AAE 320 Fall 2020 **Final Exam** **Name: KEY**

1) (30 pts. total, 2 pts. each) True or False? Mark your answer.

a) T_X_ F___ Farmers buy crop insurance from crop insurance companies and signup for commodity support programs at the USDA Farm Service Agency.

b) T___ F_X_ Most Wisconsin corn and soybean farmers 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_X_ F___ USDA data shows that about 90% of US farms are small, with less than $350,000 in annual revenue.

e) T_X_ F___ Based on USDA data, owners/operators of many small farms in the US have other jobs or are retired.

f) T_X_ F___ Crop insurance premiums are subsidized so that farmers pay less than the actuarially fair premium.

g) T___ F_X_ Based on class discussion, despite structural racism problems in the US, the USDA has a long tradition of helping minorities buy farm land.

h) T_X_ F___ Dairy Margin Coverage (DMC) is a commodity support program for dairy farmers run by the USDA-FSA.

i) T_X_ F___ The Coronavirus Food Assistance Program (CFAP) is a temporary program to pay farmers for losses due to disruptions from the pandemic.

j) T_X_ F___ When using a cost basis balance sheet, equity only increases when the farm retains earnings and uses them to pay off debts.

k) T_X_ F___ When using a market basis balance sheet, increases in land values contribute to increasing owner equity.

l) T_X_ F___ When using a cost basis balance sheet, increases in land values have no effect on owner equity.

m) T_X_ F___ Agricultural supply and food demand are relatively inelastic – prices vary a lot, but farmers and consumers make relatively small quantity changes.

n) T_X_ F___ Poverty rates in the US have generally remained between 10% and 18% for the last 50 years and have always been higher in rural areas.

o) T___ F_X_ The USDA budget makes it the second largest of all federal agencies, with most of its spending on subsidy programs for large farms.

2) (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 aces = 24,000 bushels. You bought 12,000 bushels of corn from a neighbor.

2a) (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 12,000 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__X__ 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

2b) (2 pts.) You use 7,000 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 = 7,000 bu x $2.20/bu =$15,400

2c) (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 PLC Reference price of $3.70/bu

B____Pay back the MAL using corn from your corn base acres

C____Pay back the MAL using 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

2d) (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.

3a) (6 pts.) What is required for a farmer to be eligible to enroll for the potential to receive corn i) Price Loss Coverage (PLC) or County Agriculture Risk Coverage (County ARC) payments?

Operate a farm with corn base acres.

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

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

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

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).

3b) (10 pts.) You plant 80 acres of corn on a farm, but the farm has 60 corn base acres that you enrolled in County ARC. The county guarantee is $625/ac for 2020. Your actual corn yield for the farm was 200 bu/ac and you sold the corn for $3.80/bu. The USDA announces that the 2020 county average yield is 170 bu/ac and the USDA national marketing year average price is $3.60.
i) What is your 2020 County ARC payment for the farm?

Actual County Revenue =170 bu/ac x $3.60/bu =$612/ac, which is < the $625 guarantee, so ARC Payment is triggered, = 85% x 60 base acres x ($625 – $612) = $663

ii) What is your 2020 County ARC payment if instead you sell your 2020 corn crop for $3.50?

Still the same, $663, there is no change. (Payments do not depend on your actual selling price).

iii) What is your 2020 County ARC payment for corn if you never sold any of the corn, but instead fed it all to your dairy cows?

Still the same, $663, there is no change. (ARC does not require actually selling the grain).

iv) What is your 2020 County ARC payment if you receive a crop insurance indemnity of $25/ac?

Still the same, $663, there is no change. (ARC does not depend on crop insurance).

v) What is your 2020 County ARC payment for corn if instead you had planted only soybeans?

Still the same, $663, there is no change. (ARC payments do not require you to plant the crop associated with the base acres).

3c) (4 pts.) You plant 50 acres of soybeans on a farm, but the farm has 40 soybean base acres that you enrolled in PLC with a 40 bu/ac payment yield. You harvest 35 bu/ac and sell it for $8.30/bu, even though the 2020 USDA national marketing year average price is $10.50.
What is your 2020 PLC payment for the farm?

National marketing year average price of $10.50 > Reference Price of $8.40, so
NO PLC payment triggered, PLC payment = 85% x 40 ac x 40 bu/ac x $0 = $0

4) (8 pts. total) You insure 300 acres of corn in one unit with an average yield of 170 bu/ac.
4a) (4 pts.) You buy 80% Yield Protection (YP) crop insurance and choose the $4.00/bu price election. What is your per acre yield guarantee? What is the total yield guarantee for the unit?

Per Acre Guarantee = 80% x 170 bu/ac = 136 bu/ac
Unit Guarantee = 136 bu/ac x 300 ac = 40,800 bu

4b) (4 pts.) You harvest a yield of 130 bu/ac from the unit and sell it for $4.10/bu.

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

Harvest = 130 bu/ac x 300 ac = 39,000 bu from the unit

ii) What would be your insurance indemnity?

39,000 bu < 40,800 bu guarantee, so indemnity is triggered.
Indemnity = $4.00 x (40,800 – 39,000) = $7,200

5) (14 pts. total) You insure 100 acres of soybeans in one unit with an average yield of 45 bu/ac.
5a) (4 pts.) Suppose the farm buys 80% Revenue Protection (RP) crop insurance with a $9.50/bu Base Price. What is the initial per acre revenue guarantee? What is the initial revenue guarantee for the unit?

Initial per acre revenue guarantee = 80% x $9.50/bu x 45 bu/ac = $342/ac

Initial revenue guarantee for the unit = $342/ac x 100 ac = $34,200

For 5b and 5c, the price increases over the season so that the official Harvest Price is $10.50/bu.

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

Maximum of base price and harvest price is $10.50/bu, so the Final Guarantee is updated to 80% x $10.50/bu x 45 bu/ac = $378/ac and x 100 ac = $37,800

5c) (2 pts.) You harvest 3,500 bushels of soybeans from the unit, what would be your insurance indemnity?

Actual Revenue = 3,500 bu x $10.50/bu = $36,750, which is less than the Final Guarantee of $37,800, so an indemnity is triggered. Indemnity = $37,800 – $36,750 = $1,050.

For 5d to 5f, the price decreases over the season so that the official Harvest Price is $8.50/bu.

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

Maximum of base price and harvest price is $9.50/bu, so the Final Guarantee remains unchanged at $34,200.

5e) (2 pts.) You harvest 3,500 bushels of soybeans from the unit, what would be your insurance indemnity?

Actual Revenue = 3,500 bu x $8.50/bu = $29,750, which is less than the Final Guarantee of $34,200, so an indemnity is triggered. Indemnity = $34,200 – $29,750 = $4,450.

5f) (2 pts.) Suppose you actually sell the harvested soybeans for $9.00/bu in May. How much would your 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: Revenue Protection
Yield			
Actual Farm Yield			X
County Average Yield		X	
Payment Yield for Base Acres	X		
Price			
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 the 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. Your average yield is 205 bu/ac, the county average yield is 190 bu/ac. The Base Price is $4.00/bu, so the initial county revenue guarantee is 90% x 190 bu/ac x $4.00/bu = $684/ac. Your actual farm yield is 185 bu/ac while the actual county yield is 160 bu/ac. You sell the corn for $3.85/bu, but the official harvest price is $3.90/bu. What would be the total insurance indemnity for all 200 acres?

Final revenue guarantee = 90% x 190 bu/ac x max($4.00, $3.90) = $684/ac [No Change]
Actual county revenue = 160 bu/ac x $3.90 = $624/ac
Indemnity per acre = $684 – $624 = $60/ac
Total Indemnity = $60/ac x 200 ac = ***$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**		
Your farm yield falls to 100 bu/ac due to hail			**X**
The harvest price falls to $3.40 due to tariffs	**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).

8a) (2 pts.) Which business entities must register with the state's Department of Financial Institutions to be a legal business entity?

Corporations (both C and S corporations) and LLCs.
Technically, in many states limited liability partnerships do as well, but that is not a required answer here, but is acceptable.

8b) (2 pts.) Besides sole proprietors, which business entities discussed in class do not pay taxes on their income, but pass the income through to the owners who pay taxes?

Pass through entities include Partnerships (both general and limited), S Corporations and LLC.

9) (8 pts. total) Provide short answers to these questions. Joni and Rob 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.

9a) (2 pts.) Suppose Joni and Rob gave the land and corn to their daughter, Maddi. How much gain must Joni and Rob 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 Maddi'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 Maddi sold the land for $500,000 and corn for $100,000 after receiving it as a gift, how much gain must she report for tax purposes?

Land Gain = *$500,000 – $100,000 =* ***$400,000***

Corn Gain = *$100,000 – $0 =* ***$100,000***

9d) (2 pts.) Considering ordinary income tax, self-employment tax, and capital gain tax, which one or ones of these taxes would Maddi owe on this gain from the land sale? Which one or ones of these taxes would Maddi 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 $10.50/bu. You are considering whether to use a seed treatment for early season insects and diseases. Talking to the sales representative, you estimate that it will increase your yield by 2%, but it costs $18 per acre. Also, because you get better stand establishment, you can plant fewer seeds per acre, reducing your seed costs $10 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.

<table>
<tr><td colspan="2">Benefits</td><td colspan="2">Costs</td></tr>
<tr><td colspan="2"><u>Additional Revenues</u>
What new revenue will be generated?

Value of Yield Gain
2% x 60 bu/ac x $10.50/bu = $12.60/ac</td><td colspan="2"><u>Additional Costs</u>
What new costs will be added?

$18/ac for seed treatment</td></tr>
<tr><td colspan="2"><u>Costs Reduced</u>
What costs will be eliminated?

$10/ac in lower seed costs</td><td colspan="2"><u>Revenues Reduced</u>
What revenues will be lost?

None</td></tr>
<tr><td>Total Benefits ($/ac)</td><td>$22.60</i></td><td>Total Costs ($/ac)</td><td>$18</td></tr>
<tr><td colspan="3">Total Benefits – Total Costs = Net Benefit ($/ac)</td><td>$4.60</td></tr>
</table>

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 $4.60/ac based on these assumptions.

11) (8 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	180	--	--
90	184	*0.4*	*$1.60*
100	187	*0.3*	*$1.20*
110	189	*0.2*	*$0.80*
120	190	*0.1*	*$0.40*

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 = ΔQ/ΔX = (184 – 180)/(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 x MP = $4.00 x 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 = input price, here = $0.40, which occurs at Nitrogen = 120 pounds/acre

12) (14 pts. total) In 2018 you bought a used tractor for **$180,000**.
12a) (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
2018	*30,000*	*150,000*
2019	*30,000*	*120,000*
2020	*30,000*	*90,000*
2021	*30,000*	*60,000*

Depreciation = 1/UsefulLife x (Price – SalvageValue) = (1/4) x (180,000 – 60,000) = 30,000

12b) (2 pts.) You have been depreciating the tractor you bought for $180,000 for tax purposes using the IRS tax table below. Enter depreciation claimed in 2018 and 2019 in the table below.

Year	Tax Year	Depreciation Rate	Depreciation Claimed
1	2018	25.00%	180,000 x 25% = 45,000
2	2019	21.43%	180,000 x 21.43% = 38,574
3	2020	15.31%	
4	2021	10.93%	
5	2022	8.75%	
6	2023	8.74%	
7	2024	8.75%	
8	2025	1.09%	

12c) (2 pts.) What was your income tax basis in the tractor at the beginning of 2020?

Basis = purchase price – total depreciation claimed = $180,000 – $45,000 – $38,574 = ***$96,426***

12d) (2 pts.) If you sold the tractor at the beginning of 2020 for $100,000, how much gain or loss would you report on your income tax return?

Gain = sale price – basis = $100,000 – $96,426 = ***$3,574***

For parts e though 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 2018 taxes.
12e) (2 pts.) What is your income tax basis in the tractor at the beginning of 2020?

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

12f) (2 pts.) If you sold the tractor at the beginning of 2020 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?

Gain = sale price – basis = $100,000 – $0 = ***$100,000***
Depreciation recapture is only subject to ***Ordinary Income Tax***

12g) (2 pts.) Briefly explain the tax benefit that farmers gain by choosing the Section 179 election for depreciating purchased machinery like this tractor.

The main benefit is that ***you avoid paying the self-employment tax of 15.3% on the value of the depreciation claimed (here $180,000)****, 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).

13) (16 pts) Corn yield as a function of the nitrogen fertilizer rate is $Q = 150 + 1.1N - 0.002N^2$, 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 $4 per bushel. You have two options for nitrogen fertilizer: 1) urea that is 45% N and sold for $360 per ton and urea-ammonium nitrate (UAN) that is 32% N and sold for $300 per ton.

a) (2 pts) What are the prices in $ per pound of nitrogen for the urea and UAN fertilizers? Round to the nearest $0.01 per pound. Which is the lower cost source for nitrogen?

Urea: $\frac{\$360}{1 \text{ ton of Fert.}} x \frac{1 \text{ ton of Fert.}}{2{,}000 \text{ pounds of Fert.}} x \frac{1 \text{ pound of Fert.}}{0.45 \text{ pounds of N}} = \frac{\$0.40}{1 \text{ pound of N}}$ *or $0.40/pound for N*

UAN: $\frac{\$300}{1 \text{ ton of Fert.}} x \frac{1 \text{ ton of Fert.}}{2{,}000 \text{ pounds of Fert.}} x \frac{1 \text{ pound of Fert.}}{0.32 \text{ pounds of N}} = \frac{\$0.47}{1 \text{ pound of N}}$ *or $0.47/pound for N*

Urea is the lowest cost source of Nitrogen: $0.40/lb

b) (10 pts) Using the price for lowest cost nitrogen source you identified in part a, 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. Round to four digits to the right of the decimal while doing algebra and then round your final answer to the nearest tenth of a pound per acre.

Set up profit: $\pi = p*f(x) - r*x = 4(150 + 1.1N - 0.002N^2) - 0.4N$

FOC $d\pi/dN = 4(1.1 - 0.004N) - 0.4 = 0$

Solve FOC for X: $4.4 - 0.016N = 0.4$

$4.0 = 0.016N$ $N = 4.0/0.016 =$ ***250.0 pounds***

SOC: $d^2\pi/dN^2 = -0.016 < 0$, *which satisfies SOC for maximum*

c) (2pts) At the nitrogen rate you derived in part b, what is the corn yield in bushels per acre?

$Q(N) = 150 + 1.1N - 0.002N^2 = 150 + 1.1(250) - 0.002(250)^2 =$ ***300.0 bu/ac***

d) (2 pts) Besides the cost of nitrogen, other costs are $850/acre. What are net returns ($ per acre)?

$\pi = 4 \text{ x } 300.0 - 0.4 \text{ x } 250 - 850 =$ ***$250/acre***

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	1/1/2020	1/1/2019
Current Assets	800,000	750,000
Non-Current Assets	2,000,000	1,800,000
Total Assets given	2,500,000	2,250,000
correct	2,800,000	2,550,000

	1/1/2020	1/1/2019
Current Liabilities	400,000	400,000
Non-Current Liabilities	600,000	500,000
Total Liabilities	1,000,000	900,000
Equity given	1,500,000	1,350,000
correct	1,800,000	1,650,000
Total Liabilities and Equity	2,500,000	2,250,000
correct	2,800,000	2,550,000

14a) (2 pts.) What was the Current Ratio on 1/1/**2020**?

CR = current assets/current liabilities = 800,000 / 400,000 = ***2.0***

14b) (2 pts.) What was the Debt to Asset Ratio on 1/1/**2020**?

Using Given Numbers: D to A = total liabilities / total assets = 1,000,000 / 2,500,000 = ***0.400***
Using Correct Numbers: D to A = total liabilities / total assets = 1,000,000 / 2,800,000 = ***0.357***

INCOME STATEMENT 1/1/2019 to 12/31/2019	
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 = NFIfO + Interest – UnpaidLabrMgmt = 250,000 + 50,000 – 100,000 = ***200,000***

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

With Given: ROROA = ROA/Avg Assets = 200,000 / ½(2,500,00 + 2,250,000) = ***8.42%***
With Correct: ROROA = ROA/Avg Assets = 200,000 / ½(2,800,00 + 2,550,000) = ***7.48%***

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

ROE = ROA – Interest = 200,000 – 50,000 = ***150,000***

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

With Given: ROROE = ROE/Avg Equity = 150,000 / ½(1,500,00 + 1,350,000) = ***10.53%***
With Correct: ROROE = ROE/Avg Equity = 150,000 / ½(1,800,00 + 1,650,000) = ***8.70%***

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

Profit Margin = ROA / Revenue = 200,000 / 1,000,000 = ***20.0%***