AE 340 Laboratory 10 Field Capacity and Machinery Costs

PROBLEMS (Modified from text book)

Question 15.3 A company is planning to design a family of self-propelled combines with a range of field capacities. All of the combines will be designed to operate at the typical speed listed in Table 15.1. Corn heads and 6, 8, 10, and 12 rows will be marketed, all for 75-cm row spacing and with separating capacities to match the corn heads. (a) If the field efficiency of the 6-row machine is 70%, calculate the total time losses, that are incurred in harvesting one hectare. (b) Assuming that these time losses would remained unchanged for the combines larger than 2-row capacity, calculate the field efficiency for all size of the corn heads. (c) As an alternate assumption, calculate the allowable total time losses, that could be tolerated per hectare if all of the combines were to have the same field efficiency.

Question 15.6 Calculate and plot specific annual ownership costs versus economic life for life ranging from 1 to 20 years. Include two curves, one for a general inflation rate of 2% when the prevailing interest rate is 7% and one for a general inflation rate of 20% when the prevailing interest rate is 25%. Assume salvage value is 10% of purchase price, while taxes, insurance, and shelter are 2% of purchase price.

Question 15.17 A conventional row-crop planter is to be used to plant 200 ha of soybeans with 75-cm row spacing in early May in Central Illinois. The soybeans have an estimated yield of 2.7 Mg/ha and an anticipated selling price of $190/Mg. The farmer works 10-hour days. The planter is pulled by a $70,000 tractor that is used 400 hours per year (only a fraction of that total time is used with the planter) with an economic life of 15 years. For both the planter and tractor, assume salvage value of 10%, interest rate of 5% and Ktis= 2%. The economic life of the planter is 10 years and labor costs are $10.00 per hour. List prices are $22,000, $38,000 and $60,000 for 8, 12 and 16-row planters, respectively. Calculate (a) the total annual ownership costs and (b) specific ownership costs of the tractor, (c) the specific annual ownership costs, (d) unit price function and (e) optimum effective field capacity of the planter. (f) If the planter works at the typical speed and field capacity given in Table 15.1, select the best available planter, i.e., how many rows would it have?