

1) (25 pts. total) Conduct a partial budget analysis of switching from conventional to no-till.

The only differences between the tillage systems are the following:

- You farm 3000 acres, growing only corn, with an average yield of 200 bu/ac.
- With no-till, you expect a 1% yield decrease.
- Use \$6.00/bu as the price for corn.
- Conventional tillage plus planting costs you \$50/ac, but no-till planting will cost \$25/ac.
- Herbicide with conventional tillage costs \$30/ac, but \$45/ac with no-till.
- With the additional time due to using no-till, you expect to do 2,000 acres of custom planting for other farmers. You net (revenue – costs) \$5/ac doing custom work.

Ignore all other costs and benefits in the analysis. Show your work for potential partial credit.

a) (5 pts.) What is the Additional Revenues (if any)?

*Custom planting: 2000 acres x \$5/ac revenue = \$10,000*

b) (5 pts.) What is the Additional Costs (if any)?

*Herbicide costs: (\$45/ac – \$30/ac) = \$15/ac x 3000 ac = \$45,000*

c) (5 pts.) What is the Costs Reduced (if any)?

*Tillage and planting costs: \$50/ac - \$25/ac) = \$25/ac x 3000 ac = \$75,000*

d) (5 pts.) What is the Revenues Reduced (if any)?

*Yield loss: 1% x 200 bu/ac = 2 bu/ac x \$6/bu x 3000 ac = \$36,000*

e) (5 pts.) Use your numbers to fill in the Partial Budget below, and then calculate the Total Benefits, Total Costs, and Net Benefit.

<b>Additional Revenues</b>		<b>Additional Costs</b>	
	\$10,000		\$45,000
<b>Costs Reduced</b>		<b>Revenues Reduced</b>	
	\$75,000		\$36,000
<b>Total Benefits</b>	\$85,000	<b>Total Costs</b>	\$81,000
		<b>Net Benefit</b>	\$4,000

2 a) (5 pts.) Your neighbor says he thought about expanding his corn acreage this year by renting 100 more acres of land. He said he would make more money (he estimated a net gain of \$100/ac), but he decided not to do it because the opportunity cost of his time was too high to justify it. Explain what opportunity costs means here.

*Opportunity cost = value of what is given up. He either had something else he could make more money doing, or he valued his personal time more than the corn would have generated for him.*

**2 b) (5 pts.)** Briefly explain the difference between a fixed and variable cost, giving two agricultural examples for each type of cost.

*Fixed Cost: remains constant, no matter how much output is produced.*

*Examples: Mortgage payment for land mortgage or property taxes. Age related depreciation on machinery.*

*Variable Costs: vary with the amount of output produced.*

*Examples: fertilizer and other variable crop input costs—pay more as plant more acres. Feed for livestock—higher costs the more animals you have.*

*There are many possible more examples for both cases, the key is whether or not the cost varies with output.*

**2 c) (5 pts.)** You are a corn farmer with \$200,000 per year in fixed costs and \$400/ac in variable costs. As you increase your corn acres from 1,000 acres to 1,500 acres, how does your per acre cost for fixed costs change? How does your per acre cost for variable costs change?

*Per acre fixed costs decrease as acreage increases because you spread the same fixed costs (\$200,000) over more acres. Here, the per acre fixed cost is  $\$200,000/1000 \text{ ac} = \$200/\text{ac}$ , which falls to  $\$200,000/1500 \text{ ac} = \$133.33/\text{ac}$  as the acreage expands.*

*Per acre variable costs remain the same as acreage increases, \$400/ac for 1000 acres and \$400/ac for 1500 acres. This is the cost of things such as fertilizer, seed, and tillage.*

**3) (20 pts.)** Briefly describe the three commodity price support programs discussed in class—Direct Payments, Counter-Cyclical Payments, and Loan Deficiency Payments—paying particular attention to i) What triggers each type of payment? and ii) What determines the total amount of the payment (i.e., how many acres and/or bushels are eligible for payments?).

*Direct Payments: What triggers a payment? Nothing, you just sign up for them and get them. What determines the amount? How many base acres you have and your payment yield, as the  $DP = DP \text{ rate} \times 85\% \text{ Base Acres} \times \text{Payment Yield}$  (83.3% in some years now).*

*Counter-Cyclical Payments: What triggers a payment? The national Marketing Year Average (MYA) price has to be below the “trigger price” equal to the Target Price minus the Direct Payment Rate. What determines the amount? How far below this “trigger price” the national MYA price falls. For every cent below this amount, down to the Loan Rate, the farmer receives one cent. This CCP payment rate (like a “price”) is then paid  $\times 85\% \text{ Base Acres} \times \text{Payment Yield}$  (83.3% in some years now).*

*Loan Deficiency Payments: What triggers a payment? On the day a farmer sells grain, the Posted County Price (PCP) must be below the Loan Rate. What determines the amount? The difference between the Loan Rate and the PCP is the payment rate per bushel multiplied by the number of bushels the farmer sells.*

**4 a) (8 pts.)** For each type of crop insurance policy below, indicate whether it is an individual or area-wide (county) policy and whether it is a yield or revenue policy.

- i) Actual Production History (APH): Individual yield insurance
- ii) Group Risk Plan (GRP): Area-wide (county) yield insurance
- iii) Group Risk Income Plan (GRIP): Area-wide (county) revenue insurance
- iv) Crop Revenue Coverage (CRC): Individual revenue insurance

**4 b) (6 pts.)** Briefly explain the difference between a yield and a revenue crop insurance policy, focusing in particular on what triggers a payment.

*Yield insurance uses a yield guarantee and if the actual harvested yield falls below this yield guarantee, an indemnity is triggered and paid to the farmer.*

*Revenue insurance uses a revenue guarantee and if the actual revenue falls below this revenue guarantee, an indemnity is triggered and paid to the farmer.*

*The key is to define very specifically (so there are no legal disputes) just how yield is defined (the farm's or the county's) and how price is observed (e.g., closes prices of specific contracts on the Chicago Board of Trade over certain defined days, etc.).*

**4 c) (6 pts.)** Briefly explain the difference between an individual and an area-wide (county) crop insurance policy, focusing in particular on what triggers a payment.

*Individual insurance insures the yield or revenue of an individual farmer to see if a payment is triggered and to determine how large the payment should be, where the specific land unit is clearly defined. Area-wide insurance uses the yield or revenue for a county to see if a payment is triggered and to determine how large the payment should be.*

**5 a) (5 pts.)** Your brother wants to invest \$6,000 in your farm, with you paying 6% interest compounded annually. How much will you owe in 6 years if you return his \$6,000 plus interest?

$$FV = PV(1 + r)^t = 6000(1.06)^6 = 8,511.11.$$

**5 b) (5 pts.)** How much money must be invested today earning a 7% interest rate compounded annually to have \$70,000 in 7 years?

$$PV = FV \times [(1/1 + r)^t] = 70,000/(1.07^7) = 43,592.48$$

**5 c) (5 pts.)** Shares in an ethanol plant sell for \$2,000 today and will be worth \$2,500 in 3 years. What is the rate of return expressed as an annually compounded interest rate?

$$r = (FV/PV)^{(1/t)} - 1 = (2500/2000)^{(1/3)} - 1 = 2^{1/3} - 1 = 7.72\%$$

**6 a) (15 pts.)** What is the net present value (NPV) for a berry patch that costs \$3,000 to plant in year 1, then generates a net return of \$2,500 in years 2 and 3 and \$1,000 in year 4, assuming a 10% discount rate? As part of your calculations, fill in the two columns in the table below. Show your work for potential partial credit.

Year	Net Return	Present Value
1	-3,000	-2,727.27
2	2,500	2,066.12
3	2,500	1,878.29
4	1,000	683.01
	NPV	1,900.14

For each year, the  $PV = FV \times [(1/1 + r)^t]$ , so  
 Year 1:  $-3,000/(1.1^1) = -2,727.27$   
 Year 2:  $2,500/(1.1^2) = 2,066.12$   
 Year 3:  $2,500/(1.1^3) = 1,878.29$   
 Year 4:  $1,000/(1.1^4) = 683.01$   
 NPV = sum of all the PV's.

$$NPV = -2,727.27 + 2,066.12 + 1,878.29 + 683.01 = 1,900.14$$

**6 b) (5 pts.)** What is the annuity equivalent to the time varying returns from the berry patch?

The annuity factor formula is  $K = \frac{1}{r} \left( 1 - \frac{1}{(1+r)^t} \right)$ , so that the annuity is  $C = NPV/K$ .

Show your work for potential partial credit.

$$K = \frac{1}{r} \left( 1 - \frac{1}{(1+r)^t} \right) = \frac{1}{0.1} \left( 1 - \frac{1}{(1+0.1)^4} \right) = 3.169865$$

$$C = NPV/K = 1,900.14/3.169865 = \$599.44$$

**7) (11 pts. total)** You run a free-range egg farm. This table gives the number of laying hens and how many dozen eggs are laid, collected, washed, and put into cartons in a day for the farm.

Hens	Dozens/day	Marginal Product	Value of Marginal Product
125	9.15	--	--
150	11.10	0.078	\$0.78
175	13.00	0.076	\$0.76
200	14.85	0.074	\$0.74

**a) (4 pts.)** Use this table to show how to calculate the Marginal Product and then fill in the Marginal Product column in the table. Show your work for potential partial credit.

$$MP = \Delta Q/\Delta X = (11.10 - 9.15)/(150 - 125) = 0.0780. \text{ Calculate the rest accordingly.}$$

**b) (4 pts.)** Free-range eggs sell for \$10/dozen. Show how to calculate the Value of Marginal Product for one example, and then fill in the Value of Marginal Product column in the table.

$$VMP = \text{output price} \times MP = 0.0780 \times \$10 = \$0.78. \text{ Calculate the rest accordingly.}$$

**c) (3 pts.)** If the total cost (for feed, housing, overhead, etc.) to keep a hen is \$0.74 per day, what is the profit maximizing number of hens for your operation to have?

$$VMP = \text{output price, which occurs with 200 hens producing 14.85 dozen per day}$$

**8) (11 pts. total)** The table below reports the cost (\$/yr) of producing specialty pork (cwt/yr) for Billy-Bobb's Big Belly Bacon® for making specialty cured pork products.

Pork (cwt)	Fixed Cost	Variable Cost	Total Cost	Marginal Cost
304	1,000	21,875	22,875	--
362	1,000	26,250	27,250	75.43
418	1,000	30,625	31,625	78.13
472	1,000	35,000	36,000	81.02

**a) (8 pts.)** Use the table above, show how to calculate the Total Cost and Marginal Cost and then fill in the missing values in the table. Show your work for potential partial credit.

$$TC = FC + VC = 1,000 + 21,875 = 22,875. \text{ Calculate the rest accordingly.}$$

$$MC = \Delta TC / \Delta Q = (27,250 - 22,875) / (362 - 304) = 75.43. \text{ Calculate the rest accordingly.}$$

**b) (3 pts.)** If Billy-Bobb's pays \$81.00/cwt for pork, what is the profit maximizing amount of pork to produce for Billy-Bobb's?

*Output price  $P = MC$ , which occurs with 472 cwt of pork.*

**9) (10 pts)** Suppose corn yield is determined by the following function:  $Y = 5 + 3N - 0.01N^2$ , where  $Y$  is yield (bu/ac) and  $N$  is applied nitrogen (lbs/ac). If the price of corn is \$6/bu and the price of applied nitrogen fertilizer is \$0.60/lb, what is the profit maximizing amount of nitrogen fertilizer to apply? **Don't forget to check the Second Order Condition.**

$$\pi = pY(N) - rN = 6(5 + 3N - 0.01N^2) - 0.6N$$

$$FOC: d\pi/dN = 6(3 - 0.02N) - 0.6 = 0.$$

$$\text{Solve FOC for } N: \quad 3 - 0.02N = 0.6/6 = 0.1$$

$$-0.02N = 0.1 - 3 = -2.9$$

$$N = -2.9 / -0.02 = 145 \text{ lbs of } N$$

$$SOC: d^2\pi/dN^2 < 0. \quad \text{Check: } d^2\pi/dN^2 = 6(-0.02) = -0.12 < 0 \text{ satisfied.}$$

**10) (10 pts. total)** You buy a truck for \$60,000 that you plan to use for 3 years. For this questions, calculate annual depreciation of the truck assuming a \$0 salvage value.

**a) (5 pts.)** Fill in this table using Straight Line Depreciation. Show your work for potential partial credit.

Year	Depreciation During Year	Value at Year End
1	20,000	$60,000 - 20,000 = 40,000$
2	20,000	$40,000 - 20,000 = 20,000$
3	20,000	$20,000 - 20,000 = 0$

*SL annual depreciation =  
(purchase price - salvage  
value) / useful life*

$$60,000 / 3 = 20,000$$

**b) (5 pts.)** Assume you deducted the depreciation reported above from your ordinary income on your Schedule F each year. You sell the truck in year 4 for \$10,000 (not the \$0 salvage value). Do you pay ordinary income tax, self-employment tax, and/or capital gains tax on this \$10,000? In other words, what taxes are paid (if any) on depreciation recapture?

*You have to declare the \$10,000 on your taxes as income and the tax code requires that you pay only ordinary income tax on that income (depreciation recapture).*

**11) (5 pts.)** Briefly explain the “limited liability” that owners of a Limited Liability Company (LLC) typically have as a result of using this form of business arrangement rather than the other business arrangements (partnership, corporation, and sole proprietorship) discussed in class.

*The owners of the LLC cannot have their personal assets claimed to pay the debts of the LLC. However, individual members are often asked to sign as individuals for the debts of the LLC, so that creditors have the legal ability to make legal claims on personal assets. Also, an individual can be found individually negligent for actions taken while acting for the LLC.*

**12) (15 pts. total)** Mom and Dad own a farm, with all assets owned as marital property under Wisconsin’s marital property law. Mom and Dad bought land years ago for \$100,000, but currently it has a fair market value of \$400,000. Give a brief explanation for each answer.

**a) (5 pts.)** Suppose Mom and Dad sell the land to Son for \$400,000.

i) How much gain would Mom and Dad have to report on their income tax return?

*M & D’s gain = \$400,000 – \$100,000 = \$300,000.*

ii) What is Son’s basis for the land?

*Son’s basis = the purchase price of \$400,000*

**b) (5 pts.)** Suppose Mom and Dad give the land to Son and Mom and Dad have used none of their lifetime gift tax exclusions on previous gifts.

i) How much gift taxes would they have to pay on their gain in the land?

*The gift exceeds the annual exclusion and would thus trigger gift tax, except none of the lifetime exclusion has been claimed yet, so both Mom and Dad can claim half of the gift value and not owe any gift taxes.*

ii) What is Son’s basis for the land?

*Basis carries over with the gift, so his basis is the same as M & D’s basis = \$100,000.*

**c) (5 pts.)** Suppose Mom dies and then Dad gives the land to Son.

i) After Mom dies, what is Dad’s basis in the land?

*Dad’s basis updates to the fair market value on the day of her death, which here is \$400,000.*

i) What is Son's basis for the land?

*The basis carries over with the gift, so the Son's basis equals the Dad's newly updated basis of \$400,000.*

**13) (13 pts. total)** Use the simplified Balance Sheet and Income Statement below to answer these questions. Show your work for potential partial credit.

<b>BALANCE SHEET</b>	<b>12/31/2007</b>	<b>12/31/2006</b>		<b>12/31/2007</b>	<b>12/31/2006</b>
Current Assets	800,000	700,000	Current Liabilities	600,000	575,000
Non-Current Assets	1,600,000	1,500,000	Non-Current Liabilities	750,000	800,000
			Total Liabilities	1,350,000	1,375,000
			Equity	1,050,000	825,000
Total Assets	2,400,000	2,200,000	Total Liabilities and Equity	2,400,000	2,200,000

**a) (3 pts.)** What is the Current Ratio on 12/31/2007?

$$CR = \text{current assets} / \text{current liabilities} = 800,000 / 600,000 = 1.333$$

**b) (3 pts.)** What is the Debt to Asset Ratio on 12/31/2007?

$$D:A = \text{total liabilities} / \text{total assets} = 1,350,000 / 2,400,000 = 0.563$$

**INCOME STATEMENT 12/31/2006 to 12/31/2007**

Crop Sales	375,000
Livestock Sales	325,000
Gross Revenue	700,000
Operating Expenses	375,000
Depreciation	60,000
Interest Expenses	50,000
Total Costs	485,000
Net Farm Income from Operations	215,000

**c) (7 pts.)** Assume the farm family paid themselves \$50,000 for their labor & management. What is this farm's Return on Assets? What is this farm's Rate of Return on Assets?

$$ROA = \text{Revenue} - \text{Operating Expenses} - \text{Unpaid Labor/Management}$$

$$ROA = 700,000 - 375,000 - 60,000 - 50,000 = 215,000$$

$$ROROA = ROA / \text{Avg Assets} = 215,000 / [\frac{1}{2}(2,400,000 + 2,200,000)] = 215,000 / 2,300,000 = 9.35\%$$