

1) (20 pts. total, 2 pts. each) Based on class discussion, True or False? Mark your answer.

- a) T ___ F X Area Yield Protection is by far the most popular crop insurance policy for corn and soybean growers in Wisconsin.
- b) T X F ___ Almost all US farms use cash accounting.
- c) T X F ___ The number of dairy farmers in Wisconsin has been decreasing and average herd size increasing.
- d) T X F ___ Because the government subsidizes crop insurance premiums, on average over the long run, farmers should make money with crop insurance.
- e) T X F ___ Farmers commonly endure multi-year periods of negative margins (prices below cost of production), but 2021 and 2022 were high income years.
- f) T X F ___ Government support payments to farmers look to be back to normal in 2022 after much higher payments in 2020 and 2021 due to the pandemic.
- g) T X F ___ In 2021 and 2022, land values increased in Wisconsin and many states, which, on a market basis balance sheet, increases owner equity.
- h) T ___ F X The farmer's share of money spent on food by consumers is by far the largest of all parts along the food supply chain.
- i) T X F ___ Farmers buy Revenue Protection from a crop insurance company & enroll base acres in Agriculture Risk Coverage with the Farm Service Agency.
- j) T ___ F X Most USDA spending is for farmer support programs, not Supplemental Nutrition Assistance Program (SNAP) or the school lunch program.

2a) (6 pts.) What does a farmer need to do to be eligible to enroll for the potential to receive corn Price Loss Coverage (PLC) or County Agriculture Risk Coverage (County ARC) payments?

Operate a farm with corn base acres.

ii) What triggers a corn PLC payment for eligible farmers?

National Marketing Year Average Price for corn less than the Reference Price (\$3.70).

iii) What triggers a corn County ARC Payment for eligible farmers?

Actual County Revenue less than the County Revenue Guarantee for that county (which depends on the Olympic average of historical county average corn yields and the national marketing year average corn price).

2b) (4 pts.) In 2022, you plant 160 acres of corn on a farm that has 80 corn base acres enrolled in PLC with a 150 bu/ac payment yield. You harvest 180 bu/ac and sell it for \$5.75/bu, though the 2022 USDA national marketing year average price is \$5.85, and the Reference Price is \$3.70. What is your 2022 PLC payment for the farm?

The national marketing year average price of \$5.85 > Reference Price of \$3.70, so no PLC payment is triggered

2c) (10 pts.) In 2022, you plant 60 acres of soybeans on a farm that has 90 soybean base acres enrolled in County ARC. The county guarantee is \$420/ac for 2022. Your actual soybean yield was 50 bu/ac and you sold the soybeans for \$9.50/bu. The USDA announces that the 2022 county average yield is 40 bu/ac and the USDA national marketing year average price is \$10.00.
i) What is your 2022 County ARC payment for soybeans for this farm?

Actual County Revenue = 40 bu/ac x \$10.00/bu = \$400/ac, which is less than the guarantee of \$420/ac, so an ARC Payment is triggered = 85% x 90 base acres x (\$420 - \$400) = \$1,530

ii) How much would your County ARC payment decrease if you sold your soybeans for \$10.20?

No change

iii) How much would your County ARC payment increase if you never sold any of the soybeans, but instead used them to make biodiesel on your farm?

No change

iv) How much would your County ARC payment decrease if you receive a crop insurance indemnity for \$1,800?

No change (no connection between crop insurance and payments)

v) Would you lose the County ARC payment for soybeans if you had planted only corn?

No (payment depends on base acres, not accrual crop planted)

3) (3 pts) A dairy farm with historical average milk production of 3,000,000 pounds per year, or 30,000 cwt per year or $30,000 / 12 = 2,500$ cwt per month, enrolls in the Dairy Margin Coverage (DMC) program, buying the \$9.50 margin guarantee at a coverage rate of 95%. Suppose in December, the all milk price is \$23.00/cwt and the announced DMC feed ration cost is \$15.00/cwt, so the actual margin is $\$23 - \$15 = \$8.00$ /cwt.

What DMC payment would the farm receive that month with a coverage rate of 95%?

Payment Rate = $(\$9.50 - \$8.00) = \$1.50$ /cwt

DMC Payment = $95\% \times 2,500 \text{ cwt} \times \$1.50/\text{cwt} = \underline{\underline{\$3,562.50}}$

4) (16 pts. total) Your farm has 60 soybean base acres with a payment yield of 40 bu/ac, or $60 \times 40 = 2,400$ bu of soybeans. You planted 80 soybean acres and bought 75% Yield Protection (YP) with a guarantee of $75\% \times 60 \text{ bu/ac} \times 80 \text{ ac} = 3,600$ bushels. Your harvested yield averaged 55 bu/ac $\times 80 \text{ acres} = 4,400$ bushels. You bought 2,000 bushels of soybeans from a neighbor.

4a) (5 pts.) Suppose you want to get a Marketing Assistance Loan (MAL). Place an X by ALL of the following options that you can use as collateral for a MAL.

- A The 2,000 bushels of soybeans you bought from your neighbor
- B The 4,400 bushels of soybeans you harvested from your farm
- C The 2,400 bushels of soybeans calculated from your base acres
- D The 3,600 bushels of soybeans from your YP yield guarantee
- E A MAL does not need grain as collateral

4b) (2 pts.) You use 1,000 bushels of eligible soybeans as collateral for a Marketing Assistance Loan (MAL). Using a soybean loan rate of \$6.20/bu, how large would your loan be?

$$MAL = 1,000 \text{ bu} \times \$6.20/\text{bu} = \underline{\$6,200}$$

4c) (6 pts.) For this MAL, place an X by ALL the following cases in which you would also receive a Loan Deficiency Payment (pay back less than you borrowed).

- A Pay back the MAL when the Posted County Price is less than the Loan Rate
- B Pay back the MAL when the National Marketing Year Average Price is less than the PLC Reference price of \$8.40/bu
- C Pay back the MAL using soybeans harvested from your soybean base acres
- D Pay back the MAL using a Revenue Protection indemnity, but only if you had the Harvest Price Exclusion
- E Pay back the MAL on a day when a state-certified grain buyer using Chicago Mercantile Exchange data has a price less than the Loan Rate
- F You would not receive a Loan Deficiency Payment under any of these conditions

4d) (2 pts.) What is the main benefit to farmers for using Marketing Assistance Loans, even if they do not expect to receive Loan Deficiency Payments?

The program provides short-term low interest loans to help farmers manage cash flow at harvest time so they can pay back operating loans usually due right after harvest and hold the grain to sell later when prices tend to be higher.

5) (8 pts. total) You insure 500 acres of corn in one unit with an average yield of 180 bu/ac.

5a) (4 pts.) You buy 80% Yield Protection (YP) crop insurance and choose the \$5.80/bu price election. What is your per acre yield guarantee? What is the total yield guarantee for the unit?

$$\text{Per Acre Guarantee} = 80\% \times 180 \text{ bu/ac} = \underline{144 \text{ bu/ac}}$$

$$\text{Unit Guarantee} = 144 \text{ bu/ac} \times 500 \text{ ac} = \underline{72,000 \text{ bu}}$$

5b) (4 pts.) You harvest a yield of 140 bu/ac from the unit and sell it for \$6.20/bu.

i) How many bushels do you harvest from the unit?

$$\text{Harvest} = 140 \text{ bu/ac} \times 500 \text{ ac} = \underline{\underline{70,000 \text{ bu}}}$$

ii) What would be your insurance indemnity?

70,000 bu < 72,000 bu guarantee, so triggers an indemnity.

$$\text{Indemnity} = \$5.80 \times (72,000 - 70,000) = \underline{\underline{\$11,600}}$$

6) (14 pts. total) You insure 400 acres of soybeans in one unit with an average yield of 50 bu/ac.

6a) (4 pts.) You buy 75% Revenue Protection (RP) crop insurance with a \$13.00/bu Base Price.

What is the initial per acre revenue guarantee? What is the initial revenue guarantee for the unit?

$$\text{Initial per acre revenue guarantee} = 75\% \times \$13.00/\text{bu} \times 50 \text{ bu/ac} = \underline{\underline{\$487.50/\text{ac}}}$$

$$\text{Initial revenue guarantee for the unit} = \$487.50/\text{ac} \times 400 \text{ ac} = \underline{\underline{\$195,000}}$$

For 6b and 6c, the price increases over the season so that the official Harvest Price is \$14.00/bu.

6b) (2 pts.) What is the final revenue guarantee for the unit?

Maximum of base price and harvest price is \$14.00/bu, so the Final Guarantee is updated to

$$75\% \times \$14.00/\text{bu} \times 50 \text{ bu/ac} = \$525/\text{ac} \text{ and } \times 150 \text{ ac} = \underline{\underline{\$210,000}}$$

6c) (2 pts.) You harvest 14,000 bushels of soybeans from the unit, what is your insurance indemnity?

Actual Revenue = 14,000 bu x \$14.00/bu = \$196,000, which is less than the Final Guarantee of \$210,000, so triggers an indemnity. Indemnity = \$210,000 - \$196,000 = \$14,000.

For 6d to 6f, the price decreases over the season so that the official Harvest Price is \$12.00/bu.

6d) (2 pts.) What is the final revenue guarantee for the unit?

Maximum of base price and harvest price is \$13.00/bu, so the Final Guarantee remains unchanged at \$195,000.

6e) (2 pts.) You harvest 14,000 bushels of soybeans from the unit, what is your insurance indemnity?

Actual Revenue = 14,000 bu x \$12.00/bu = \$168,000, which is less than the Final Guarantee of \$195,000, so triggers an indemnity. Indemnity = \$195,000 - \$168,000 = \$27,000.

6f) (2 pts.) Suppose you sell the harvested soybeans for \$13.00/bu in May. How much would your crop insurance indemnity decrease?

Not at all, no change (indemnity depends on the CME prices, not the actual prices you receive)

7 (9 pts.) Mark an X in each box to indicate which yield and price each program or policy uses to determine payments. Note, each column will have at least one X for Yield and for Price.

	ARP: Area Revenue Protection	ARC: Agriculture Risk Coverage	RP: Revenue Protection
<u>Yield</u>			
County Average Yield	X	X	
Payment Yield for Base Acres			
Actual Farm Yield			X
<u>Price</u>			
Actual Average Farm Price			
Chicago Mercantile Exchange Price	X		X
Posted County Price			
National Marketing Year Average Price		X	

8a) (2 pts.) What triggers an indemnity for the Area Revenue Protection (ARP) crop insurance?

Actual county revenue below the county revenue guarantee the farmer chooses. Actual county revenue is the county average yield announced by USDA NASS multiplied by the harvest price based on the Chicago Mercantile Exchange prices for futures contracts.

8b) (4 pts.) You insure 300 acres of corn with an Area Revenue Protection (ARP) crop insurance policy with a 90% coverage level. Your average yield is 220 bu/ac, the county average yield is 190 bu/ac. The Base Price is \$5.70/bu, so the initial county revenue guarantee is 90% x 190 bu/ac x \$5.70/bu = \$974.70/ac. Your actual farm yield is 190 bu/ac while the actual county yield is 170 bu/ac. The official Harvest Price is \$5.50/bu. You sell the corn for \$5.60/bu. What would be the total insurance indemnity for all 300 acres?

*Final revenue guarantee = 90% x 190 bu/ac x max(\$5.70, \$5.50) = \$974.70/ac [no change]
 Actual county revenue = 170 bu/ac x \$5.50 = \$935/ac
 Indemnity per acre = \$974.70 – \$935 = \$39.70/ac
 Total Indemnity = \$39.70/ac x 300 ac = **\$11,910***

8c) (4 pts.) Mark an X in the box indicating how each event directly affects the ARP indemnity.

Event	Increase It	Decrease It	No Change
Your farm yield falls below 120 bu/ac due to hail			X
You sell the corn to neighbor for \$6.00/bu			X
The harvest price falls to \$5.20 due to tariffs	X		
Flooding causes county yield to fall to 120 bu/ac	X		

9) (4 pts. total) Answer the following questions about business entities discussed in class (sole proprietor, partnership, C- and S-corporations, limited liability company).

9a) (2 pts.) Which business entities must register with the state's Department of Financial Institutions to be a legal business entity?

C and S Corporations and LLCs must register

9b) (2 pts.) Besides sole proprietors, which of these business entities do not pay taxes on their income, but pass the income through to the owners who pay taxes?

LLCs, S corporations and all kinds of Partnerships (both general and limited)

10) (8 pts. total) Provide short answers to these questions. Mom and Dad own a farm, with all assets owned as marital property under Wisconsin's marital property law. Among their assets is land worth \$500,000 with a tax basis of \$100,000 and corn worth \$100,000 with a \$0 tax basis (they raised it). Answer each question below.

10c) (2 pts.) Suppose Mom and Dad sell the land for \$500,000 and corn for \$100,000. They file joint taxes. How much gain must they report for tax purposes?

Land Gain = \$500,000 - \$100,000 = \$400,000 (Gain = sale price - basis)

Corn Gain = \$100,000 - \$0 = \$100,000

10d) (2 pts.) Considering ordinary income tax, self-employment tax, and capital gain tax, which one or ones of these taxes would they owe on this gain from the land sale? Which one or ones of these taxes would they owe on this gain from the corn sale?

Tax types owed on Land sale = Capital Gains

Tax types owed on Corn sale = Ordinary Income and Self-Employment

10a) (2 pts.) Suppose Mom and Dad give the land and corn to their son named Son. How much gain must Mom and Dad report for tax purposes?

Land Gain = None, gift does not trigger recognition of gain

Corn Gain = None, gift does not trigger recognition of gain

10b) (2 pts.) What is Son's tax basis in the land and in the corn?

Land Basis = \$100,000, basis transfers with gift

Corn Basis = \$0, basis transfers with gift

11) (9 pts.) On your farm you grow corn, with an average yield of 200 bu/acre and an expected corn price of \$5.80/bu. You are considering whether to switch to no-till. Your cost of field preparation is currently \$25/ac for pre-planting tillage, which would be \$0/ac with no-till. Your current cost of planting is \$30/ac and would increase to \$35/ac with the new no-till planter. With no-till, you would increase your nitrogen fertilizer rate by 10 pounds per acre (to help decompose the crop residue) and nitrogen costs \$0.50 per pound. With no-till, your yield would decrease 1%.

a) (7 pts.) Use the given information to conduct a partial budget analysis of this switch to using a seed treatment by filling in the table below. Show your calculations in the space provided.

Benefits		Costs	
<u>Additional Revenues</u> What new revenue will be generated? None		<u>Additional Costs</u> What new costs will be added? $\$35 - \$30 = \$5/\text{ac}$ for no-till planter $10 \text{ lbs/ac} \times \$0.50/\text{lb} = \$5/\text{ac}$ for N fertilizer Total is $\$5 + \$5 = \$10/\text{ac}$	
<u>Costs Reduced</u> What costs will be eliminated? $\$25/\text{ac}$ for pre-plant tillage		<u>Revenues Reduced</u> What revenues will be lost? $1\% \times 200 \text{ bu} \times \$5.80 = \$11.60$	
Total Benefits (\$/ac)	\$25/ac	Total Costs (\$/ac)	\$10 + \$11.60 = \$21.60/ac
Total Benefits – Total Costs = Net Benefit (\$/ac)			\$25 - \$21.60 = \$3.40/ac

b) (2 pts.) Based on your results, considering only the money you would earn, is switching to no-till a profitable change? Briefly explain.

***Yes**, these calculations indicate a **gain** of \$3.40 per acre*

12) (8 pts. total) You are re-evaluating your nitrogen use for your corn due to the recent price increase. This table gives the nitrogen applied (pounds/ac) and corn yield (bu/ac) on your farm.

Nitrogen (pounds/ac)	Yield (bu/ac)	Marginal Product	Value of Marginal Product
120	210	--	--
130	220	<i>1.0</i>	<i>\$6.00</i>
140	225	<i>0.5</i>	<i>\$3.00</i>
150	227	<i>0.2</i>	<i>\$1.20</i>
160	228	<i>0.1</i>	<i>\$0.60</i>

12a) (2 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.

$$MP = \Delta Q / \Delta X = (220 - 210) / (130 - 120) = 10 / 10 = 1.0$$

12b) (2 pts.) Corn sells for \$6.00/bu. 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.

$$VMP = P \times MP = \$6.00 \times 1.0 = \$6.00$$

12c) (2 pts.) If nitrogen costs \$0.60 per pound, what is the profit maximizing amount to apply based on the table above (you may need to interpolate between entries)?

$$VMP = \text{input price, here} = \$0.60/\text{pound, which occurs at } \underline{\text{Nitrogen} = 160 \text{ pounds/acre}}$$

13) (14 pts. total) In 2020 you bought a used seeder for **\$70,000** to plant cover crops.

13a) (2 pts.) For your internal farm accounting you plan to keep the seeder for 4 years. Calculate annual depreciation for the seeder assuming a **\$10,000 salvage value**. Fill in the table using **Straight Line Depreciation**. Show your work for potential partial credit.

Year	Depreciation During Year	Value at Year End
2020	<i>15,000</i>	<i>55,000</i>
2021	<i>15,000</i>	<i>40,000</i>
2022	<i>15,000</i>	<i>25,000</i>
2023	<i>15,000</i>	<i>10,000</i>

$$\text{Depreciation} = 1/\text{UsefulLife} \times (\text{Price} - \text{SalvageValue}) = (1/4) \times (70,000 - 10,000) = 15,000$$

13b) (2 pts.) You have been depreciating the seeder you bought for \$70,000 for tax purposes using the IRS tax table below. Enter depreciation claimed in 2020 and 2021 in the table below.

Year	Tax Year	Depreciation Rate	Depreciation Claimed
1	2020	23.00%	$\$70,000 \times 23\% = \underline{\$16,100}$
2	2021	19.63%	$\$70,000 \times 19.63\% = \underline{\$13,741}$
3	2022	15.11%	
4	2023	9.93%	
5	2024	9.75%	
6	2025	9.74%	
7	2026	9.75%	
8	2027	3.09%	

13c) (2 pts.) What was your income tax basis in the seeder at the beginning of 2022?

Basis = purchase price – total depreciation claimed = \$70,000 – \$16,100 – \$13,741 = \$40,159

13d) (2 pts.) If you sold the seeder at the beginning of 2022 for \$50,000, how much gain or loss would you report on your income tax return?

Gain = sale price – basis = \$50,000 – \$40,159 = \$9,841

For parts e through g below, rather than using the table in part b, suppose instead you chose the Section 179 election and deducted the full cost of the planter for your 2020 taxes.

13e) (2 pts.) What is your income tax basis in the seeder at the beginning of 2022?

*Basis = purchase price – depreciation claimed = \$0 **ZERO BASIS***

13f) (2 pts.) If you sold the seeder at the beginning of 2022 for \$50,000, how much gain or loss would you report on your income tax return? Which of the following taxes would be owed for this gain: ordinary income, self-employment, and/or capital gains?

Gain = sale price – basis = \$50,000 – \$0 = \$50,000

Depreciation recapture is only subject to Ordinary Income Tax (not self-employment)

13g) (2 pts.) Briefly explain the tax benefit that farmers gain by choosing the Section 179 election for depreciating purchased machinery like this seeder.

The main benefit is that you avoid paying the self-employment tax of 15.3% on the value of the depreciation claimed (here \$50,000 x 15.3% = \$7,650), since when you do sell the asset, the gain is only taxed as ordinary income.

Minor benefits (not required) include using the deduction initially to potentially lower your tax bracket for other taxable income, but this can be partially offset by the increased income when you sell the asset, potentially increasing your tax bracket later (to a lesser extent).

14) (12 pts. total) Use the simplified Balance Sheet and Income Statement below to answer these questions. Show your work for potential partial credit.

BALANCE SHEET					
	1/1/2022	1/1/2021		1/1/2022	1/1/2021
Current Assets	800,000	700,000	Current Liabilities	500,000	450,000
Non-Current Assets	3,000,000	2,800,000	Non-Current Liabilities	1,000,000	900,000
			Total Liabilities	1,500,000	1,350,000
			Equity	2,300,000	2,150,000
Total Assets	3,800,000	3,500,000	Total Liabilities and Equity	3,800,000	3,500,000

14a) (2 pts.) What was the Current Ratio on 1/1/2022?

$$CR = \text{current assets} / \text{current liabilities} = 800,000 / 500,000 = \underline{1.6}$$

14b) (2 pts.) What was the Debt to Asset Ratio on 1/1/2022?

$$D \text{ to } A = \text{total liabilities} / \text{total assets} = 1,500,000 / 3,800,000 = \underline{0.395}$$

INCOME STATEMENT 1/1/2021 to 1/1/2022

Crop and Livestock Sales	1,000,000
Operating Expenses	700,000
Interest Expenses	50,000
Net Farm Income from Operations	250,000

Assume the farm family paid themselves \$100,000 for their labor & management.

14c) (2 pts.) What is this farm's Return on Assets?

$$ROA = \text{Net Farm Income} + \text{Interest} - \text{Unpaid Labor \& Mgmt} = 250,000 + 50,000 - 100,000 = \underline{200,000}$$

14d) (2 pts.) What is this farm's Rate of Return on Assets?

$$ROROA = ROA / \text{Avg Assets} = 200,000 / \frac{1}{2}(3,800,000 + 3,500,000) = \underline{5.48\%}$$

14e) (2 pts.) What is this farm's Return on Equity?

$$ROE = ROA - \text{Interest} = 200,000 - 50,000 = \underline{150,000}$$

14f) (2 pts.) What is this farm's Rate of Return on Equity?

$$ROROE = ROE / \text{Avg Equity} = 150,000 / \frac{1}{2}(2,300,000 + 2,150,000) = \underline{6.74\%}$$

14g) (2 pts.) What is this farm's Profit Margin?

$$\text{Profit Margin} = ROA / \text{Revenue} = 200,000 / 1,000,000 = \underline{20.0\%}$$

15) (10 pts) Corn yield as a function of the nitrogen fertilizer rate is $Q = 10 + 3N - 0.01N^2$, where yield Q is total bushels of corn per acre and the nitrogen application rate N is in pounds of N per acre. The corn price is \$6 per bushel and nitrogen fertilizer costs \$0.70 per pound of N . There is no need for price conversions to use this production function.

What is the economically optimal nitrogen rate for corn? Set up and solve this economic problem using calculus and the given information. Check the second order condition.

$$\begin{aligned} \text{Set up profit:} & \quad \pi = p \cdot f(x) - r \cdot x = 6(10 + 3N - 0.01N^2) - 0.7N \\ \text{FOC} & \quad d\pi/dN = 6(3 - 0.02N) - 0.7 = 0 \\ \text{Solve FOC for } X: & \quad 18 - 0.12N = 0.7 \\ & \quad 17.3 = 0.12N \quad \quad N = 17.3/0.12 = \underline{\underline{144.2 \text{ pounds}}} \\ \text{SOC:} & \quad d^2\pi/dN^2 = -0.12 < 0, \text{ which satisfies SOC for maximum} \end{aligned}$$