of 8 years. The interest rate is 8% and inflation is at 2%. The salvage value of the machine after 8 years is 10% of the purchase price. Cost of taxes, insurance and housing is 2% of the purchase price per annum. The labour costs are \$10/hr and diesel fuel cost \$0.50/l (\$2.00/gallon). The engine operates at over 86% of rated power and you may assume that the cost of oil and lubrication costs may be ignored. Assume that for repairs and maintenance RF1 = 0.08 and RF2 is 2.1. The combine operates on average 250 hours a year, with 10 hours harvest days. Assume that the timeliness coefficient is 0.002 and that harvest operations are evenly balanced about the optimum harvest date. The price of corn is \$100/Mg (\$2.50/bu). The probability of a working day is 0.65 during harvest.

- b) Determine the annual ownership costs per annum (per ha, per ac)
 c) Determine the operating costs excluding timeliness costs (per ha, per ac)
 d) Determine the timeliness costs (per ha, per ac)

If the unit price function for combines is \$30,000 h/ha

- e) Determine the optimum effective field capacity.

Question 3.

b) A 135 kW (180 Hp) tractor is purchased for \$150,000. The tractor total annual use is 500 hours. The tractor is partly used to plant 400 ha (1000 acres) of soybeans, with an average planting rate of 15 ha (40 acres) in a ten hour day. The interest rate is 8% per annum and inflation is 1% per annum. Assume the annual charge for housing, taxes, and insurance is 5% of the remaining farm value at the beginning of the year. The labor costs are \$10/hr and diesel fuel cost \$0.50/l (\$2.00/gallon). The engine operates at 60% of rated power and you may assume that the cost of oil and lubrication costs may be ignored. Assume that for repairs and maintenance RF1 = 0.007 and RF2 is 2.0. Assume that the remaining farm value, RFV (i.e Salvage value) of the machine can be found from the following:

$$RFV = LP * 0.68 * (0.92)^y$$

Where: RFV = remaining farm value, \$,

LP = purchase price, \$,

y = machine age, years

- i) Estimate the total ownership costs per annum for the tractor, for the first year after purchase
 ii) Estimate the total ownership costs per ha for planting the soybeans, , for the first year after purchase
 iii) Estimate the tractor operating costs per ha for planting the soybean.
 iv) Estimate the total tractor planting costs per ha