Volume 13, Issue 6 June 2025

RightRisk™

RightRisk News

Agricultural Labor: Implications of Technology's Growing Shadow

A fundamental transformation is reshaping agricultural labor, supply chains, and rural economies. For example, recent trials show a single operator with autonomous harvesters can now manage the work that once required a crew of eight, dramatically expanding both scale and efficiency (bonsairobotics.ai 2025). As farms rapidly adopt robotics, drones, and precision agriculture technologies, the ripple effects create both unprecedented opportunities and complex challenges demanding strategic adaptation from every stakeholder in the agricultural ecosystem.

Technology's Transformative Impact

Today's digital revolution—encompassing artificial intelligence, robotics, and precision agriculture—is advancing at an unprecedented pace. The USDA Economic Research Service reports agricultural productivity has increased 170 percent since 1948, with technology adoption accelerating dramatically in the past decade (USDA ERS, 2023).

Three cutting-edge technologies exemplify this transformation:

- *Smart Livestock Management*: New Zealand-based Halter's GPS-enabled smart collars allow ranchers to manage cattle herds remotely through sound and vibration cues. A single rancher can now manage 2,000+ head across 5,000 acres—work previously requiring multiple cowboys and fencing infrastructure costing $15,000-30,000 per mile. This predictable livestock movement enables feed suppliers to optimize deliveries and helps processors reduce plant idle time by 15 percent (Morrison 2024).

- *Autonomous Harvest Systems*: Bonsai Robotics' vision-guided machines harvest nuts at twice traditional speed while reducing labor requirements by 80 percent. A single machine replaces 6-8 seasonal workers, operating 16 hours daily versus standard 8-hour shifts. Processors receive 25 percent more consistent delivery volumes, while retailers see 30 percent fewer out-of-stock incidents (bonsairobotics.ai 2025).

- *Field Management Robotics*: SwarmFarm's modular robots reduce chemical inputs by 98 percent through precision application, while FarmWise offers AI-powered weeding for $50-75 per acre compared to $120-150 for traditional methods. These systems enable sustainable practices commanding 20-40 percent premium prices while reducing input costs by 35 percent (Kiernan-Stone. Forbes 2021).

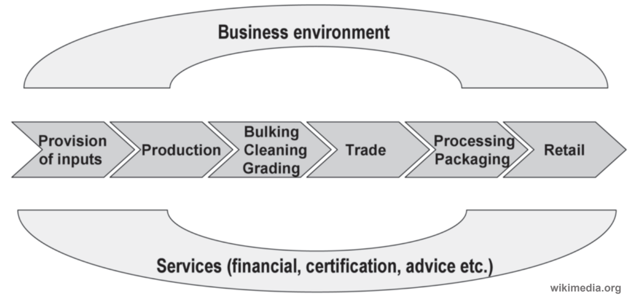
Economic and Social Transformation

Workforce Evolution

While traditional agricultural labor and farm management roles are projected to decline by about 2 percent over the next decade, demand for more technical, equipment-driven positions—like agricultural equipment operators—is forecast to grow around 8 percent, reflecting a shift toward skills-based farming and automation (US BLS, 2025). Many modern workers function as equipment operators, data analysts, and technology coordinators. Training investments now represent 12-15 percent of technology adoption costs, but successful farms report 30-40 percent efficiency increases within two years.

How Much Risk is Right for You?

Supply Chain Reorganization



Equipment suppliers also face fundamental changes. Traditional machinery dealers now derive 40 percent of revenue from software subscriptions and technical support—up from 10 percent five years ago (Newman, 2024). Precision agriculture is cutting total fertilizer volumes by up to 5 percent, while demand for specialty fertilizers—such as controlled-release products and micronutrients—is rising sharply, pushing this market toward a $25 billion valuation (McKinsey & Company 2024).

Technology adoption varies dramatically by scale: large farms (1,000+ acres) show roughly 75 percent adoption of precision-ag tools, while small farms (under 200–250 acres) lag near 10–25 percent (Miller 2023). In Iowa some farmers are forming groups to share high-cost equipment, lowering the individual financial burden.

Rural Community Impact

Towns dependent on seasonal farm labor face economic disruption. Small-town business owners in Kansas reported revenue losses of 20–30 percent during recent farm income declines—illustrating how agricultural shifts can ripple through Main Street economics (Schlitz 2025). However, rural areas with strong internet infrastructure attract agricultural technology companies. Regional data show precision agriculture positions in Nebraska employing 2,400 people averaging around $60,000/year—nearly double the average $30,000/year wage for manual farm labor in the state (ZipRecruiter 2025).

Worker transitions prove challenging. Younger workers are often more open to transitioning into machine-operator and data-management roles, while older workers may face greater learning curves. To address this need, Extension programs and local colleges increasingly offer upskilling and certification pathways.

Productivity and Risk Management

Large-scale crop producers are using precision tools—like auto-steer, yield monitors, and soil-mapping systems—primarily to boost yields, save labor, and lower input costs. Independent sources report yield gains of up to 20 percent, along with significant reductions in water use (Farmonaut.com). Water efficiency improves 30 percent through precision irrigation, while fertilizer efficiency gains of 40 percent reduce environmental impact and costs.

Technology also transforms risk management through predictive analytics that reduce weather-related losses and real-time monitoring that detects pest outbreaks earlier, potentially enabling intervention with lower pesticide use. However, new risks also emerge. Cybersecurity threats can affect precision agriculture operations costing large sums per incident. In addition, equipment complexity increases maintenance costs and GPS along with internet dependence creates vulnerability to service disruptions. Many farms report profitability improvements of 20–35 percent over 3–5 years after adopting precision ag. While individual results vary, USDA data confirm that cost savings and yield gains are common.

Policy and Ethical Challenges

Agricultural data ownership remains contentious. Farmers are increasingly concerned about data ownership and privacy, with ongoing industry debate over who controls and benefits from farm-generated data (AFBF, 2024). Farmers generate valuable operational data, but manufacturers often retain rights, creating competitive disadvantages. Technology displacement raises ethical questions about rural employment sustainability. Current federal programs provide funds for rural development, but agricultural technology transition support remains limited.

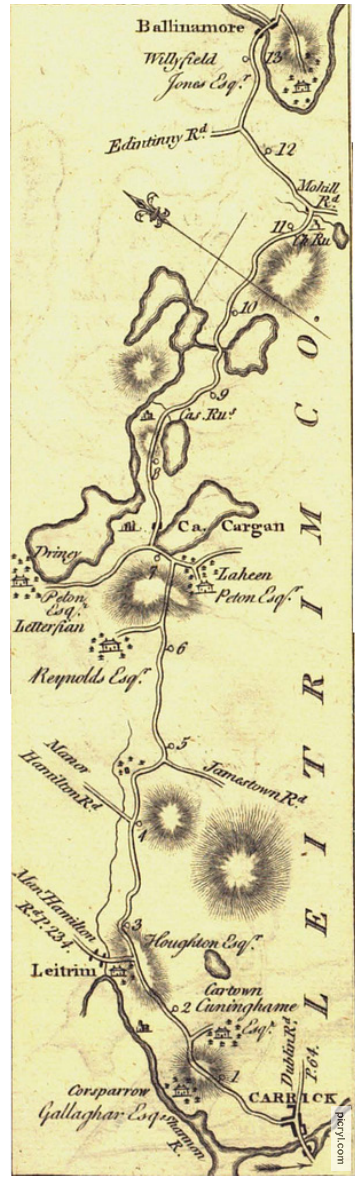
Autonomous systems create complex liability questions inadequately addressed by current legislation. Several states develop frameworks: California requires specialized licenses for autonomous equipment operators, while Iowa exempts agricultural robots from certain transportation regulations on private land (National Agricultural Law Center).

Strategic Adaptation Framework

Successful technology adoption requires comprehensive workforce development. Leading farms invest in training focused on data analysis, equipment maintenance, and system integration. John Deere partners with community colleges for certified technician programs, while cooperatives develop shared training facilities reducing trainee costs.

Strategic integration matches technology to operational scale. Small farms benefit from service-based models—custom operators providing autonomous services. Phased implementation beginning with basic precision systems allows workforce adaptation and Return on Investment (ROI) validation before advancing to autonomous equipment.

Strengthened supply chain relationships facilitate smooth transitions. Formal partnerships enable cost sharing and risk distribution, while processor-guaranteed contracts provide investment confidence. Monthly stakeholder meetings and shared data platforms help anticipate shifts and manage risks proactively.



Technology Implementation Roadmap

- *Immediate Actions (0-12 months)*: Assess technology readiness and skill gaps, establish partnerships, begin workforce development, evaluate cooperative opportunities.
- *Medium-term Development (1-3 years)*: Implement phased adoption plans, develop cybersecurity protocols, strengthen supply chain integration, participate in policy development.
- *Long-term Positioning (3-5 years)*: Achieve full technology integration, establish competitive advantages through sustainable practices, lead community transitions, influence regulatory frameworks.

Conclusion

The time for gradual exploration has passed—agricultural technology's rapid advancement demands immediate action. Farm and ranch managers must begin today by conducting honest assessments of their current technology readiness and identifying one achievable first step, whether that's joining a local precision agriculture cooperative, enrolling key staff in technical training programs, or scheduling consultations with equipment dealers about phased adoption plans.

Contact a regional extension office, farm credit advisor, or industry association this week to identify available resources, funding opportunities, and partnership possibilities. Success belongs to those who start small but start now, transforming technology's growing shadow from a competitive threat into a strategic advantage through deliberate action and collaborative relationships.

References

American Farm Bureau Federation (AFBF), Ag Data Core Principles. 2024. agdatatransparent.com. Accessed June, 2025.

Bonsairobotics.ai. Bonsai Robotics Raises $15 Million to Help Combat Farm Labor Shortage. January 2025. Accessed June, 2025.

Kiernan-Stone, L. SwarmFarm Robotics Raises A$12M Series A for its Autonomous Platform and Operating System. globalaginvesting.com. Accessed June, 2025.

Farmonaut.com. Accessed June, 2025.

Forbes, L. Farm robots could mean utopia of dystopia for the future of farming. July 2021. abc.net.au. Accessed June, 2025.

McKinsey & Company. The 2040 fertilizer industry: How could industry trends affect demand? December 2024. mckinsey.com. Accessed June, 2025.

Miller, D. How Small Farms Benefit From Big Tech. May 2023. dtnpf.com. Accessed June, 2025.

Morrison, O. Virtual fencing tech: smart solution or just shocking? August 2024. Agtechnavigator.com. Accessed June, 2025.

National Agricultural Law Center. Accessed June, 2025.

Newman, N. 77% of Precision Dealers Forecast Revenue Growth in 2024. farm-equipment.com. Accessed June, 2025.

Schlitz, H. Farmers' financial pain spills from Kansas wheat fields to Main Streets. June 2024. reuters.com. Accessed June, 2025.

U.S. Bureau of Labor Statistics (BLS). Occupational Outlook Handbook - Agricultural Workers. bls.gov. Accessed June, 2025.

USDA Economic Research Service (ERS). Agricultural Productivity in the U.S. 2023.

ZipRecruiter. Precision Ag Salary in Nebraska. ziprecruiter.com. Accessed June, 2025.

~ Other RightRisk News ~

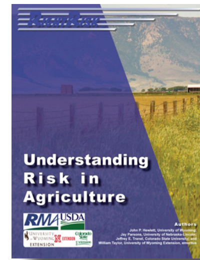
News Release - May 21 | RightRisk

Ag Credit Survey: Subdued Farm Economy Weighs on Land Values and Credit Conditions

AGRICULTURAL REAL ESTATE values in the Kansas City Federal Reserve District declined slightly in the first quarter of 2025 and credit conditions deteriorated further. According to lenders in the region, the average value of nonirrigated farmland declined about 2 percent from a year ago. Land market conditions varied in some states, but in aggregate, values declined slightly following a moderation in farm incomes over the past year . . .

For more see: RightRisk.org\News

Highlighted Publication:
Understanding Risk in Agriculture



Risk is generally understood to mean future events for which the outcomes are unknown or uncertain. We might also describe risk as a case where the unknown future matters; if the outcomes did not matter there would be no risk. People tend to think that complex problems require complex solutions when faced with risk alternatives. This tendency compounds the challenges even further. With risk the opposite is true. Simple rules can not only help to clarify the choices open to us, but also make the consequences more obvious.

Understanding Risk in Agriculture is an ebook drafted to accompany the course with the same name. It is intended to help readers better understand risk and the implications for managing an agricultural business, as well as how the manager might account for it when making decisions about risk and consequences.

To read more or to access the text, see: **RightRisk.org > Courses > Understanding Risk in Agriculture**

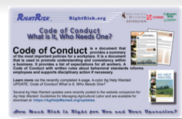
May 1 | Social Media Post
Evaluating LRP Coverage With the Multi-Temporal Risk Analyzer

May 6 | Social Media Post
Sole Proprietorship

May 8 | Social Media Post
Comparing Conventional and Strip-till Tillage Systems

May 13 | Social Media Post
Lasting Legacy Course #2

May 15 | Social Media Post
Estimating Custom Rates and Machinery Costs



May 20 | Social Media Post
Code of Conduct What is It, Who Needs One?

May 22 | Social Media Post
Evaluating Windrower Options With the Machinery Risk Calculator

May 27 | Social Media Post
Limited Liability Partnership

May 29 | Social Media Post
Hay Producers Evaluate Pivot Irrigation Alternatives

Follow us on:

Click here to see current posts:
RightRisk.org\news

Follow us on:

RightRisk™

- ***Education***
- ***Coaching***
- ***Research***

RightRisk helps decision-makers discover innovative and effective risk management solutions

RightRisk News is brought to you by the RightRisk Team

Contributing authors:
Elliott Dennis, Livestock Marketing Specialist - University of Nebraska-Lincoln, elliott.dennis@unl.edu
John Hewlett, Ranch/Farm Management Specialist - University of Wyoming, hewlett@uwyo.edu
Jay Parsons, Risk Management Specialist - University of Nebraska-Lincoln, jparsons4@unl.edu
Jeff Tranel, Ag and Business Management Specialist - Colorado State University, Jeffrey.Tranel@ColoState.edu
Editing and Layout: John Hewlett, hewlett@uwyo.edu

Past issues of RightRisk News are available at: RightRisk.org/News
To subscribe/unsubscribe, email information@RightRisk.org subject line "Subscribe/Unsubscribe RR News"

E-mail: information@RightRisk.org
Web: www.RightRisk.org

How much risk is right for you and your operation?

N EXTENSION
COLORADO STATE UNIVERSITY EXTENSION
UW Extension