

# Supplementary Information: Digital Agriculture Technologies Reshape Farmer Labor and Wellbeing Across Multiple Dimensions

## Tables

Tables SI.1–SI.3 report summary statistics and descriptive evidence for the key variables used in the analysis. Table SI.1 summarizes reported use of precision and digital agriculture technologies and services in 2024 in the IFRLP, as well as openness to future adoption among non-users. These patterns are compared to representative adoption estimates from the U.S. Department of Agriculture’s 2023 Agricultural Resource Management Survey (ARMS) for Iowa and the broader Midwest region (IA, IL, IN, MN, NE). ARMS is the primary source of information to the U.S. Department of Agriculture (USDA) about resource use, production practices, and financial characteristics of U.S. farms. Columns (4)-(5) indicate the percent of all Iowa farms in 2023 with nonzero crop acreage adopting the technology in the specific row. Column (6) indicates the percent of all Iowa soybean acres in 2023 managed using the technology in the specific row. The summary statistics in Table SI.1 indicate that the IFRLP adoption patterns are consistent with the ARMS state- and region-level estimates, supporting the external validity of the IFRLP sample.

Table SI.2 reports the distribution of responses to the survey question: “Considering the precision or digital agriculture technologies or services that you use, how have they decreased or increased the following aspects of well-being? If you do not use any, please provide your opinion about potential impacts.” Response categories included greatly reduced, reduced, no change, increased, greatly increased, and don’t know. Table SI.3 reports summary statistics for the dependent and independent variables used in the main specification and sensitivity analyses.

Table SI.4 presents ordered probit estimates for the eleven wellbeing outcomes using only the five primary digital technologies considered in the main analysis: autosteer, yield monitors, soil mapping, variable-rate equipment, and drones/uncrewed aerial vehicles.

Tables SI.5–SI.15 report ordered probit estimates for each of the eleven wellbeing outcomes across alternative model specifications. The preferred specification (Model 3) includes log crop acres, gender, marital status, age and age squared, four-year college degree completion, gross cash farm income categories, planned retirement status, successor identification, an interaction between retirement plans and successor status, and county fixed effects. Alternative specifications evaluate sensitivity to exclusion of farm size measures, demographic controls, and county fixed effects (Model 1); exclusion of farm size measures and demographic controls (Model 2); exclusion of non-adopters (Model 4); redefining the excluded adoption group as non-adopters not open to future adoption (Model 5); and inclusion of additional technologies, including online decision tools, farm sensors to collect data (soil, air, plant tissue, etc.), fully autonomous tractors, remote grain bin monitoring, and remote livestock facility monitoring (Model 6). Table SI.16 summarizes the direction and statistical significance of the estimated relationships across the eleven wellbeing outcomes for the preferred specification.

Tables SI.17 and SI.18 report sensitivity analyses using three-category rather than five-category wellbeing outcomes. The three-category ordered probit models collapse responses into worsened, no change, and improved categories. Table SI.17 reports the ordered probit estimates, while Table SI.18 summarizes the direction and statistical significance of estimated relationships across outcomes.

Table SI.19 reports OLS estimates using composite wellbeing indices constructed from the eleven wellbeing outcomes. Six alternative indices are considered: Overall Wellbeing Average (all eleven outcomes), Time Average (time pressure, time physical, time nonfarm, and flexibility for time off), All Stress Average (data stress, technology stress, task stress, growing conditions stress, and technology failure stress), Data and Technology Stress Average (data stress, technology stress, and technology failure stress), Other Time Average (time nonfarm and flexibility for time off), and Time and Fatigue Average (time pressure, time physical, and fatigue).

Table SI.20 provides illustrative quotes from the qualitative analysis, organized by theme and sentiment classifications. Since individual comments could be assigned multiple themes, several example quotations are associated with more than one theme-sentiment pair. These examples demonstrate how farmers described both the benefits of DA (e.g., reduced fatigue, improved management, greater productivity) and related concerns (e.g., cost, stress, technological reliability).

**Table SI.1.** Percent of respondents indicating precision or digital agriculture technologies or services used in 2024, with comparison to representative estimates from the U.S. Department of Agriculture’s Agricultural Resource Management Survey (ARMS)

	Iowa Farm and Rural Life Poll (IFRLP)			Agricultural Resource Management Survey (ARMS)		
	Used in 2024	Not used in 2024, open to future use	Not used in 2024, not open to future use	Iowa farms with crop acreage in 2023	Farms with crop acreage in the US Midwest in 2023	Iowa soybean acres in 2023
	(1)	(2)	(3)	(4)	(5)	(6)
GPS yield monitors and/or yield maps	63.8	19.3	17.0	60.0	47.3	85.9
Auto-steer or other GPS guidance system	59.2	20.2	20.7	48.1	42.1	45.3
GPS soil maps	56.1	26.9	17.0	48.3	37.7	19.6
Variable rate equipment (sprayers, fertilizer applications, etc.)	53.0	29.8	17.2	42.1	32.1	27.4
Imagery from drones/UAV, aircraft, or satellite	29.2	46.1	24.8	17.3	14.3	4.7
Data from online decision tools to guide crop management	25.2	49.0	25.8			23.2
Drones/UAVs used for scouting, spraying, etc.	22.5	53.1	24.4	11.4	8.6	7.5
Remote livestock facility monitoring	10.7	34.6	54.7			
On-farm sensors to collect data (soil, air, plant tissue, etc.)	9.7	57.7	32.6			2.0
Remote grain bin monitoring system	5.2	49.6	45.2			
Fully autonomous tractors	2.5	34.2	63.4			

Note: The IFRLP estimates are from total sample of survey respondents with positive crop acreage. UAV = uncrewed aerial vehicles. The ARMS estimates for Iowa farms with crop acreage in 2023 is representative of all farming operations in Iowa with positive crop acreage, using information from ARMS Phase III (column 4). The US Midwest is the top 5 corn and soybean producing states in 2023 and 2024: Iowa, Illinois, Indiana, Minnesota, and Nebraska (column 5). The ARMS estimates for Iowa soybean acres in 2023 refer is representative of all soybean acres in Iowa, using information from ARMS Phase II (column 6). The ARMS estimates for variable rate equipment include use for applications of seeds, fertilizer, pesticides, and irrigation water. The ARMS estimates for imagery include only imagery from aircraft or satellites. The ARMS estimates for data from decision tools refer to use of data from custom service applications performed on the field, as well as public data downloaded from online sources. The ARMS estimates for on-farm sensors to collect data include use of soil sensor tests, hard-wired crop condition sensors, and wireless crop condition sensors. In 2023, the ARMS program did not collection information on remote livestock monitoring, remote grain bin monitoring, or fully autonomous tractors.

**Table SI.2.** Perceived impacts of precision and digital agriculture technologies on farmer wellbeing.

Variable	Question description	Greatly decreased	Decreased	No change	Increased	Greatly increased	Don't know
Time Pressure	Time pressure during planting and harvest	2.3	24.8	41.8	13.5	3.9	13.7
Time Physical	Time spent on physical labor	2.1	27.3	50.4	6.5	2.1	11.6
Time Nonfarm	Time available for non-farm activities	0.2	3.7	57.3	23.0	3.1	12.7
Flex Timeoff	Flexibility for scheduling time off	0.4	2.2	66.2	16.4	2.4	12.5
Data Stress	Stress related to using data effectively	1.9	18.1	37.3	26.4	4.1	12.2
Tech Stress	Stress related to ensuring technology is being used correctly/effectively	1.2	11.7	31.9	35.3	7.9	12.0
Task Stress	Stress related to managing multiple tasks	2.3	16.5	41.9	22.7	4.7	11.9
Growing Conditions	Anxiety about unpredictable growing conditions (e.g., weather, pests, disease)	0.6	8.9	62.1	12.1	4.6	11.7
Fatigue	Fatigue from field work	9.2	35.5	36.5	5.5	2.1	11.2
Tech Fail Stress	Stress related to potential technology failure (e.g., due to solar flares)	1.1	6.8	41.8	29.7	7.9	12.7
Productivity	Overall productivity	0.4	2.3	34.5	42.4	8.0	12.3

*Note:* The table reports the percentage of respondents selecting each response category for the question: “Considering the precision or digital agriculture technologies or services that you use, how have they decreased or increased the following aspects of well-being? If you do not use any, please provide your opinion about potential impacts.” Total sample of survey respondents used per wellbeing item.

**Table SI.3:** Summary statistics.

	Unit	N	Mean	Std. Dev.	Min	Max
<b>Dependent Variables</b>						
Time Pressure	[1,5] categorical	534	3.08	0.85	1	5
Time Physical	[1,5] categorical	543	3.24	0.70	1	5
Time Nonfarm	[1,5] categorical	540	3.29	0.59	2	5
Flex Timeoff	[1,5] categorical	535	3.21	0.51	1	5
Data Stress	[1,5] categorical	538	2.86	0.86	1	5
Tech Stress	[1,5] categorical	544	2.57	0.86	1	5
Task Stress	[1,5] categorical	543	2.89	0.84	1	5
Growing Conditions	[1,5] categorical	541	2.88	0.63	1	5
Fatigue	[1,5] categorical	548	3.54	0.87	1	5
Tech Fail Stress	[1,5] categorical	536	2.55	0.80	1	5
Productivity	[1,5] categorical	540	3.66	0.68	1	5
<b>Main specification variables</b>						
Autosteer guidance use	{0,1}	559	0.67	0.47	0	1
Yield monitor use	{0,1}	559	0.72	0.45	0	1
Soil mapping use	{0,1}	559	0.62	0.48	0	1
Variable rate equipment use	{0,1}	559	0.58	0.49	0	1
Drone/UAV use	{0,1}	559	0.25	0.43	0	1
Row crop acres	Acres	559	779	1225	5	14000
Male	{0,1}	559	0.96	0.20	0	1
Married	{0,1}	559	0.89	0.31	0	1
Age	Years	559	64.7	11.4	30	90
At least 4-year college degree	{0,1}	559	0.39	0.49	0	1
Farm size: moderate	{0,1}	559	0.29	0.45	0	1
Farm size: mid-size	{0,1}	559	0.29	0.45	0	1
Farm size: large	{0,1}	559	0.16	0.37	0	1
Retire soon	{0,1}	559	0.31	0.46	0	1
Successor	{0,1}	559	0.56	0.50	0	1
<b>Other Precision Technology Use (sensitivity analysis only)</b>						
Online Decision Tools	{0,1}	553	0.29	0.45	0	1
Sensors	{0,1}	554	0.11	0.31	0	1
Fully Autonomous Tractors	{0,1}	555	0.02	0.15	0	1
Remote Grain Bin Monitors	{0,1}	553	0.06	0.24	0	1
Remove Livestock Monitors	{0,1}	545	0.12	0.33	0	1
Online Decision Tools	{0,1}	553	0.29	0.45	0	1
<b>Open to technology but not currently adopted (sensitivity analysis only)</b>						
Autosteer: open to future use	{0,1}	559	0.19	0.39	0	1
Yield monitor: open to future use	{0,1}	559	0.17	0.38	0	1
Soil mapping: open to future use	{0,1}	559	0.26	0.44	0	1
VR equip: open to future use	{0,1}	559	0.30	0.46	0	1
Drone/UAV: open to future use	{0,1}	559	0.57	0.50	0	1

*Note:* Summary statistics are based on the union of the estimation samples from the 11 wellbeing ordered probit models. Thus, the maximum number of observations for the main specification variables is 559, representing all respondents included in at least one of the ordered probit analyses. Sample sizes for dependent variables and variables included only in sensitivity analyses vary within this set of 559 observations due to item-specific missing responses. VR = variable rate, UAV = uncrewed aerial vehicles.

**Table SI.4:** Ordered probit estimates for individual wellbeing dimensions without controls.

	(1) Time Pressure	(2) Time Physical	(3) Time Nonfarm	(4) Flex Time Off	(5) Data Stress	(6) Tech Stress	(7) Task Stress	(8) Growing Cond.	(9) Fatigue	(10) Tech Fail. Stress	(11) Prod.
Autosteer guidance use	0.247** (2.06)	0.307** (2.46)	0.162 (1.23)	0.097 (0.68)	-0.104 (-0.89)	-0.092 (-0.78)	0.103 (0.88)	0.303** (2.37)	0.600*** (5.04)	-0.157 (-1.32)	0.585*** (4.68)
Yield monitors use	0.050 (0.37)	0.170 (1.22)	-0.118 (-0.81)	-0.073 (-0.46)	0.199 (1.52)	0.220* (1.69)	0.248* (1.90)	0.090 (0.63)	0.303** (2.31)	0.084 (0.63)	0.027 (0.20)
Soil mapping use	0.059 (0.52)	-0.067 (-0.57)	0.113 (0.92)	0.072 (0.54)	0.148 (1.35)	0.131 (1.20)	-0.055 (-0.50)	0.035 (0.29)	-0.015 (-0.13)	0.032 (0.28)	0.161 (1.38)
Variable rate equipment use	-0.097 (-0.93)	0.142 (1.31)	0.243** (2.11)	0.245** (1.97)	0.043 (0.42)	-0.084 (-0.82)	0.006 (0.06)	-0.029 (-0.26)	0.099 (0.94)	0.133 (1.26)	0.147 (1.35)
Drones/UAV use	-0.066 (-0.65)	-0.078 (-0.73)	0.034 (0.30)	-0.074 (-0.62)	0.166 (1.62)	0.054 (0.53)	0.259** (2.52)	0.140 (1.24)	0.087 (0.84)	0.084 (0.81)	0.133 (1.24)
N	645	656	652	648	650	657	653	654	660	646	649
LR X <sup>2</sup>	9.54	25.49	14.75	8.49	15.52	7.60	23.10	19.72	94.92	5.21	74.77
Prob > X <sup>2</sup>	0.089*	0.0001***	0.012**	0.131	0.008***	0.180	0.0003***	0.001***	0.000***	0.391	0.000***
Pseudo R <sup>2</sup>	0.01	0.02	0.01	0.01	0.01	0.004	0.01	0.02	0.06	0.003	0.06

Notes: Coefficients rounded to three decimals; z-statistics in parentheses. LR = Likelihood ratio chi-squared test statistic. Significance is denoted as \* p<0.10, \*\* p<0.05, \*\*\* p<0.01. UAV = uncrewed aerial vehicles.

**Table SI.5.** Ordered probit estimates for time pressure with controls and sensitivity checks.

	(1)	(2)	(3)	(4)	(5)	(6)
Autosteer guidance use	0.247** (2.06)	0.222 (1.58)	0.338** (2.20)	0.373** (2.32)	-0.005 (-0.02)	0.319** (1.97)
Yield monitors use	0.050 (0.37)	0.006 (0.04)	-0.080 (-0.45)	-0.009 (-0.05)	0.036 (0.10)	-0.140 (-0.77)
Soil mapping use	0.059 (0.52)	-0.024 (-0.18)	0.025 (0.18)	0.050 (0.34)	0.149 (0.47)	0.016 (0.11)
Variable rate equipment use	-0.097 (-0.93)	0.068 (0.56)	0.007 (0.05)	0.053 (0.39)	-0.293 (-1.16)	0.005 (0.04)
Drones/UAV use	-0.066 (-0.65)	0.001 (0.01)	0.056 (0.44)	0.070 (0.55)	0.392** (1.99)	0.123 (0.88)
Log crop acres		0.036 (0.68)	0.003 (0.05)	-0.006 (-0.08)	-0.003 (-0.04)	-0.017 (-0.23)
Male			0.211 (0.75)	0.112 (0.38)	0.202 (0.72)	0.371 (1.24)
Married			-0.122 (-0.70)	0.054 (0.27)	-0.136 (-0.77)	-0.070 (-0.39)
Age			0.092** (2.35)	0.106** (2.43)	0.097** (2.44)	0.085** (2.14)
Age <sup>2</sup>			-0.001** (-2.49)	-0.001** (-2.56)	-0.001*** (-2.60)	-0.001** (-2.27)
At least 4-year college degree			0.095 (0.82)	0.060 (0.48)	0.086 (0.73)	0.073 (0.60)
Farm size: moderate			0.150 (0.94)	0.177 (0.98)	0.159 (0.99)	0.151 (0.91)
Farm size: mid-size			-0.109 (-0.56)	-0.067 (-0.32)	-0.091 (-0.46)	-0.080 (-0.39)
Farm size: large			0.094 (0.38)	0.154 (0.57)	0.110 (0.44)	-0.008 (-0.03)
Retire soon			-0.026 (-0.12)	0.017 (0.07)	-0.072 (-0.35)	-0.122 (-0.55)
Successor			0.061 (0.46)	0.072 (0.49)	0.082 (0.61)	0.049 (0.36)
Retire soon × successor			0.116 (0.46)	0.089 (0.31)	0.164 (0.64)	0.260 (0.99)
Autosteer: open to future use					-0.457* (-1.68)	
Yield monitor: open to future use					0.096 (0.28)	
Soil mapping: open to future use					0.159 (0.48)	
VR equip: open to future use					-0.363 (-1.35)	
Drone/UAV: open to future use					0.410** (2.24)	
Online decision tools						0.062 (0.42)
Sensors for data collection						-0.119 (-0.59)
Fully autonomous tractor						0.145 (0.36)
Remote bin monitoring						0.161 (0.67)
Remote livestock monitoring						0.286 (1.62)
County-level FEs	No	Yes	Yes	Yes	Yes	Yes
Exclude non-adopters	No	No	No	Yes	No	No
N	645	576	534	462	534	509
Pseudo R <sup>2</sup>	0.01	0.08	0.10	0.11	0.11	0.11

Notes: Coefficients rounded to three decimals; z-statistics in parentheses. Significance is denoted as \* p<0.10, \*\* p<0.05, \*\*\* p<0.01. VR = variable rate, UAV = uncrewed aerial vehicles.

**Table SI.6.** Ordered probit estimates for time physical labor with controls and sensitivity checks.

	(1)	(2)	(3)	(4)	(5)	(6)
Autosteer guidance use	0.307** (2.46)	0.307** (2.05)	0.372** (2.27)	0.418** (2.43)	-0.010 (-0.03)	0.308* (1.78)
Yield monitors use	0.170 (1.22)	0.082 (0.50)	-0.007 (-0.04)	0.024 (0.12)	0.566 (1.60)	0.039 (0.21)
Soil mapping use	-0.067 (-0.57)	-0.113 (-0.83)	-0.145 (-0.98)	-0.147 (-0.95)	-0.178 (-0.58)	-0.160 (-1.04)
Variable rate equipment use	0.142 (1.31)	0.296** (2.31)	0.336** (2.41)	0.312** (2.13)	0.161 (0.62)	0.350** (2.46)
Drones/UAV use	-0.078 (-0.73)	0.044 (0.35)	0.034 (0.25)	0.058 (0.42)	0.212 (1.02)	0.024 (0.16)
Log crop acres		0.010 (0.18)	0.026 (0.35)	-0.007 (-0.08)	0.023 (0.32)	-0.003 (-0.03)
Male			0.453 (1.54)	0.432 (1.40)	0.426 (1.45)	0.714** (2.28)
Married			-0.025 (-0.14)	-0.047 (-0.22)	-0.088 (-0.48)	-0.057 (-0.30)
Age			-0.044 (-1.07)	-0.035 (-0.77)	-0.041 (-0.97)	-0.056 (-1.33)
Age <sup>2</sup>			0.000 (0.79)	0.000 (0.48)	0.000 (0.70)	0.000 (1.05)
At least 4-year college degree			-0.005 (-0.04)	0.072 (0.54)	-0.014 (-0.12)	0.003 (0.03)
Farm size: moderate			-0.140 (-0.84)	-0.329* (-1.73)	-0.157 (-0.94)	-0.125 (-0.72)
Farm size: mid-size			-0.075 (-0.37)	-0.167 (-0.75)	-0.069 (-0.34)	-0.065 (-0.31)
Farm size: large			-0.150 (-0.59)	-0.234 (-0.84)	-0.137 (-0.53)	-0.118 (-0.44)
Retire soon			-0.132 (-0.63)	-0.038 (-0.15)	-0.157 (-0.74)	-0.301 (-1.34)
Successor			0.024 (0.17)	0.091 (0.59)	0.041 (0.29)	0.016 (0.12)
Retire soon × successor			0.220 (0.84)	0.050 (0.17)	0.242 (0.92)	0.435 (1.59)
Autosteer: open to future use					-0.465 (-1.60)	
Yield monitor: open to future use					0.685* (1.91)	
Soil mapping: open to future use					-0.005 (-0.01)	
VR equip: open to future use					-0.200 (-0.73)	
Drone/UAV: open to future use					0.209 (1.09)	
Online decision tools						-0.127 (-0.82)
Sensors for data collection						-0.060 (-0.29)
Fully autonomous tractor						0.579 (1.41)
Remote bin monitoring						-0.154 (-0.62)
Remote livestock monitoring						0.431** (2.34)
County-level FEs	No	Yes	Yes	Yes	Yes	Yes
Exclude non-adopters	No	No	No	Yes	No	No
N	656	586	543	466	543	519
Pseudo R <sup>2</sup>	0.02	0.12	0.14	0.16	0.15	0.15

Notes: Coefficients rounded to three decimals; z-statistics in parentheses. Significance is denoted as \* p<0.10, \*\* p<0.05, \*\*\* p<0.01. VR = variable rate, UAV = uncrewed aerial vehicles.

**Table SI.7.** Ordered probit estimates for time nonfarm with controls and sensitivity checks.

	(1)	(2)	(3)	(4)	(5)	(6)
Autosteer guidance use	0.162 (1.23)	0.160 (0.99)	0.207 (1.17)	0.274 (1.44)	0.434 (1.34)	0.147 (0.79)
Yield monitors use	-0.118 (-0.81)	-0.087 (-0.49)	-0.376* (-1.86)	-0.411* (-1.87)	-1.195*** (-2.85)	-0.321 (-1.54)
Soil mapping use	0.113 (0.92)	0.072 (0.49)	0.052 (0.32)	0.105 (0.61)	-0.083 (-0.24)	-0.054 (-0.32)
Variable rate equipment use	0.243** (2.11)	0.299** (2.17)	0.298** (1.98)	0.359** (2.23)	0.828*** (2.78)	0.304** (1.98)
Drones/UAV use	0.034 (0.30)	-0.072 (-0.53)	-0.133 (-0.92)	-0.137 (-0.91)	0.266 (1.14)	-0.157 (-0.99)
Log crop acres		0.036 (0.62)	-0.073 (-0.91)	-0.071 (-0.76)	-0.077 (-0.95)	-0.073 (-0.87)
Male			-0.166 (-0.52)	-0.310 (-0.92)	-0.138 (-0.43)	0.111 (0.33)
Married			0.057 (0.29)	0.255 (1.08)	0.047 (0.24)	-0.032 (-0.16)
Age			-0.020 (-0.44)	0.014 (0.27)	-0.040 (-0.87)	-0.020 (-0.43)
Age <sup>2</sup>			0.000 (0.34)	-0.000 (-0.36)	0.000 (0.79)	0.000 (0.36)
At least 4-year college degree			0.176 (1.33)	0.236 (1.62)	0.171 (1.28)	0.168 (1.21)
Farm size: moderate			0.162 (0.90)	-0.055 (-0.26)	0.187 (1.02)	0.220 (1.16)
Farm size: mid-size			0.510** (2.31)	0.315 (1.28)	0.533** (2.39)	0.545** (2.34)
Farm size: large			0.483* (1.73)	0.262 (0.83)	0.510* (1.80)	0.443 (1.52)
Retire soon			0.026 (0.11)	-0.321 (-1.14)	0.030 (0.12)	-0.051 (-0.20)
Successor			0.312** (2.07)	0.368** (2.22)	0.343** (2.26)	0.349** (2.27)
Retire soon × successor			-0.288 (-1.00)	-0.099 (-0.30)	-0.334 (-1.14)	-0.196 (-0.65)
Autosteer: open to future use					0.347 (1.04)	
Yield monitor: open to future use					-0.921** (-2.18)	
Soil mapping: open to future use					-0.150 (-0.42)	
VR equip: open to future use					0.623** (1.99)	
Drone/UAV: open to future use					0.460** (2.15)	
Online decision tools						0.122 (0.72)
Sensors for data collection						0.284 (1.27)
Fully autonomous tractor						0.568 (1.28)
Remote bin monitoring						-0.278 (-1.02)
Remote livestock monitoring						0.128 (0.64)
County-level FEs	No	Yes	Yes	Yes	Yes	Yes
Exclude non-adopters	No	No	No	Yes	No	No
N	652	582	540	467	540	515
Pseudo R <sup>2</sup>	0.01	0.12	0.16	0.19	0.17	0.17

Notes: Coefficients rounded to three decimals; z-statistics in parentheses. Significance is denoted as \* p<0.10, \*\* p<0.05, \*\*\* p<0.01. VR = variable rate, UAV = uncrewed aerial vehicles.

**Table SI.8.** Ordered probit estimates for flexibility for time off with controls and sensitivity checks.

	(1)	(2)	(3)	(4)	(5)	(6)
Autosteer guidance use	0.097 (0.68)	0.127 (0.69)	0.236 (1.13)	0.283 (1.27)	0.514 (1.38)	0.109 (0.49)
Yield monitors use	-0.073 (-0.46)	-0.142 (-0.69)	-0.432* (-1.80)	-0.369 (-1.43)	-1.331*** (-2.87)	-0.340 (-1.36)
Soil mapping use	0.072 (0.54)	-0.031 (-0.18)	-0.127 (-0.67)	-0.013 (-0.07)	0.062 (0.15)	-0.254 (-1.26)
Variable rate equipment use	0.245** (1.97)	0.346** (2.19)	0.413** (2.35)	0.451** (2.40)	0.873** (2.33)	0.419** (2.30)
Drones/UAV use	-0.074 (-0.62)	-0.239 (-1.57)	-0.291* (-1.73)	-0.261 (-1.51)	-0.006 (-0.02)	-0.293 (-1.57)
Log crop acres		0.095 (1.45)	-0.052 (-0.58)	0.030 (0.29)	-0.047 (-0.51)	-0.083 (-0.85)
Male			-0.042 (-0.12)	-0.118 (-0.32)	0.100 (0.28)	0.255 (0.66)
Married			0.315 (1.37)	0.144 (0.54)	0.308 (1.30)	0.242 (1.00)
Age			0.008 (0.16)	0.012 (0.21)	-0.014 (-0.27)	0.007 (0.14)
Age <sup>2</sup>			-0.000 (-0.03)	-0.000 (-0.04)	0.000 (0.43)	0.000 (0.01)
At least 4-year college degree			-0.007 (-0.05)	-0.038 (-0.23)	-0.015 (-0.10)	-0.082 (-0.51)
Farm size: moderate			0.300 (1.40)	0.108 (0.44)	0.321 (1.48)	0.423* (1.87)
Farm size: mid-size			0.650** (2.53)	0.496* (1.76)	0.658** (2.52)	0.819*** (2.93)
Farm size: large			0.751** (2.34)	0.402 (1.14)	0.725** (2.22)	0.896*** (2.61)
Retire soon			0.041 (0.15)	-0.118 (-0.37)	0.093 (0.33)	-0.112 (-0.37)
Successor			0.307* (1.77)	0.333* (1.76)	0.320* (1.82)	0.324* (1.80)
Retire soon × successor			-0.438 (-1.30)	-0.348 (-0.91)	-0.526 (-1.52)	-0.296 (-0.82)
Autosteer: open to future use					0.466 (1.22)	
Yield monitor: open to future use					-1.048** (-2.22)	
Soil mapping: open to future use					0.253 (0.58)	
VR equip: open to future use					0.512 (1.30)	
Drone/UAV: open to future use					0.339 (1.33)	
Online decision tools						0.123 (0.63)
Sensors for data collection						0.422 (1.63)
Fully autonomous tractor						0.532 (1.20)
Remote bin monitoring						-0.240 (-0.78)
Remote livestock monitoring						0.248 (1.06)
County-level FEs	No	Yes	Yes	Yes	Yes	Yes
Exclude non-adopters	No	No	No	Yes	No	No
N	648	578	535	463	535	511
Pseudo R <sup>2</sup>	0.01	0.19	0.23	0.25	0.24	0.25

Notes: Coefficients rounded to three decimals; z-statistics in parentheses. Significance is denoted as \* p<0.10, \*\* p<0.05, \*\*\* p<0.01. VR = variable rate, UAV = uncrewed aerial vehicles.

**Table SI.9.** Ordered probit estimates for data stress with controls and sensitivity checks.

	(1)	(2)	(3)	(4)	(5)	(6)
Autosteer guidance use	-0.104 (-0.89)	-0.143 (-1.05)	-0.010 (-0.06)	-0.088 (-0.57)	0.251 (0.98)	-0.075 (-0.48)
Yield monitors use	0.199 (1.52)	0.173 (1.13)	0.090 (0.53)	-0.029 (-0.16)	0.065 (0.20)	0.078 (0.44)
Soil mapping use	0.148 (1.35)	0.232* (1.84)	0.261* (1.91)	0.230 (1.62)	-0.106 (-0.36)	0.214 (1.51)
Variable rate equipment use	0.043 (0.42)	0.061 (0.51)	0.038 (0.30)	0.011 (0.08)	-0.056 (-0.23)	-0.000 (-0.00)
Drones/UAV use	0.166 (1.62)	0.269** (2.27)	0.277** (2.19)	0.235* (1.83)	0.543*** (2.75)	0.278** (2.01)
Log crop acres		-0.046 (-0.89)	-0.066 (-0.96)	-0.030 (-0.38)	-0.059 (-0.85)	-0.081 (-1.12)
Male			0.266 (0.97)	0.139 (0.49)	0.287 (1.04)	0.363 (1.26)
Married			-0.274 (-1.59)	-0.335* (-1.68)	-0.299* (-1.71)	-0.307* (-1.72)
Age			0.041 (1.04)	0.047 (1.07)	0.041 (1.03)	0.031 (0.77)
Age <sup>2</sup>			-0.000 (-0.96)	-0.000 (-1.07)	-0.000 (-0.94)	-0.000 (-0.60)
At least 4-year college degree			0.226** (1.98)	0.235* (1.89)	0.253** (2.19)	0.208* (1.74)
Farm size: moderate			0.112 (0.71)	0.189 (1.07)	0.080 (0.51)	0.111 (0.68)
Farm size: mid-size			-0.167 (-0.89)	-0.190 (-0.92)	-0.216 (-1.15)	-0.145 (-0.74)
Farm size: large			0.128 (0.54)	0.124 (0.48)	0.079 (0.33)	-0.023 (-0.09)
Retire soon			-0.135 (-0.68)	0.012 (0.05)	-0.121 (-0.61)	-0.126 (-0.61)
Successor			-0.038 (-0.29)	-0.024 (-0.17)	-0.021 (-0.16)	-0.045 (-0.34)
Retire soon × successor			0.271 (1.12)	0.201 (0.72)	0.258 (1.05)	0.289 (1.14)
Autosteer: open to future use					0.327 (1.24)	
Yield monitor: open to future use					-0.042 (-0.12)	
Soil mapping: open to future use					-0.403 (-1.35)	
VR equip: open to future use					-0.114 (-0.44)	
Drone/UAV: open to future use					0.319* (1.75)	
Online decision tools						0.376*** (2.61)
Sensors for data collection						-0.164 (-0.83)
Fully autonomous tractor						0.830** (1.99)
Remote bin monitoring						0.088 (0.37)
Remote livestock monitoring						0.278 (1.59)
County-level FEs	No	Yes	Yes	Yes	Yes	Yes
Exclude non-adopters	No	No	No	Yes	No	No
N	650	580	538	465	538	514
Pseudo R <sup>2</sup>	0.01	0.070	0.10	0.10	0.10	0.11

Notes: Coefficients rounded to three decimals; z-statistics in parentheses. Significance is denoted as \* p<0.10, \*\* p<0.05, \*\*\* p<0.01. VR = variable rate, UAV = uncrewed aerial vehicles.

**Table SI.10.** Ordered probit estimates for tech stress with controls and sensitivity checks.

	(1)	(2)	(3)	(4)	(5)	(6)
Autosteer guidance use	-0.092 (-0.78)	-0.155 (-1.14)	-0.077 (-0.52)	-0.121 (-0.78)	0.272 (1.06)	-0.114 (-0.73)
Yield monitors use	0.220* (1.69)	0.175 (1.15)	0.134 (0.79)	0.102 (0.56)	0.071 (0.22)	0.115 (0.66)
Soil mapping use	0.131 (1.20)	0.097 (0.77)	0.168 (1.24)	0.150 (1.06)	0.091 (0.32)	0.131 (0.93)
Variable rate equipment use	-0.084 (-0.82)	-0.111 (-0.95)	-0.175 (-1.37)	-0.176 (-1.31)	-0.328 (-1.34)	-0.204 (-1.57)
Drones/UAV use	0.054 (0.53)	0.147 (1.25)	0.128 (1.02)	0.070 (0.54)	0.021 (0.11)	0.129 (0.94)
Log crop acres		0.019 (0.38)	-0.002 (-0.04)	0.015 (0.19)	0.002 (0.03)	-0.014 (-0.20)
Male			0.276 (1.01)	0.174 (0.61)	0.282 (1.03)	0.444 (1.54)
Married			-0.232 (-1.36)	-0.289 (-1.42)	-0.211 (-1.22)	-0.185 (-1.05)
Age			0.017 (0.45)	0.011 (0.26)	0.021 (0.54)	0.009 (0.23)
Age <sup>2</sup>			-0.000 (-0.41)	-0.000 (-0.28)	-0.000 (-0.50)	-0.000 (-0.21)
At least 4-year college degree			0.206* (1.82)	0.218* (1.75)	0.231** (2.01)	0.178 (1.50)
Farm size: moderate			-0.165 (-1.07)	-0.131 (-0.75)	-0.179 (-1.16)	-0.127 (-0.79)
Farm size: mid-size			-0.413** (-2.22)	-0.475** (-2.32)	-0.447** (-2.38)	-0.330* (-1.69)
Farm size: large			0.004 (0.02)	-0.004 (-0.02)	-0.033 (-0.14)	-0.135 (-0.55)
Retire soon			-0.317 (-1.60)	-0.354 (-1.52)	-0.292 (-1.47)	-0.234 (-1.13)
Successor			-0.012 (-0.09)	0.020 (0.14)	-0.019 (-0.14)	-0.014 (-0.10)
Retire soon × successor			0.449* (1.84)	0.553** (1.97)	0.426* (1.73)	0.394 (1.55)
Autosteer: open to future use					0.416 (1.57)	
Yield monitor: open to future use					-0.061 (-0.18)	
Soil mapping: open to future use					-0.097 (-0.33)	
VR equip: open to future use					-0.195 (-0.75)	
Drone/UAV: open to future use					-0.125 (-0.71)	
Online decision tools						0.129 (0.90)
Sensors for data collection						-0.044 (-0.22)
Fully autonomous tractor						1.372*** (3.33)
Remote bin monitoring						0.349 (1.46)
Remote livestock monitoring						0.083 (0.48)
County-level FEs	No	Yes	Yes	Yes	Yes	Yes
Exclude non-adopters	No	No	No	Yes	No	No
N	657	588	544	468	544	519
Pseudo R <sup>2</sup>	0.004	0.06	0.09	0.10	0.09	0.10

Notes: Coefficients rounded to three decimals; z-statistics in parentheses. Significance is denoted as \* p<0.10, \*\* p<0.05, \*\*\* p<0.01. VR = variable rate, UAV = uncrewed aerial vehicles.

**Table SI.11.** Ordered probit estimates for task stress with controls and sensitivity checks.

	(1)	(2)	(3)	(4)	(5)	(6)
Autosteer guidance use	0.103 (0.88)	0.111 (0.82)	0.209 (1.41)	0.204 (1.32)	0.414 (1.59)	0.149 (0.96)
Yield monitors use	0.248* (1.90)	0.321** (2.11)	0.285* (1.68)	0.256 (1.41)	0.449 (1.36)	0.314* (1.80)
Soil mapping use	-0.055 (-0.50)	-0.131 (-1.04)	-0.035 (-0.26)	-0.003 (-0.02)	-0.590** (-2.03)	-0.087 (-0.62)
Variable rate equipment use	0.006 (0.06)	-0.046 (-0.39)	-0.169 (-1.32)	-0.133 (-0.99)	-0.311 (-1.26)	-0.204 (-1.57)
Drones/UAV use	0.259** (2.52)	0.347*** (2.92)	0.386*** (3.05)	0.346*** (2.69)	0.519*** (2.68)	0.338** (2.44)
Log crop acres		0.006 (0.11)	-0.063 (-0.91)	-0.026 (-0.32)	-0.060 (-0.87)	-0.051 (-0.70)
Male			0.013 (0.05)	-0.164 (-0.58)	-0.011 (-0.04)	0.128 (0.44)
Married			-0.188 (-1.09)	-0.184 (-0.89)	-0.163 (-0.93)	-0.204 (-1.14)
Age			0.060 (1.55)	0.081* (1.86)	0.069* (1.76)	0.061 (1.54)
Age <sup>2</sup>			-0.000 (-1.53)	-0.001* (-1.88)	-0.001* (-1.77)	-0.000 (-1.53)
At least 4-year college degree			0.021 (0.19)	-0.008 (-0.07)	0.058 (0.50)	0.021 (0.18)
Farm size: moderate			-0.096 (-0.61)	-0.126 (-0.71)	-0.113 (-0.72)	-0.104 (-0.64)
Farm size: mid-size			-0.043 (-0.23)	-0.134 (-0.65)	-0.093 (-0.49)	-0.048 (-0.24)
Farm size: large			0.216 (0.90)	0.115 (0.44)	0.183 (0.76)	0.082 (0.33)
Retire soon			-0.372* (-1.86)	-0.618*** (-2.62)	-0.378* (-1.88)	-0.428** (-2.03)
Successor			-0.260** (-2.00)	-0.280* (-1.96)	-0.250* (-1.91)	-0.275** (-2.08)
Retire soon × successor			0.482** (1.97)	0.727** (2.58)	0.497** (2.01)	0.551** (2.16)
Autosteer: open to future use					0.179 (0.67)	
Yield monitor: open to future use					0.154 (0.46)	
Soil mapping: open to future use					-0.644** (-2.17)	
VR equip: open to future use					-0.178 (-0.68)	
Drone/UAV: open to future use					0.162 (0.92)	
Online decision tools						0.221 (1.54)
Sensors for data collection						-0.116 (-0.59)
Fully autonomous tractor						1.062*** (2.69)
Remote bin monitoring						0.099 (0.41)
Remote livestock monitoring						0.190 (1.10)
County-level FEs	No	Yes	Yes	Yes	Yes	Yes
Exclude non-adopters	No	No	No	Yes	No	No
N	653	585	543	468	543	518
Pseudo R <sup>2</sup>	0.01	0.08	0.10	0.11	0.11	0.11

Notes: Coefficients rounded to three decimals; z-statistics in parentheses. Significance is denoted as \* p<0.10, \*\* p<0.05, \*\*\* p<0.01. VR = variable rate, UAV = uncrewed aerial vehicles.

**Table SI.12.** Ordered probit estimates for growing conditions anxiety with controls and sensitivity checks.

	(1)	(2)	(3)	(4)	(5)	(6)
Autosteer guidance use	0.303** (2.37)	0.328** (2.11)	0.325* (1.89)	0.412** (2.26)	0.431 (1.46)	0.269 (1.48)
Yield monitors use	0.090 (0.63)	-0.003 (-0.02)	-0.081 (-0.41)	-0.056 (-0.27)	-0.111 (-0.30)	-0.011 (-0.06)
Soil mapping use	0.035 (0.29)	-0.010 (-0.07)	0.046 (0.29)	0.115 (0.70)	-0.121 (-0.36)	0.012 (0.07)
Variable rate equipment use	-0.029 (-0.26)	-0.135 (-1.00)	-0.144 (-0.96)	-0.123 (-0.78)	0.039 (0.14)	-0.145 (-0.95)
Drones/UAV use	0.140 (1.24)	0.221 (1.61)	0.185 (1.26)	0.153 (1.01)	0.287 (1.28)	0.094 (0.58)
Log crop acres		0.083 (1.42)	0.052 (0.67)	0.029 (0.32)	0.062 (0.79)	0.039 (0.47)
Male			-0.110 (-0.36)	-0.196 (-0.61)	-0.075 (-0.24)	-0.219 (-0.67)
Married			-0.295 (-1.54)	-0.243 (-1.09)	-0.326* (-1.69)	-0.249 (-1.26)
Age			0.052 (1.19)	0.056 (1.14)	0.045 (1.00)	0.059 (1.31)
Age <sup>2</sup>			-0.000 (-1.07)	-0.000 (-1.00)	-0.000 (-0.86)	-0.000 (-1.19)
At least 4-year college degree			0.099 (0.75)	0.058 (0.40)	0.103 (0.77)	0.122 (0.88)
Farm size: moderate			0.066 (0.37)	-0.092 (-0.45)	0.047 (0.26)	0.034 (0.18)
Farm size: mid-size			0.165 (0.77)	0.072 (0.30)	0.136 (0.62)	0.151 (0.66)
Farm size: large			0.322 (1.20)	0.278 (0.93)	0.296 (1.09)	0.192 (0.68)
Retire soon			-0.607*** (-2.68)	-0.779*** (-2.89)	-0.588*** (-2.58)	-0.602** (-2.50)
Successor			-0.418*** (-2.72)	-0.318* (-1.88)	-0.408*** (-2.64)	-0.499*** (-3.15)
Retire soon × successor			0.497* (1.79)	0.628* (1.95)	0.467* (1.67)	0.534* (1.83)
Autosteer: open to future use					0.197 (0.65)	
Yield monitor: open to future use					-0.011 (-0.03)	
Soil mapping: open to future use					-0.178 (-0.52)	
VR equip: open to future use					0.233 (0.77)	
Drone/UAV: open to future use					0.118 (0.57)	
Online decision tools						0.256 (1.51)
Sensors for data collection						-0.088 (-0.40)
Fully autonomous tractor						0.352 (0.75)
Remote bin monitoring						-0.052 (-0.18)
Remote livestock monitoring						-0.062 (-0.31)
County-level FEs	No	Yes	Yes	Yes	Yes	Yes
Exclude non-adopters	No	No	No	Yes	No	No
N	654	585	541	466	541	516
Pseudo R <sup>2</sup>	0.02	0.12	0.15	0.17	0.15	0.15

Notes: Coefficients rounded to three decimals; z-statistics in parentheses. Significance is denoted as \* p<0.10, \*\* p<0.05, \*\*\* p<0.01. VR = variable rate, UAV = uncrewed aerial vehicles.

**Table SI.13.** Ordered probit estimates for fatigue with controls and sensitivity checks.

	(1)	(2)	(3)	(4)	(5)	(6)
Autosteer guidance use	0.600*** (5.04)	0.678*** (4.88)	0.779*** (5.15)	0.765*** (4.84)	0.831*** (3.22)	0.744*** (4.68)
Yield monitors use	0.303** (2.31)	0.370** (2.42)	0.267 (1.57)	0.251 (1.38)	0.186 (0.56)	0.314* (1.79)
Soil mapping use	-0.015 (-0.13)	-0.091 (-0.71)	-0.102 (-0.73)	-0.056 (-0.39)	-0.102 (-0.35)	-0.100 (-0.69)
Variable rate equipment use	0.099 (0.94)	0.213* (1.77)	0.171 (1.31)	0.168 (1.23)	0.198 (0.77)	0.186 (1.41)
Drones/UAV use	0.087 (0.84)	0.051 (0.42)	0.050 (0.39)	0.085 (0.65)	0.280 (1.43)	0.122 (0.87)
Log crop acres		0.081 (1.54)	-0.046 (-0.67)	-0.075 (-0.93)	-0.039 (-0.55)	-0.069 (-0.94)
Male			0.508* (1.87)	0.508* (1.80)	0.553** (2.02)	0.589** (2.05)
Married			-0.275 (-1.62)	-0.397** (-2.01)	-0.322* (-1.86)	-0.281 (-1.60)
Age			0.041 (1.03)	0.063 (1.43)	0.033 (0.83)	0.038 (0.95)
Age <sup>2</sup>			-0.000 (-1.36)	-0.001* (-1.67)	-0.000 (-1.13)	-0.000 (-1.26)
At least 4-year college degree			0.171 (1.47)	0.177 (1.40)	0.172 (1.46)	0.179 (1.47)
Farm size: moderate			0.202 (1.28)	0.143 (0.81)	0.188 (1.19)	0.246 (1.50)
Farm size: mid-size			0.304 (1.59)	0.341 (1.63)	0.294 (1.53)	0.311 (1.55)
Farm size: large			0.591** (2.42)	0.613** (2.29)	0.568** (2.32)	0.630** (2.47)
Retire soon			-0.188 (-0.92)	-0.297 (-1.25)	-0.163 (-0.79)	-0.233 (-1.08)
Successor			-0.058 (-0.44)	0.060 (0.41)	-0.035 (-0.27)	-0.033 (-0.24)
Retire soon × successor			0.160 (0.64)	0.195 (0.69)	0.125 (0.50)	0.158 (0.61)
Autosteer: open to future use					0.116 (0.44)	
Yield monitor: open to future use					-0.053 (-0.15)	
Soil mapping: open to future use					0.029 (0.09)	
VR equip: open to future use					0.043 (0.16)	
Drone/UAV: open to future use					0.274 (1.52)	
Online decision tools						-0.023 (-0.16)
Sensors for data collection						-0.058 (-0.29)
Fully autonomous tractor						-0.022 (-0.05)
Remote bin monitoring						0.121 (0.50)
Remote livestock monitoring						-0.149 (-0.85)
County-level FEs	No	Yes	Yes	Yes	Yes	Yes
Exclude non-adopters	No	No	No	Yes	No	No
N	660	592	548	474	548	523
Pseudo R <sup>2</sup>	0.06	0.14	0.17	0.17	0.17	0.17

Notes: Coefficients rounded to three decimals; z-statistics in parentheses. Significance is denoted as \* p<0.10, \*\* p<0.05, \*\*\* p<0.01. VR = variable rate, UAV = uncrewed aerial vehicles.

**Table SI.14.** Ordered probit estimates for technology failure stress with controls and sensitivity checks.

	(1)	(2)	(3)	(4)	(5)	(6)
Autosteer guidance use	-0.157 (-1.32)	-0.155 (-1.10)	-0.144 (-0.95)	-0.084 (-0.53)	0.273 (1.04)	-0.173 (-1.08)
Yield monitors use	0.084 (0.63)	0.066 (0.42)	0.130 (0.74)	0.252 (1.35)	0.196 (0.58)	0.122 (0.67)
Soil mapping use	0.032 (0.28)	0.088 (0.67)	0.090 (0.64)	0.173 (1.18)	-0.216 (-0.73)	0.081 (0.56)
Variable rate equipment use	0.133 (1.26)	-0.014 (-0.12)	-0.022 (-0.16)	0.090 (0.65)	-0.089 (-0.34)	-0.044 (-0.33)
Drones/UAV use	0.084 (0.81)	0.246** (2.03)	0.188 (1.45)	0.142 (1.08)	0.099 (0.49)	0.181 (1.28)
Log crop acres		-0.073 (-1.39)	-0.112 (-1.58)	-0.142* (-1.73)	-0.106 (-1.49)	-0.129* (-1.75)
Male			-0.012 (-0.04)	-0.006 (-0.02)	-0.017 (-0.06)	0.109 (0.36)
Married			-0.529*** (-3.03)	-0.688*** (-3.36)	-0.516*** (-2.91)	-0.546*** (-3.04)
Age			-0.031 (-0.77)	-0.032 (-0.71)	-0.029 (-0.70)	-0.036 (-0.88)
Age <sup>2</sup>			0.000 (0.81)	0.000 (0.61)	0.000 (0.75)	0.000 (0.93)
At least 4-year college degree			0.152 (1.30)	0.096 (0.76)	0.189 (1.60)	0.114 (0.94)
Farm size: moderate			0.045 (0.29)	-0.039 (-0.22)	0.022 (0.14)	0.093 (0.57)
Farm size: mid-size			-0.060 (-0.31)	-0.244 (-1.16)	-0.106 (-0.55)	0.029 (0.14)
Farm size: large			0.048 (0.20)	-0.087 (-0.33)	0.010 (0.04)	0.111 (0.44)
Retire soon			-0.447** (-2.19)	-0.820*** (-3.36)	-0.412** (-1.99)	-0.451** (-2.10)
Successor			-0.262* (-1.94)	-0.226 (-1.54)	-0.258* (-1.90)	-0.272** (-1.98)
Retire soon × successor			0.644** (2.55)	1.061*** (3.63)	0.597** (2.34)	0.674*** (2.58)
Autosteer: open to future use					0.518* (1.90)	
Yield monitor: open to future use					0.098 (0.28)	
Soil mapping: open to future use					-0.353 (-1.16)	
VR equip: open to future use					-0.083 (-0.30)	
Drone/UAV: open to future use					-0.101 (-0.55)	
Online decision tools						0.106 (0.72)
Sensors for data collection						0.135 (0.66)
Fully autonomous tractor						0.105 (0.26)
Remote bin monitoring						-0.097 (-0.40)
Remote livestock monitoring						-0.072 (-0.40)
County-level FEs	No	Yes	Yes	Yes	Yes	Yes
Exclude non-adopters	No	No	No	Yes	No	No
N	646	578	536	464	536	511
Pseudo R <sup>2</sup>	0.003	0.09	0.12	0.15	0.13	0.12

Notes: Coefficients rounded to three decimals; z-statistics in parentheses. Significance is denoted as \* p<0.10, \*\* p<0.05, \*\*\* p<0.01. VR = variable rate, UAV = uncrewed aerial vehicles.

**Table SI.15.** Ordered probit estimates for productivity with controls and sensitivity checks.

	(1)	(2)	(3)	(4)	(5)	(6)
Autosteer guidance use	0.585*** (4.68)	0.619*** (4.16)	0.678*** (4.12)	0.634*** (3.72)	0.773*** (2.83)	0.697*** (4.05)
Yield monitors use	0.027 (0.20)	-0.063 (-0.39)	-0.269 (-1.45)	-0.279 (-1.42)	0.015 (0.04)	-0.262 (-1.38)
Soil mapping use	0.161 (1.38)	0.077 (0.57)	0.072 (0.48)	0.091 (0.59)	-0.382 (-1.20)	0.069 (0.45)
Variable rate equipment use	0.147 (1.35)	0.227* (1.77)	0.097 (0.69)	0.077 (0.53)	0.127 (0.46)	0.083 (0.58)
Drones/UAV use	0.133 (1.24)	0.031 (0.24)	-0.004 (-0.03)	0.012 (0.09)	0.212 (1.02)	-0.020 (-0.14)
Log crop acres		0.134** (2.44)	0.061 (0.83)	0.060 (0.70)	0.068 (0.91)	0.044 (0.57)
Male			0.357 (1.24)	0.455 (1.51)	0.373 (1.28)	0.365 (1.20)
Married			0.139 (0.75)	0.015 (0.07)	0.089 (0.47)	0.116 (0.61)
Age			0.014 (0.33)	0.027 (0.58)	0.015 (0.35)	0.010 (0.24)
Age <sup>2</sup>			-0.000 (-0.60)	-0.000 (-0.78)	-0.000 (-0.60)	-0.000 (-0.43)
At least 4-year college degree			0.340*** (2.76)	0.334** (2.50)	0.367*** (2.93)	0.349*** (2.72)
Farm size: moderate			-0.205 (-1.22)	-0.177 (-0.94)	-0.243 (-1.44)	-0.210 (-1.21)
Farm size: mid-size			0.336* (1.66)	0.418* (1.89)	0.296 (1.45)	0.320 (1.51)
Farm size: large			0.332 (1.30)	0.388 (1.38)	0.302 (1.17)	0.268 (1.00)
Retire soon			0.067 (0.30)	-0.020 (-0.08)	0.085 (0.37)	0.101 (0.43)
Successor			0.288** (2.03)	0.337** (2.19)	0.310** (2.17)	0.320** (2.22)
Retire soon × successor			-0.171 (-0.63)	-0.157 (-0.51)	-0.199 (-0.73)	-0.270 (-0.96)
Autosteer: open to future use					0.140 (0.50)	
Yield monitor: open to future use					0.358 (0.99)	
Soil mapping: open to future use					-0.508 (-1.53)	
VR equip: open to future use					0.048 (0.16)	
Drone/UAV: open to future use					0.259 (1.35)	
Online decision tools						0.218 (1.38)
Sensors for data collection						-0.232 (-1.08)
Fully autonomous tractor						-0.021 (-0.05)
Remote bin monitoring						0.132 (0.52)
Remote livestock monitoring						0.049 (0.26)
County-level FEs	No	Yes	Yes	Yes	Yes	Yes
Exclude non-adopters	No	No	No	Yes	No	No
N	649	582	540	469	540	515
Pseudo R <sup>2</sup>	0.06	0.16	0.21	0.22	0.21	0.21

Notes: Coefficients rounded to three decimals; z-statistics in parentheses. Significance is denoted as \* p<0.10, \*\* p<0.05, \*\*\* p<0.01. VR = variable rate, UAV = uncrewed aerial vehicles.

**Table SI.16.** Direction and significance across 11 wellbeing ordered probit regressions from main specification.

	(1) Time Pressure	(2) Time Physical	(3) Time Nonfarm	(4) Flex Time Off	(5) Data Stress	(6) Tech Stress	(7) Task Stress	(8) Growing Cond.	(9) Fatigue	(10) Tech Fail. Stress	(11) Prod.
Autosteer guidance use	***	***	+	+	-	-	+	+	***	-	***
Yield monitor use	-	-	-*	-*	+	+	+	-	+	+	-
Soil mapping use	+	-	+	-	+	+	-	+	-	+	+
Variable rate equipment use	+	***	***	***	+	-	-	-	+	-	+
Drone/UAV use	+	+	-	-*	***	+	***	+	+	+	-
Log crop acres	+	+	-	-	-	-	-	+	-	-	+
Male	+	+	-	-	+	+	+	-	+	-	+
Married	-	-	+	+	-	-	-	-	-	***	+
Age	***	-	-	+	+	+	+	+	+	-	+
Age <sup>2</sup>	**	+	+	-	-	-	-	-	-	+	-
At least 4-year college degree	+	-	+	-	***	+	+	+	+	+	***
Farm size: moderate	+	-	+	+	+	-	-	+	+	+	-
Farm size: mid-size	-	-	***	***	-	**	-	+	+	-	+
Farm size: large	+	-	+	***	+	+	+	+	***	+	+
Retire soon	-	-	+	+	-	-	-*	***	-	**	+
Successor	+	+	***	+	-	-	**	***	-	-*	***
Retire soon × successor	+	+	-	-	+	+	***	+	+	***	-
County-level FEs	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	534	543	540	535	538	540	543	541	548	536	540
Pseudo R <sup>2</sup>	0.10	0.14	0.16	0.23	0.10	0.09	0.10	0.15	0.17	0.12	0.21

Notes: Entries report coefficient signs and statistical significance from Model (3) ordered probit estimates. '+' / '-' indicate coefficient sign. Significance levels: \* p<0.10, \*\* p<0.05, \*\*\* p<0.01. All signs are shown regardless of statistical significance. UAV = uncrewed aerial vehicles.

**Table SI.17.** Ordered probit estimates across wellbeing outcomes using 3-point wellbeing scale for main specification.

	(1) Time Pressure	(2) Time Physical	(3) Time Nonfarm	(4) Flex Time Off	(5) Data Stress	(6) Tech Stress	(7) Task Stress	(8) Growing Cond.	(9) Fatigue	(10) Tech Fail. Stress	(11) Prod.
Autosteer guidance use	0.364** (2.29)	0.440*** (2.62)	0.225 (1.23)	0.277 (1.29)	-0.092 (-0.59)	-0.180 (-1.11)	0.192 (1.23)	0.307* (1.74)	0.843*** (5.17)	-0.223 (-1.34)	0.643*** (3.65)
Yield monitor use	-0.078 (-0.42)	-0.010 (-0.05)	-0.460** (-2.18)	-0.493** (-1.97)	0.142 (0.79)	0.208 (1.10)	0.379** (2.11)	-0.045 (-0.22)	0.274 (1.48)	0.141 (0.73)	-0.262 (-1.27)
Soil mapping use	-0.013 (-0.09)	-0.130 (-0.85)	0.074 (0.44)	-0.221 (-1.13)	0.304** (2.09)	0.194 (1.29)	-0.086 (-0.59)	0.097 (0.60)	-0.173 (-1.10)	0.075 (0.48)	0.034 (0.20)
VR equipment use	0.003 (0.02)	0.310** (2.15)	0.366** (2.33)	0.464** (2.52)	0.042 (0.31)	-0.196 (-1.37)	-0.258* (-1.89)	-0.141 (-0.92)	0.141 (0.97)	-0.106 (-0.72)	0.119 (0.74)
Drone/UAV use	-0.010 (-0.07)	-0.048 (-0.34)	-0.164 (-1.07)	-0.351** (-2.00)	0.216 (1.59)	0.114 (0.82)	0.315** (2.35)	0.237 (1.57)	-0.040 (-0.26)	0.198 (1.39)	-0.168 (-1.01)
Log crop acres	0.023 (0.31)	0.018 (0.24)	-0.064 (-0.76)	-0.064 (-0.68)	-0.036 (-0.49)	0.047 (0.63)	-0.098 (-1.34)	0.044 (0.53)	0.024 (0.30)	-0.053 (-0.69)	0.075 (0.90)
Male	0.163 (0.56)	0.469 (1.54)	-0.259 (-0.76)	-0.079 (-0.21)	0.299 (1.01)	0.091 (0.31)	-0.087 (-0.30)	-0.085 (-0.27)	0.589** (2.00)	0.024 (0.08)	0.165 (0.50)
Married	-0.119 (-0.66)	-0.025 (-0.13)	0.114 (0.56)	0.426* (1.78)	-0.283 (-1.55)	-0.420** (-2.25)	-0.176 (-0.95)	-0.296 (-1.50)	-0.245 (-1.29)	-0.601*** (-3.25)	0.159 (0.76)
Age	0.072* (1.75)	-0.053 (-1.22)	-0.032 (-0.69)	-0.009 (-0.17)	0.019 (0.45)	0.010 (0.23)	0.056 (1.37)	0.063 (1.38)	0.056 (1.23)	-0.042 (-0.95)	0.001 (0.02)
Age <sup>2</sup>	-0.001* (-1.95)	0.000 (0.89)	0.000 (0.61)	0.000 (0.27)	-0.000 (-0.36)	-0.000 (-0.10)	-0.000 (-1.39)	-0.000 (-1.30)	-0.001 (-1.57)	0.000 (1.04)	-0.000 (-0.32)
At least 4-year degree	0.133 (1.09)	-0.032 (-0.25)	0.140 (1.01)	0.023 (0.14)	0.191 (1.58)	0.210* (1.67)	-0.034 (-0.28)	0.091 (0.67)	0.246* (1.81)	0.205 (1.60)	0.253* (1.73)
Farm size: moderate	0.100 (0.60)	-0.117 (-0.68)	0.152 (0.81)	0.364* (1.65)	0.061 (0.37)	-0.178 (-1.06)	-0.074 (-0.45)	0.011 (0.06)	0.184 (1.06)	-0.001 (-0.01)	-0.128 (-0.69)
Farm size: mid-size	-0.147 (-0.73)	-0.012 (-0.06)	0.548** (2.38)	0.786*** (2.93)	-0.280 (-1.41)	-0.480** (-2.35)	0.070 (0.35)	0.138 (0.62)	0.306 (1.42)	-0.108 (-0.52)	0.568** (2.45)
Farm size: large	-0.014 (-0.06)	-0.075 (-0.28)	0.487* (1.67)	0.777** (2.32)	0.012 (0.05)	-0.076 (-0.30)	0.324 (1.28)	0.309 (1.10)	0.400 (1.44)	-0.055 (-0.21)	0.542* (1.81)
Retire soon	-0.046 (-0.21)	-0.155 (-0.70)	-0.012 (-0.05)	0.129 (0.45)	-0.039 (-0.19)	-0.260 (-1.16)	-0.373* (-1.73)	-0.651*** (-2.75)	-0.288 (-1.27)	-0.191 (-0.86)	0.204 (0.82)
Successor	0.080 (0.57)	-0.008 (-0.06)	0.300* (1.89)	0.278 (1.52)	0.002 (0.02)	-0.025 (-0.17)	-0.178 (-1.29)	-0.417*** (-2.64)	-0.219 (-1.42)	-0.205 (-1.38)	0.080 (0.49)
Retire soon × success	0.172 (0.64)	0.299 (1.10)	-0.258 (-0.86)	-0.497 (-1.42)	0.166 (0.64)	0.326 (1.18)	0.471* (1.78)	0.500* (1.73)	0.355 (1.25)	0.336 (1.22)	-0.138 (-0.45)
County-level FEs	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	534	543	540	535	538	544	543	541	548	536	540
Pseudo R <sup>2</sup>	0.12	0.16	0.20	0.27	0.12	0.13	0.13	0.18	0.23	0.18	0.26

Notes: Ordered probit estimates reported with z-statistics in parentheses. County fixed effects included but omitted from the table. \* p < 0.10, \*\* p < 0.05, \*\*\* p < 0.01. VR = variable rate, UAV = uncrewed aerial vehicles, successor = successor.

**Table SI.18.** Direction and significance across 11 wellbeing ordered probit regressions using 3-point wellbeing outcomes for main specification.

	(1) Time Pressure	(2) Time Physical	(3) Time Nonfarm	(4) Flex Time Off	(5) Data Stress	(6) Tech Stress	(7) Task Stress	(8) Growing Cond.	(9) Fatigue	(10) Tech Fail. Stress	(11) Prod.
Autosteer guidance use	+	+	+	+	-	-	+	+	+	-	+
Yield monitor use	-	-	-	-	+	+	+	-	+	+	-
Soil mapping use	-	-	+	-	+	+	-	+	-	+	+
Variable rate equipment use	+	+	+	+	+	-	-	+	+	-	+
Drone/UAV use	-	-	-	-	+	+	+	+	-	+	-
Log crop acres	+	+	-	-	-	+	-	+	+	-	+
Male	+	+	-	-	+	+	-	-	+	+	+
Married	-	-	+	+	-	-	-	-	-	-	+
Age	+	-	-	-	+	+	+	+	+	-	+
Age <sup>2</sup>	-	+	+	+	-	-	-	-	-	+	-
At least 4-year college degree	+	-	+	+	+	+	-	+	+	+	+
Farm size: moderate	+	-	+	+	+	-	-	+	+	-	-
Farm size: mid-size	-	-	+	+	-	-	+	+	+	-	+
Farm size: large	-	-	+	+	+	-	+	+	+	-	+
Retire soon	-	-	-	+	-	-	-	-	-	-	+
Successor	+	-	+	+	+	-	-	-	-	-	+
Retire soon × successor	+	+	-	-	+	+	+	+	+	+	-
County-level FEs	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	534	543	540	535	538	544	543	541	548	536	540
Pseudo R <sup>2</sup>	0.12	0.16	0.20	0.27	0.12	0.13	0.13	0.18	0.23	0.18	0.26

Notes: Entries report coefficient signs and statistical significance from Model (3) ordered probit estimates. '+' / '-' indicate coefficient sign. Significance levels: \* p<0.10, \*\* p<0.05, \*\*\* p<0.01. All signs are shown regardless of statistical significance. UAV = uncrewed aerial vehicles.

**Table SI.19.** OLS estimates for averaged wellbeing outcomes for main specification.

	(1) Average	(2) Time Average	(3) All Stress Average	(4) Data & Tech Stress	(5) Other Time Average	(6) Time & Fatigue
Autosteer guidance use	0.139** (2.55)	0.137** (2.36)	0.025 (0.32)	-0.036 (-0.40)	0.070 (1.05)	0.303*** (3.75)
Yield monitor use	0.023 (0.37)	-0.081 (-1.22)	0.080 (0.89)	0.068 (0.67)	-0.152** (-1.98)	0.045 (0.49)
Soil mapping use	0.008 (0.16)	-0.023 (-0.42)	0.067 (0.93)	0.131 (1.58)	0.003 (0.05)	-0.067 (-0.89)
Variable rate equipment use	0.028 (0.59)	0.098* (1.96)	-0.050 (-0.74)	-0.035 (-0.46)	0.113** (1.98)	0.099 (1.41)
Drone/UAV use	0.066 (1.41)	-0.023 (-0.47)	0.143** (2.13)	0.136* (1.77)	-0.053 (-0.95)	0.022 (0.32)
Log crop acres	-0.016 (-0.63)	-0.006 (-0.21)	-0.025 (-0.68)	-0.035 (-0.85)	-0.014 (-0.45)	-0.009 (-0.24)
Male	0.118 (1.18)	0.085 (0.79)	0.069 (0.48)	0.156 (0.96)	-0.057 (-0.47)	0.218 (1.48)
Married	-0.097 (-1.56)	0.003 (0.05)	-0.181** (-2.05)	-0.222** (-2.20)	0.053 (0.72)	-0.119 (-1.30)
Age	0.013 (0.88)	0.008 (0.55)	0.013 (0.62)	0.003 (0.11)	-0.005 (-0.29)	0.022 (1.01)
Age <sup>2</sup>	-0.000 (-0.94)	-0.000 (-0.73)	-0.000 (-0.55)	-0.000 (-0.06)	0.000 (0.26)	-0.000 (-1.31)
At least 4-year college degree	0.082* (1.95)	0.031 (0.69)	0.089 (1.48)	0.133* (1.93)	0.027 (0.54)	0.055 (0.89)
Farm size: moderate	0.013 (0.23)	0.047 (0.77)	-0.019 (-0.23)	-0.028 (-0.30)	0.076 (1.10)	0.056 (0.67)
Farm size: mid-size	0.020 (0.29)	0.062 (0.85)	-0.084 (-0.85)	-0.167 (-1.47)	0.190** (2.26)	0.031 (0.30)
Farm size: large	0.111 (1.25)	0.096 (1.03)	0.066 (0.52)	0.006 (0.04)	0.212** (1.98)	0.102 (0.78)
Retire soon	-0.144** (-1.99)	-0.043 (-0.55)	-0.204* (-1.96)	-0.185 (-1.55)	0.010 (0.11)	-0.090 (-0.83)
Successor	-0.018 (-0.37)	0.067 (1.32)	-0.114 (-1.64)	-0.066 (-0.83)	0.118** (2.02)	0.002 (0.03)
Retire soon × successor	0.156* (1.74)	0.013 (0.14)	0.276** (2.14)	0.291** (1.97)	-0.117 (-1.05)	0.114 (0.85)
County-level FEs	Yes	Yes	Yes	Yes	Yes	Yes
N	559	550	553	553	544	555
R-squared	0.27	0.23	0.23	0.23	0.27	0.28
Adjusted R-squared	0.08	0.04	0.03	0.04	0.08	0.10

Notes: Each column reports Model (3) from Panel A of the corresponding dependent-variable table. Coefficients rounded to three decimals; t-statistics in parentheses. \* p<0.10, \*\* p<0.05, \*\*\* p<0.01. *Average* is the average over all eleven wellbeing metrics. *Time Average* is the average of time pressure, time physical, time nonfarm, and flex time off. *All Stress Average* is the average of data stress, tech stress, task stress, growing conditions, and tech failure stress. *Data & Tech Stress* is the average of data stress, tech stress, and tech failure stress. *Other Time Average* is the average of time nonfarm and flex time off. *Time & Fatigue* is the average of time pressure, time physical, and fatigue. VR = variable rate, UAV = uncrewed aerial vehicles.

**Table SI.20.** Illustrative example quotes from qualitative analysis, by theme and sentiment.

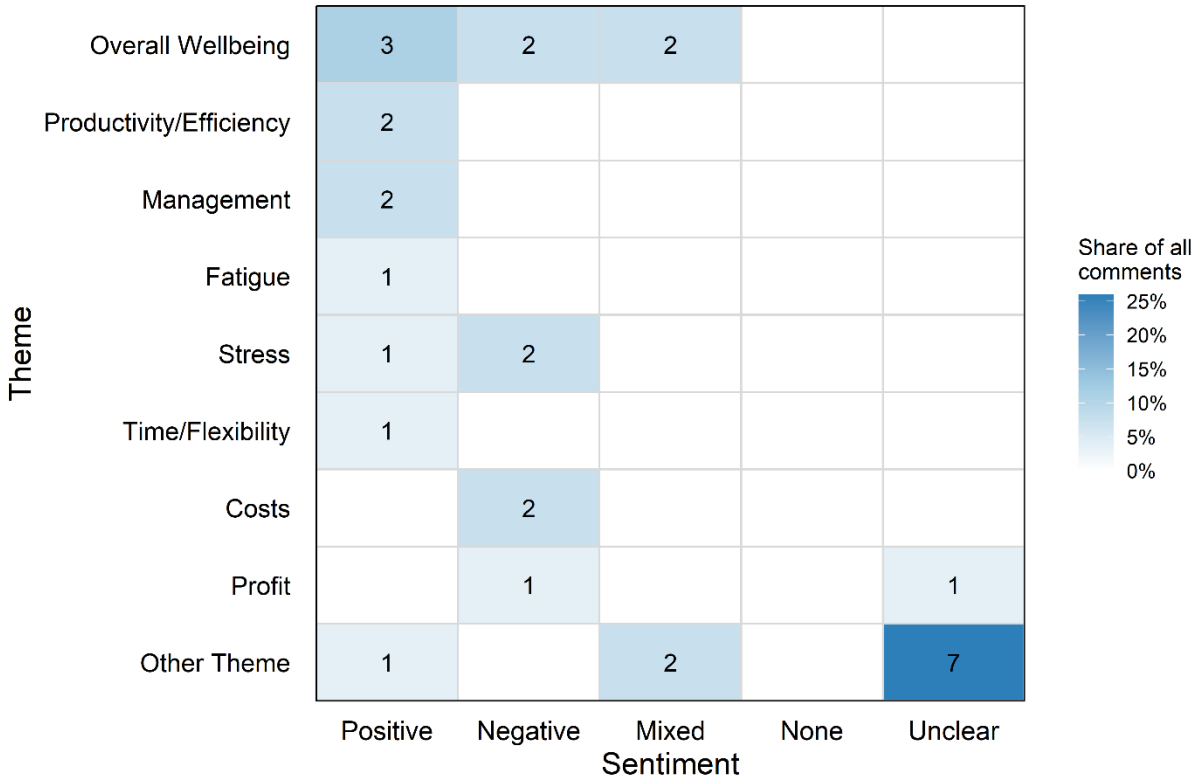
Quote	Theme-sentiment 1	Theme-sentiment 2	Theme-sentiment 3
Made the repetitive aspects of fieldwork much less tiresome. Much easier to compare hybrids. Yield maps have made tiling decisions much simpler, and identify if any variations are something management can control.	Fatigue+	Management+	Productivity/efficiency+
Some of technology has helped to management decisions. Other technology I use and tried increased stress because it only works part of the time so you have to be watching it closely.	Management+	Stress-	
Less fatigue. More productive thru increased accuracy. Less overlap. Less time in the field.	Fatigue+	Productivity/efficiency+	Time/flexibility+
Physical is easier with autosteer. Yield monitor is helpful. Cost is a concern - does it pay on a small operation?	Fatigue+	Management+	Cost-
I have noticed not being nearly as tired at the end of a 12-14 hour day as I would have been without auto-steer. Auto-steering has nearly eliminated the stress of a long work day because it frees you up from focusing on the planter mark etc.	Fatigue+	Stress+	Time/flexibility+
Yield maps help select more compatible varieties. Cluttered the cab. Frustrating technical problems. Too many cables. Higher maintenance and troubleshooting costs. Costly licenses.	Management+	Stress-	Cost-
Better yields, less seed, less fertilizer. Stress from cost of tech and aggravation of electronic failures	Productivity/efficiency+	Stress-	Cost-

**Note:** Many quotes had more than one theme. For illustrative purposes, we include several quotes that were coded into two or three theme-sentiment pairs. A plus (+) indicates positive sentiment, whereas a minus sign (-) indicates negative sentiment.

## Figures

Figure SI.1 displays theme-sentiment pairs identified among non-adopters, excluding 54 instances coded as “Other Theme–None.” Among the 30 theme–sentiment pairs indicating perceived impacts, positive sentiment was most commonly associated with overall wellbeing, productivity/efficiency, and management. Nonadopters exhibited negative sentiment around stress and cost outcomes, as well as overall wellbeing.

**Figure SI.1.** Themes and sentiments prevailing in non-adopting farmers' open-ended comments



**Source:** 2025 Iowa Farm and Rural Life Poll.

**Note:** Cells show counts of 30 finalized theme-sentiment pairs from open-ended comments by non-adopters to the question, “Thinking about all of the different precision and digital agricultural technologies and services that you use, in what ways have they impacted your life?” Shading indicates each cell's share of all finalized comments. The theme-sentiment pairs reported exclude 54 instances of (Other Theme, None).

## Open-Ended Question Analysis Codebook

This codebook was developed to analyze digital agriculture adopters' responses to the open-ended survey question, "Thinking about all of the different precision and digital agricultural technologies and services that you use, in what ways have they impacted your life?" The coding followed a two-step process whereby each comment was coded for themes and sentiments. The first step was to code responses into one or more of eight themes: productivity/efficiency, management, fatigue, stress, time/flexibility, overall wellbeing, costs, and profit. Each open-ended response could contain multiple themes (e.g., fatigue, cost). Each thematic code was coded into one of five sentiment categories: positive, negative, mixed, none, and unclear.

### 1. Theme Coding

We will code all applicable themes from each comment.

#### Theme 1: Costs

Mentions financial cost, subscription fees, or economics, either associated with technology or not directly linked to technology.

##### Include

- "expensive"
- "cost too much"
- "subscriptions"
- "hard to justify"
- "raised my business expenses."

##### Exclude

- General mentions of revenues, sales, or profits

#### Theme 2: Fatigue

Mentions primarily physical strain (or perhaps some mental strain) or comfort.

##### Include

- "less fatigue"
- "easier day"
- "more relaxed"

##### Exclude

- "less stressful" or "more stressful"
- Specific mentions of extending the day or timing → code as timing/flexibility

#### Theme 3: Stress

Mentions mental pressure, strain, burden and/or anxiety (regardless of the particular reason like technology vs. data).

##### Include

- "less stressful" or "more stressful"
- Mentions of being mentally relaxed

##### Exclude

- "less fatigue"

- Reductions of physical stress → more properly coded as fatigue

#### **Theme 4: Productivity/Efficiency**

Mentions altered output, efficiency, reduced/increased input use, or physical performance (e.g., yields, bushels).

##### **Include**

- “better yields” or “higher yields”
- “more efficient”
- “less overlap”
- “saves inputs” or “greater input use”

##### **Exclude**

- Decision-making improvements → may belong in Management theme
- Statements about input *cost* reductions rather than the *physical inputs* themselves
  - “saves inputs” → Productivity/Efficiency but “saves input costs” → Costs

#### **Theme 5: Management**

Mentions improved decision-making, planning, or information use.

##### **Include**

- “better decisions”
- “more data”
- “manage better”
- “better timing”
- “monitoring”
- “optimize”

##### **Example**

- “able to manage weather conditions better, able to manage markets better”

##### **Exclude**

- Pure productivity/efficiency gains without a managerial component → Productivity

#### **Theme 6: Time/Flexibility**

Mentions changes in working hours, scheduling, flexibility, time savings, longer days, or time allocation.

##### **Include**

- “longer days”
- “more free time”
- “less time away from farm”

##### **Exclude**

- “more efficient and faster” (unless time referenced very explicitly)
- “can farm more acres” (this more appropriately belongs under productivity/efficiency)

#### **Theme 7: Profit**

Explicit mention of impacts on profits or profitability

## **Exclude**

Mentions of cost that may be interpreted as implicitly profit-related, but are not explicit about profit impacts

## **Theme 8: Overall wellbeing**

General statements that focus on higher-order wellbeing, not specific to any of the other themes

## **Include**

- “Made life easier”
- “Made life less enjoyable”
- “Made farming more fun and exciting”

## **Exclude**

## **Theme X: No theme**

Record no theme if it is clear that the comment cannot be linked to any of the above 6 themes (i.e., the comment simply does not have a theme).

## **Theme Assignments General Instructions**

For each comment, read the comment and identify all themes that plausibly apply.

- a) Explicit emphasis overrides implicit content: assign themes based on explicit wording rather than ideas/concepts that seem to be implied or suggested.
- b) Be careful about management vs. productivity/efficiency
  - If the comment emphasizes thinking/deciding/monitoring → Management
  - If it emphasizes output, speed, efficiency → Productivity/efficiency

### **Examples**

- “better decisions with more data” → Management
- “get more done in less time” → Productivity/efficiency

## **Special Cases**

A. Very short comments

### **Example 1**

- “a little”
  - Sentiment: Positive
  - Theme: No theme

### **Example 2**

- “Not at all”
  - Sentiment: none
  - Theme: No theme

### **Example 3**

- “Don’t use”
  - INDICATE “YES” IN THE NEW COLUMN FOR NONADOPTERS
  - Sentiment: none
  - Theme: No theme

B. Multi-sentence comments

- Focus mostly on the overall message

C. Lists of effects

**Example**

- “more efficient, better decisions, less stress”
  - Themes: productivity/efficiency, management, stress

## **2. Sentiment Coding**

Each comment receives one and only one sentiment code.

### **Positive sentiment**

The respondent indicates that precision/digital technologies have had a net beneficial effect on their life, work, or wellbeing.

#### **Indicators**

- Reduced fatigue/stress
- Improved efficiency or outcomes
- Better management or decision-making
- Positive framing without mention of downsides

#### **Example**

- “able to manage weather conditions better, able to manage markets better”

### **Negative sentiment**

The respondent indicates that technologies have had a net harmful effect on their life or wellbeing.

#### **Indicators**

- Increased stress or frustration
- Cost burden emphasized
- Technology failure complaints
- Explicit dissatisfaction

#### **Example**

- “too expensive and causes more headaches than it’s worth”

### **Mixed sentiment**

The respondent provides indications of both positive and negative sentiments for the same theme. This can be with respect to the same subject/object or on two or more different subjects/objects in the same comment.

#### **Indicators**

- Increased and decreased stress or frustration
- Increased and decreased costs
- Satisfaction and dissatisfaction along one or more dimensions

#### **Example**

- “data increase and decrease stress”
- “believe they can be useful but have an overall negative effect on the users”

### **None-No sentiment**

The respondent indicates no meaningful effect, which is not to be confused with statements that are unclear, i.e., statements that describe a mechanism or technology, but the evaluation is missing or indeterminate. (see category below)

#### **Indicators**

- “none”

- “no impact”
- vague or minimal response

### **Example**

- “no effect on me or my household”

### **Sentiment Unclear**

The respondent’s comment is indecipherable or otherwise impossible to determine. These comments tend to describe a mechanism or technology but lack an evaluation.

### **Indicators**

- Comment states *what changed* but not whether it’s good or bad (e.g., “allows” or “provides” or “gives me”).
- Descriptions of *what the technology does*, now how it affects them

### **Examples**

- “more data available”
- “can monitor fields remotely”
- “uses GPS and mapping”
- “allows for variable rate application”