

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

- a) T X F ___ Farmers buy crop insurance from crop insurance companies and sign up for commodity support programs at the USDA Farm Service Agency.
- b) T ___ F X Most Wisconsin corn and soybean growers insure their crops using Area Revenue Protection of Yield (ARPY) with a 90% or 95% coverage level.
- c) T X F ___ In the US, though accrual accounting is the business standard, most farms use cash accounting.
- d) T ___ F X USDA data shows that most (> 80%) Wisconsin farms are fairly large (>800 acres) with more than \$800,000 in annual sales.
- e) T X F ___ Crop insurance premiums are subsidized so that farmers pay less than the actuarially fair premium.
- f) T X F ___ One reason farmers use too much of some inputs (put some more on) is that underuse is obvious, overuse is invisible and the inputs are low cost.
- g) T X F ___ Dairy Margin Coverage (DMC) is a commodity support program for dairy farmers run by the USDA-FSA.
- h) T X F ___ The Market Facilitation Program (MFP) is a temporary program to pay farmers in 2018 and 2019 for losses due to tariffs from the trade wars.
- i) T X F ___ As Dr. Brian Luck discussed, most farmers will likely use crop consultants or other specialists to manage their data and make management decisions.
- j) T X F ___ Agricultural supply and food demand are relatively inelastic – prices vary widely, but farmers and food consumers make small quantity changes.

2a) (6 pts.) What is required for a farmer 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

Suppose a farmer is eligible—what triggers a corn PLC Payment?

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

Suppose a farmer is eligible—what triggers a corn County ARC Payment?

Actual County Revenue less than the county revenue guarantee for that county

2b) (6 pts.) You operate a farm that has 50 corn base acres enrolled in County ARC. The county guarantee is \$600/ac for 2019. The USDA announces that the 2019 county average yield is 180 bu/ac and the USDA national marketing year average price is \$3.40. Your actual corn yield for the farm was 200 bu/ac and you sold the corn for \$3.60/bu. What is your 2019 County ARC payment for the farm? (Remember you only receive 85% of the full payment).

Actual County Revenue = 180 bu/ac x \$3.40/bu = \$612/ac > \$600 guarantee, NO payment triggered, so ARC Payment = 85% x 40 ac x 0 = \$0

What is your 2019 County ARC payment if instead you sell your 2019 corn crop for \$3.20?

The same, still \$0

What is your 2019 County ARC payment if you receive an insurance indemnity of \$35 per acre?

The same, still \$0

What is your 2019 County ARC payment for corn if you only plant soybeans on the farm?

The same, still \$0

2c) (4 pts.) You plant 35 acres of soybeans on a farm with 40 soybean base acres enrolled in PLC with a 40 bu/ac payment yield. The 2019 USDA national marketing year average price is \$8.30. You harvest 35 bu/ac and sell it at \$8.20/bu. The PLC Reference price is \$8.40/bu. What is your 2019 PLC payment for the farm? (Remember you only receive 85% of the full payment).

*National marketing year average price of \$8.30 < Reference Price of \$8.40, payment triggered
PLC payment = 85% x 40 ac x 40 bu/ac x (\$8.40 - \$8.30) = \$136*

What is your 2019 PLC payment if you feed all of your 2019 soybean crop to your livestock?

The same, still \$136

3) (16 pts. total) Your farm has 100 corn base acres with a payment yield of 150 bu/ac, or 100 x 150 = 15,000 bu of corn. You planted 120 corn acres with 75% Yield Protection (YP) insurance and a guarantee of 75% x 180 bu/ac x 120 ac = 16,200 bushels. Your harvested yield averaged 200 bu/ac x 120 acres = 24,000 bushels. You bought 10,000 bushels of corn from a neighbor.

3a) (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 10,000 bushels of corn you bought from your neighbor
- B The 16,200 bushels of corn from your YP yield guarantee
- C The 15,000 bushels of corn from your base acres
- D The 24,000 bushels of corn you harvested from your farm
- E None of these, you need to have Revenue Protection (RP) to get a MAL

3b) (2 pts.) You use 8,000 bushels of eligible corn as collateral for a Marketing Assistance Loan (MAL). Using a corn loan rate of \$2.20/bu, how large would your loan be?

$$MAL = 8,000 \text{ bu} \times \$2.20/\text{bu} = \$17,600$$

3c) (6 pts.) For this MAL, place an X by ALL of the following cases in which you would also receive a Loan Deficiency Payment.

- A ___ Pay back the MAL when the National Marketing Year Average Price is less than the target price for counter-cyclical payments
- B ___ Pay back the MAL using corn from your corn base acres
- C ___ Pay back the MAL with a PLC (Price Loss Coverage) or county ARC (Agriculture Risk Coverage) payment
- D ___ Pay back the MAL with a Yield Protection (YP) or Revenue Protection (RP) crop insurance indemnity
- E ___ Pay back the MAL when the Chicago Mercantile Exchange's November average of the December corn futures price is less than the loan rate
- F X You would not receive a Loan Deficiency Payment under any of these conditions

3d) (3 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 low interest loans to help farmers manage cash flow issues, such as to pay back an operating loan due right after harvest, so they can hold the grain and sell later when prices tend to be higher.

4) (10 pts. total) You insure 400 acres of corn in one unit with an average yield of 175 bu/ac.

4a) (4 pts.) You buy 75% Yield Protection (YP) crop insurance. What is your per acre yield guarantee? What is the total yield guarantee for your 400 acre unit?

$$\text{Per Acre Guarantee} = 75\% \times 175 \text{ bu/ac} = 131.25 \text{ bu/ac}$$

$$\text{Unit Guarantee} = 131.25 \text{ bu/ac} \times 400 \text{ ac} = 52,500 \text{ bu}$$

4b) (4 pts.) You harvest a yield of 150 bu/ac from the unit. How many bushels do you harvest from the unit? What would be your insurance indemnity with a price election of \$4.00/bu?

$$\text{Harvest} = 150 \text{ bu/ac} \times 400 \text{ ac} = 60,000 \text{ bu from the unit}$$

$$60,000 \text{ bu} > 52,500 \text{ bu guarantee, NO indemnity triggered}$$

$$\text{Indemnity} = \$4.00 \times 0 = \$0$$

4c) (2 pts.) Again, you harvest a yield of 150 bu/ac from the 400 acre unit. What will be your indemnity with a price election of \$4.00/bu if you actually sell the corn for \$3.50/bu?

The same, \$0

5) (14 pts. total) Suppose a farm has 90 acres of soybeans in one insured unit with an average yield of 40 bu/ac as established by crop insurance rules and the Base Price is \$9.00/bu.

5a) (4 pts.) Suppose the farm buys 80% Revenue Protection (RP) crop insurance. What is the initial per acre revenue guarantee? What is the initial revenue guarantee for the 90 acre unit?

$$\text{Initial per acre revenue guarantee} = 80\% \times \$9.00/\text{bu} \times 40 \text{ bu/ac} = \$288/\text{ac}$$

$$\text{Initial revenue guarantee for the unit} = \$288/\text{ac} \times 90 \text{ ac} = \$25,920$$

For 5b and 5c, the price increases over the season so that the official Harvest Price is \$10.00/bu.

5b) (2 pts.) What is the final revenue guarantee for the 90 acre unit?

Maximum of base price and harvest price is now \$10/bu, so the Final Guarantee is updated to $80\% \times \$10/\text{bu} \times 40 \text{ bu/ac} = \$320/\text{ac}$ and $\times 90 \text{ ac} = \$28,800$

5c) (2 pts.) Suppose the farmer actually harvests 2,700 bushels of soybeans from the unit, what would be the insurance indemnity, if any?

Actual Revenue = $2,700 \text{ bu} \times \$10.00/\text{bu} = \$27,000$, which is less than the Final Guarantee of \$28,800, so an indemnity is triggered

$$\text{Indemnity} = \$28,800 - \$27,000 = \$1,800$$

For 5d to 5f, the price decreases over the season so that the official Harvest Price is \$8.00/bu.

5d) (2 pts.) What is the final revenue guarantee for the 90 acre unit?

Maximum of base price and harvest price is still \$9/bu, so the Final Guarantee is remains unchanged at \$25,920

5e) (2 pts.) Suppose the farmer actually harvests 2,700 bushels of soybeans from the unit, what would be the insurance indemnity, if any?

Actual Revenue = $2,700 \text{ bu} \times \$8.00/\text{bu} = \$21,600$, which is less than the Final Guarantee of \$25,920, so an indemnity is triggered

$$\text{Indemnity} = \$25,920 - \$21,600 = \$4,320$$

5f) (2 pts.) Suppose the farmer actually sold the harvested soybeans for \$9.00/bu in May. How much would the crop insurance indemnity change?

The indemnity does not depend on the price the farmer actually receives, so there is no change.

6 (12 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 Price.

	PLC: Price Loss Coverage	AYP: Area Yield Protection	RP: Yield Protection
<u>Yield</u>			
Actual Farm Yield			X
County Average Yield		X	
Payment Yield for Base Acres	X		
<u>Price</u>			
Actual Farm Price			
Chicago Mercantile Exchange Price		X	X
National Marketing Year Average Price	X		

7a) (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 county average yield announced by USDA NASS multiplied by the harvest price based on the Chicago Mercantile Exchange prices for futures contracts.

7b) (4 pts.) You insure 200 acres of corn with an Area Revenue Protection (ARP) crop insurance policy with a 90% coverage level. The base price is \$4.00/bu, so the initial county revenue guarantee is $90\% \times 190 \text{ bu/ac} \times \$4.00/\text{bu} = \$684/\text{ac}$. Actual county yield is 160 bu/ac and actual farm yield is 150 bu/ac. The official harvest price is \$3.90/bu, but you sell the corn for \$3.50/bu. What would be the total insurance indemnity for all 200 acres?

*Final revenue guarantee = $90\% \times 190 \text{ bu/ac} \times \max(\$4.00, \$3.90) = \$684/\text{ac}$ [No Change]
 Actual county revenue = $160 \text{ bu/ac} \times \$3.90 = \$624/\text{ac}$
 Indemnity per acre = $\$684 - \$624 = \$60/\text{ac}$
 Total Indemnity = $\$60/\text{ac} \times 200 \text{ ac} = \underline{\underline{\$12,000}}$*

7c) (4 pts.) Mark an X the box indicating how each event directly affects the ARP indemnity.

Event	Increase It	Decrease It	No Change
You don't sell your corn, but feed it to livestock			X
Flooding causes county yield to fall to 100 bu/ac	X		
Due to hail, your farm yield falls to 100 bu/ac			X
Tariffs cause the harvest price to fall to \$3.40	X		

8) (4 pts. total) Answer the following questions about business entities discussed in class (sole proprietor, partnership, C- and S-corporations, limited liability company) and financial liability.

8a) (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, LLC, plus limited partnerships for limited partners

8b) (2 pts.) The owners of which of these business entities do not have their personal assets directly liable to pay the financial liabilities of the business?

C and S Corporations, LLC, plus limited partnerships for limited partners

9) (8 pts. total) Provide short answers to these questions. Jonathan and Taylor own a farm, with all assets owned as marital property with a right of survivorship under Wisconsin's marital property law. Among their assets is land worth \$400,000 with a tax basis of \$100,000 and corn worth \$80,000 with a \$0 tax basis (they raised it). Answer each question below.

9a) (2 pts.) If Jonathan and Taylor gave the land and corn to their son. How much gain would be triggered that Jonathan and Taylor must report for tax purposes?

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

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

9b) (2 pts.) What is their 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*

9c) (2 pts.) If their son then sold the land for \$400,000 and corn for \$80,000, how much gain must he report for tax purposes?

Land Gain = *\$400,000 - \$100,000 = \$300,000*

Corn Gain = *\$80,000 - \$0 = \$80,000*

9d) (2 pts.) Considering ordinary income tax, self-employment tax, and capital gain tax, which one or ones of these taxes would their son owe on this gain from the land sale? Which one or ones of these taxes would their son owe on this gain from the corn sale?

Taxes types owed on Land sale = *Capital Gains*

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

10) (9 pts.) On your farm you grow soybeans, with an average yield of 60 bu/acre and an expected soybean price of \$9/bu. You are considering whether to use a seed treatment for early season insects and diseases. Talking to the sales person, you estimate that it will increase your yield by 2%, but it costs \$16 per acre. Also, because you get better stand establishment, you can plant fewer seeds per acre, reducing your seed costs per \$8 per acre.

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? <i>Value of Yield Gain</i> $2\% \times 60 \text{ bu/ac} \times \$9.00/\text{bu} = \$10.80/\text{ac}$		<u>Additional Costs</u> What new costs will be added? <i>\$16/ac for seed treatment</i>	
<u>Costs Reduced</u> What costs will be eliminated? <i>\$8/ac in lower seed costs</i>		<u>Revenues Reduced</u> What revenues will be lost? <i>None</i>	
Total Benefits (\$/ac)	<i>\$18.80/ac</i>	Total Costs (\$/ac)	<i>\$16.00/ac</i>
Total Benefits – Total Costs = Net Benefit (\$/ac)			<i>\$2.80/ac</i>

b) (2 pts.) Based on your results, considering only the money earned, is buying the soybean seed treatment a profitable change? Briefly explain.

Yes, the farmer will gain \$2.80/ac based on these assumptions.

11) (6 pts. total) You are deciding on nitrogen for your corn crop. This table gives the nitrogen applied (pounds/ac) and the corn yield (bu/ac).

Nitrogen (pounds/ac)	Yield (bu/ac)	Marginal Product	Value of Marginal Product
80	190	--	--
90	194	<i>0.4</i>	<i>\$1.60</i>
100	197	<i>0.3</i>	<i>\$1.20</i>
110	198	<i>0.1</i>	<i>\$0.40</i>

11a) (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.

$$MP = \Delta Q / \Delta X = (194 - 190) / (90 - 80) = 4 / 10 = 0.4$$

11b) (2 pts.) Corn sells for \$4.00/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.

$$VMP = P \times MP = \$4 \times 0.4 = \$1.60$$

11c) (2 pts.) If nitrogen costs \$0.40 per pound, what is the profit maximizing amount to apply based on the table above (you may need to interpolate between entries)?

$$VMP = \text{input price, here} = \$0.40, \text{ which occurs at Nitrogen} = 110 \text{ pounds/acre}$$

12) (10 pts) Corn yield is $Y = 150 + 5N - 0.02N^2$, where Y is yield (bu/ac) and N is nitrogen fertilizer (pounds/ac). If the price of corn is \$4.00/bu and nitrogen costs \$0.40/pound, what is the profit maximizing amount of nitrogen to use? **Check the Second Order Condition.**

$$\text{Set up profit: } \pi = p * f(x) - r * x = 4(150 + 5N - 0.02N^2) - 0.4N$$

$$\text{FOC } d\pi/dN = 4(5 - 0.04N) - 0.4 = 0$$

$$\text{Solve FOC for X: } 20 - 0.16N = 0.4$$

$$19.6 = 0.16N \quad N = 19.6 / 0.16 = \underline{122.5 \text{ pounds}}$$

$$\text{SOC: } d^2 \pi / dN^2 = -0.16 < 0, \text{ which satisfies SOC for maximum}$$

13) (8 pts. total) The table below reports the cost of producing duck eggs on your farm.

Eggs (dozens/year)	Fixed Cost	Variable Cost	Total Cost	Marginal Cost	Average Total Cost
14,500	10,000	33,000	<i>43,000</i>	--	<i>2.97</i>
18,000	10,000	40,000	<i>50,000</i>	<i>2.00</i>	<i>2.78</i>
21,000	10,000	49,000	<i>59,000</i>	<i>3.00</i>	<i>2.81</i>
22,000	10,000	57,000	<i>67,000</i>	<i>8.00</i>	<i>3.05</i>

13a) (3 pts.) Using the table above, show how to calculate Total Cost, Marginal Cost & Average Total Cost, then fill in the table's missing values. Show your work for potential partial credit.

$$TC = FC + VC = 10,000 + 33,000 = \$43,000$$

$$MC = \Delta TC / \Delta Q = (50,000 - 43,000) / (18,000 - 14,500) = 7,000 / 3,500 = \$2.00$$

$$ATC = TC / Q = 43,000 / 14,500 = \$2.97$$

13b) (2 pts.) Based on the information in the table, what is the profit maximizing number of duck eggs (dozens) to produce each year if a dozen sell for \$3.00 each?

$$Price = MC, \text{ here} = \$3.00, \text{ which occurs at } Q = 21,000 \text{ dozen duck eggs/year}$$

13c) (3 pts.) Based on your Average Total Cost numbers in the table, if the farm produces and sells this many dozens per year, will it earn a positive economic profit? How do you know?

$$\text{Yes, because the price } (\$3.00) \text{ is more than the average total cost of } \$2.81.$$

14) (14 pts. total) In 2017 you bought a used tractor for **\$160,000**.

14a) (2 pts.) For your internal farm accounting you plan to keep the tractor for 4 years. Calculate annual depreciation for the tractor assuming a **\$60,000 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
2017	<i>\$25,000</i>	<i>\$135,000</i>
2018	<i>\$25,000</i>	<i>\$110,000</i>
2019	<i>\$25,000</i>	<i>\$85,000</i>
2020	<i>\$25,000</i>	<i>\$60,000</i>

$$Deprec = 1/UsefulLife(Price - SalvageValue) = (1/4)*(160,000 - 60,000) = 25,000$$

14b) (2 pts.) You have been depreciating the tractor you bought for \$160,000 for tax purposes using the IRS tax table below. Enter depreciation claimed in 2017 and 2018 in the table below.

Year	Tax Year	Depreciation Rate	Depreciation Claimed	Basis at year end
1	2017	25.00%	$\$160,000 \times 25.00\% = \$40,000$	$\$160,000 - \$40,000 = \$120,000$
2	2018	21.43%	$\$160,000 \times 21.43\% = \$34,288$	$\$120,000 - \$34,288 = \$85,712$
3	2019	15.31%		
4	2020	10.93%		
5	2021	8.75%		
6	2022	8.74%		
7	2023	8.75%		
8	2024	1.09%		

14c) (2 pts.) What was your income tax basis in the tractor at the beginning of 2019?

$$\text{Basis} = \text{purchase price} - \text{total depreciation claimed} = \$160,000 - \$40,000 - \$34,288 = \$85,712$$

14d) (2 pts.) If you decided to sell the tractor at the beginning of 2019 for \$100,000, how much gain or loss would you report on your income tax return?

$$\text{Gain} = \text{sale price} - \text{basis} = \$100,000 - \$85,712 = \$14,288$$

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 tractor for your 2017 taxes.

14e) (2 pts.) What is your income tax basis in the tractor at the beginning of 2019?

$$\text{Basis} = \text{Purchase Price} - \text{Depreciation Claimed} = \$0 \quad \text{ZERO BASIS!}$$

14f) (2 pts.) If you sold the tractor at the beginning of 2019 for \$100,000, 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?

$$\text{Gain} = \text{sale price} - \text{basis} = \$100,000 - \$0 = \$100,000$$

*Depreciation recapture is only subject to **Ordinary Income Tax***

14g) (2 pts.) Briefly explain the tax benefit that farmers gain by choosing the Section 179 election for depreciating purchased machinery like this tractor.

*In short-term, reduce your taxable income by the amount you claim (here \$160,000), which may put you in a lower tax bracket for some of your income, and also delays any taxes due in the future years. In longer term, **you avoid paying the self-employment tax of 15.3%**, since when you do sell the asset, the gain is only taxed as ordinary income, but the avoided taxes when you first claimed the deduction reduced both ordinary income and self-employment taxes.*

15) (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					
	1/1/2019	1/1/2018		1/1/2019	1/1/2018
Current Assets	500,000	450,000	Current Liabilities	400,000	400,000
Non-Current Assets	2,000,000	1,800,000	Non-Current Liabilities	600,000	500,000
			Total Liabilities	1,000,000	900,000
			Equity	1,500,000	1,350,000
Total Assets	2,500,000	2,250,000	Total Liabilities and Equity	2,500,000	2,250,000

15a) (2 pts.) What is the Current Ratio on 1/1/2019?

$$CR = \text{current assets} / \text{current liabilities} = 500,000 / 400,000 = \underline{1.25}$$

15b) (2 pts.) What is the Debt to Asset Ratio on 1/1/2019?

$$D \text{ to } A = \text{total liabilities} / \text{total assets} = 1,000,000 / 2,500,000 = \underline{0.40}$$

INCOME STATEMENT 1/1/2018 to 12/31/2018

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.

15c) (2 pts.) What is this farm's Return on Assets?

$$ROA = \text{NFI} / \text{O} + \text{Interest} - \text{Unpaid Labor \& Mgmt} = 250,000 + 50,000 - 100,000 = \underline{200,000}$$

15d) (2 pts.) What is this farm's Rate of Return on Assets?

$$ROROA = ROA / \text{Avg Assets} = 200,000 / \frac{1}{2}(2,500,000 + 2,250,000) = \underline{8.42\%}$$

15e) (2 pts.) What is this farm's Return on Equity?

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

15f) (2 pts.) What is this farm's Rate of Return on Equity?

$$ROROE = ROE / \text{Avg Equity} = 150,000 / \frac{1}{2}(1,500,000 + 1,350,000) = \underline{10.53\%}$$