



Carefully integrating grazing livestock on cropland is one aspect of regenerative agriculture. Photo courtesy of Thousand Hills Lifetime Grazed.

#### NORTH AMERICAN IPM TRAINING SERIES

# Regenerative Agriculture: What Every CCA Needs to Know

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Regenerative agriculture is more than a buzzword. A growing number of food and fiber companies have regenerative ag initiatives underway, and CCAs should be prepared to answer questions from clients and others about regenerative ag and have a plan for accessing expertise, pursuing professional development, and minimizing client risk if called on to help a client implement such systems. The business models of CCAs and their employers may need to be adjusted to ensure healthy revenue from expertise

and services to replace reduced input sales revenue. This is the final article in the three-part series in *Crops & Soils* magazine. It is part of an American Society of Agronomy training series sponsored by the Kellogg Company. Earn 1 CEU in Integrated Pest Management by reading this article and taking the quiz at [www.certifiedcropadviser.org/education/classroom/classes/998](http://www.certifiedcropadviser.org/education/classroom/classes/998).

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# North American Integrated Pest Management Training Series

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**R**egenerative agriculture is more than a buzzword. A growing number of food and fiber companies have regenerative ag initiatives underway, and CCAs may be called on to help clients meet requests to engage with important buyers of crop and livestock products. Key elements include a focus on farmer bottom line rather than maximum yields and reducing reliance on purchased fertilizers and crop protectants by enhancing natural nutrient cycling and biological controls of weeds, insects, and diseases. Certified Crop Advisers should be prepared to answer questions from clients and others about regenerative ag and have a plan for accessing expertise, pursuing professional development, and minimizing client risk if called on to help a client implement such systems. The business models of CCAs and their employers may need to be adjusted to ensure healthy revenue from expertise and services to replace reduced input sales revenue.

## What is Regenerative Agriculture?

Regenerative ag descriptions typically include farming or ranching that builds soil health and biodiversity, limiting the need for external inputs, capturing carbon from the atmosphere, and improving farmer net income.

Unlike organic agriculture, regenerative ag is largely undefined with no consensus on a single definition or standard. This is entirely appropriate given the current rapid evolution of approaches to regenerative ag and the benefits of adapting the general principles to site-specific conditions. Regenerative ag system development in many cropping systems and regions has not yet started, or is in its infancy, and much research is needed to refine optimum approaches and document outcomes.

Typically, regenerative ag includes the following elements integrated into a carefully designed system:

- Minimize soil disturbance by reducing tillage and using fewer inputs with potential impact on soil organisms.

- Keep living roots in the soil year-round.
- Keep cover on the soil year-round.
- Increase diversity through crop rotation, including cover crops, which promotes beneficial organism abundance and diversity in the soil and above ground.
- Carefully integrate grazing livestock on cropland.
- Design and implement to fit key elements such as geography; climate; weather; availability of equipment, services, and markets; and farmer preferences, experience, and behavior.

## Is Regenerative Ag a New Idea?

Regenerative ag draws from traditional practices from around the world as well as more than a century of applied research and development. Some of its components, such as cover crops and crop rotation, have been part of organic, biodynamic, and other sustainable farming systems for generations. Indigenous cultures made invaluable contributions to many practices currently used in regenerative ag.

The term was first introduced to the world by social scientist and author Medard Gabel in 1979 and further developed by organic advocate and publisher Robert Rodale in 1983 and agronomist Charles Francis and co-authors in 1986. The term was used only sporadically, reemerging in a Rodale Institute (2014) white paper about regenerative organic ag. Farmer and author Gabe Brown published *Dirt to Soil: One Family's Journey into Regenerative Agriculture* in 2018.

Between 2015 and 2020, an increasing range of farmers and organizations began advancing regenerative ag. General Mills, Walmart, and Thousand Hills Lifetime Grazed publicly committed to regenerate or help regenerate a total of nearly 55 million acres of farmland. General Mills has pilots underway in several regions and production systems with assistance from

consultants including farmers who have been farming successfully using a regenerative system for decades.

## How Can We Benefit from Regenerative Ag?

Agriculture is an essential human enterprise delivering a multitude of familiar benefits, including food and nutrition, clothing, shelter, livelihoods, and preservation of open space. Conventional agriculture today is facing a wealth of issues resulting from years of practices that degrade natural resources. Agriculture is the largest single user of fresh water, the leading source of water pollution and soil erosion, and an important contributor to greenhouse

gas emissions and biodiversity decline. The nutritional value of many crops is in decline, and U.S. farm bankruptcies increased for five consecutive years through 2019. There is no question improvements are needed, and a growing number of food and fiber companies and non-governmental organizations are engaging farmers to explore regenerative ag as a potential solution.

Regenerative ag practices are promoted to help restore soil health, improve air and water quality, increase species abundance and diversity, boost farmer profits, sequester carbon, buffer climate change and weather extremes, and contribute to more resilient farms and rural communities.

Anecdotal accounts of benefits include David Marsh, an Australian regenerative farmer, who reports experiencing nine years of drought without spending any money on animal feed due to native grassland grazing practices, saving between \$500,000 to \$800,000 ([www.youtube.com/watch?v=6vQW8TL\\_KLc](http://www.youtube.com/watch?v=6vQW8TL_KLc)).

Gabe Brown claims an eye-popping \$100/ac per year new income versus \$0.10–\$3.00/ac for an average conventional farm.

Benefits for individual elements of regenerative ag have been supported by peer-reviewed research for decades. Recent examples include the following on integrating livestock into cropping systems:

- A review by Hilimire (2011) reported studies demonstrating improvements in soil health, biodiversity, and pest manage-

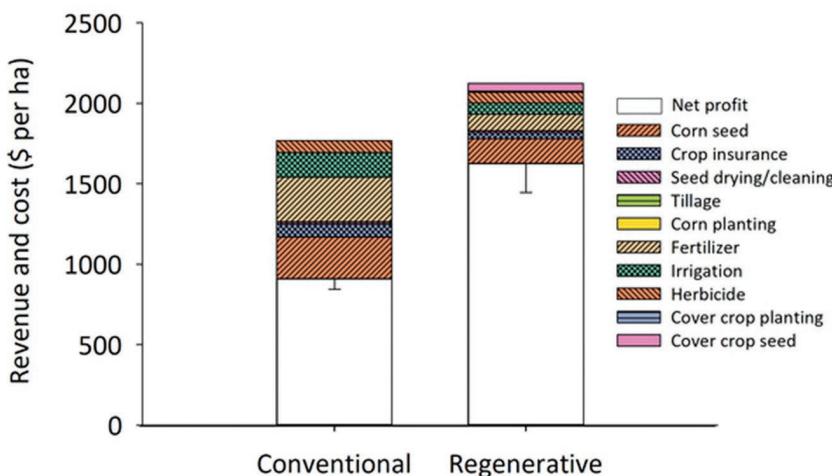


A cover crop mix of 23 different species grows in the summer at Black Leg Ranch in North Dakota. Photo by Jerry Doan.

ment along with decreased reliance on external inputs and improved profitability when livestock was integrated into formerly crop-only systems.

- In Texas, profitability was nine times greater for integrated crop-livestock systems than corn-only systems due to reductions in fertilizer and irrigation (Abagandura et al., 2019).
- In Illinois, a cattle and corn system produced 6% more corn than a corn-only system (Sulc & Franzleubbers, 2014).

Research on multi-component regenerative ag systems is more expensive and challenging to design and implement vs. small-plot replicated studies evaluating a limited set of treatments and with limited variability across plots. A small but growing body of research supports benefits including research by LaCanne and Lundgren (2018) that found pests to be 10 times more abundant on conventional corn farms compared with regenerative farms. Regenerative grain fields had 29% lower production but 70% higher profits over traditional corn production systems (Figure 1). Profit was positively correlated with soil organic matter content, not yield. The authors chose a logical but arbitrary divider to separate regenerative from conventional farmers. To be considered regenerative, farmers had to have implemented at least three practices that are included in regenerative systems.



**Figure 1.** Regenerative corn fields generate nearly twice the profit of conventionally managed corn fields. The heights of the bars represent average gross profits across all 40 fields (in each treatment). Profit was calculated using direct costs and revenues for each field and excludes any overhead and indirect expenses. Regenerative cornfields implemented three or more practices such as planting a multispecies cover mix, eliminating pesticide use, abandoning tillage, and integrating livestock onto the crop ground. Conventional cornfields used fewer than two of these practices. The regenerative systems had 70% higher profit than conventional cornfields ( $\alpha = 0.05$ ;  $n = 36$  fields in each system). Seed drying, corn planting, and cover crop planting are present on the graphs but were negligible costs. Reprinted with permission from LaCanne & Lundgren (2018).

Critiques of regenerative ag say that claims of benefits are not sufficiently supported by research, including key agronomic aspects such as maintaining nutrient sufficiency and effective pest management while greatly reducing or eliminating external inputs (Giller et al., 2021). These authors suggest regenerative ag may not successfully differentiate from other forms of sustainable or alternative agriculture, or agronomically, maximize good agricultural practices suited to the site and operation.



Practices that preserve organism abundance and diversity in the soil are an important component of regenerative agriculture. Photo by Jason de Koff.

## What Are the Barriers to Advancing Regenerative Ag?

Obstacles to both farmers and CCAs and others supporting farmers include many common to any innovation: low awareness; limited evidence of viability across the broad scope of potential applications; and few advocates, experts, and examples for successful implementation.

Lack of consensus-mandated standards for regenerative ag offers flexibility as the concept and details evolve but also presents challenges, including lack of clarity for those working to promote regenerative ag to farmers, food and fiber companies, consumers, the public, and policymakers.

With the final rule establishing the USDA National Organic Program in 2000, organic achieved that consensus after many years of effort. The Program includes rigorous, uniform standards ([www.ams.usda.gov/grades-standards/organic-standards](http://www.ams.usda.gov/grades-standards/organic-standards)), including tight restrictions on inputs that apply broadly to all crops and regions,

but at a cost. For example, Washington State generated \$447 million in organic apple sales in 2019. New England, roughly the same size as Washington State, generated less than \$1 million. The broad consensus organic standards simply do not allow apple growers in rainfed New England to compete with irrigated Washington State, which has many fewer insect pests and diseases due to the dry climate. Overall, less than 2% of U.S. cropland is certified organic in large part because of rigid, inflexible standards. Regenerative ag is not locked into that kind of box, at least not yet.

## Is Regenerative Ag Organic?

Farmers who follow regenerative ag principles and practices may or may not choose to meet organic standards. Production from the farm may be marketed as organic if compliance with the organic standards is verified by an accredited certifier. Farmers who choose to pursue organic certification may benefit from organic price premiums. In 2017, Regenerative Organic Certified ([regenorganic.org/](http://regenorganic.org/)) became available to farmers who meet organic standards plus additional

requirements, verified by both an organic audit and a Regenerative Organic Certified audit.

## What Is Our Role as CCAs?

Every CCA should be prepared to answer basic questions from clients and others about regenerative ag. Responses need to be grounded in reality and reflect the lack of consensus definition or standards and the need to fully investigate the body of knowledge, experience, and expertise that might be applicable to the site, region, markets, etc. as a first step in further exploration.

CCAs' primary role is building a return on investment (ROI) for clients. Some CCAs are being, or will be, called on to help clients implement regenerative ag systems. Being effective at this—delivering ROI and earning a living from your expertise—will require serious professional development and building new networks for mentorship, expert advice, and assistance, in most cases. It will also require serious risk management, including piloting on small acreages, and continuous adaptive management, especially in production systems where established models are lacking. Careful integration of livestock into cropping systems is an important source of benefits, and crop-focused CCAs will need to develop new skills and team with others to provide the assistance farmer-clients need.

While many CCAs will be an expert on individual aspects of regenerative ag systems, such as no-till and cover crops, few, if any, are likely to be equipped to tie all appropriate elements together into a profitable system. That is, very few will be prepared to design and implement soil management, cover crop, crop rotation, and livestock integration solutions that maximize natural nutrient cycling and minimize commercial fertilizer inputs, provide effective weed control while greatly reducing the need for herbicide applications, and while perhaps sacrificing yield, boost farmer bottom lines. That scope of work is certainly not the order of the present day for most CCAs or supported by a solid body of research or ready tools for most operations.

Business models may need to adapt. Certified Crop Advisers need to earn a living, and if your compensation is based on volume of product sold, adjusting your approach to increase revenue for your expertise may be required. Inputs will continue to be needed, of course, but likely in less volume and including shifts to different inputs such as those to meet needs for cover crops, alternative rotation crops, and livestock.



While many CCAs will be an expert on individual aspects of regenerative ag systems, such as no-till and cover crops, few, if any, are likely to be equipped to tie all appropriate elements together into a profitable system. Photo by Rajveer Singh.

If you are a CCA with clients who are supplying companies that have expressed and/or are implementing commitments to regenerative ag, either directly or through intermediaries in the value chain, the time for expanding networks and pursuing professional development is now. These companies include Applegate, Danone, General Mills, Kellogg's, Ocean Spray, Patagonia, Thousand Hills Lifetime Grazed, and others.

## Where Can I Go for More Information?

Soil Health Academy ([soilhealthacademy.org](http://soilhealthacademy.org)) may be the premier professional development opportunity available currently with several upcoming in-person training events on the calendar. The Academy also offers an online, on-demand course, Regen Ag 101, with 10 modules presented by experienced



Stocker steers grazing cereal rye and turnip forage mixture on vacant cropland following corn harvest.  
Photo by Mikayla Moore.

instructors, including co-founder Gabe Brown, who also founded Understanding Ag LLC (<https://understandingag.com>), which offers regenerative ag consulting services to farmers and other businesses.

Sustainable Food Group ([sustainablefoodgroup.org](https://sustainablefoodgroup.org)), which is part of the IPM Institute of North America and lead by co-authors of this article, assists food companies with strategic planning and execution of sustainable supply chain initiatives, including in regenerative ag. Founded in 1998, clients include organizations of all sizes and from multiple sectors, including Sysco, Frontier Co-op, General Mills, Honeybear Brands, and Red Tomato.

The University of Illinois Regenerative Agriculture Initiative (<https://bit.ly/3wGQvtR>) was launched in 2020 to build capacity and collaborations in the state.

Partnership for Ag Resource Management ([partnershipfarm.org](https://partnershipfarm.org)), is an 11-year-old initiative of the IPM Institute. The goal of the initiative is to collaborate with ag retailers to improve management of our key soil, nutrient, and crop protection resources by keeping them on our cropland and out of our streams, rivers, and lakes. Objectives are to identify and promote market-based solutions that improve farm economics and our natural resources. Multiple on-demand webinars, including for CCA CEUs, are available on the website, including several addressing regenerative ag.

The Purdue Center for Food and Agribusiness ([agribusiness.purdue.edu](http://agribusiness.purdue.edu)) creates and delivers management education programs that combine research with real-world application specifically for the food and agribusiness industries. The Center recently collaborated with the Nature Conservancy to explore and report on ag retailer and farmer perspectives on conservation, including implications for regenerative agriculture.

This article includes excerpts from a 28-page white paper by the authors (<https://bit.ly/2TMkICp>), with more detail that CCAs may find helpful to build capacity to handle questions about regenerative ag as well as providing an extensive bibliography for further reading and professional development.

## References

- Abagandura, G., Şenturklu, S., Singh, N., Kumar, S., Landblom, D., & Ringwall, K. (2019). Impacts of crop rotational diversity and grazing under integrated crop-livestock system on soil surface greenhouse gas fluxes. *PLoS ONE*, 14(5). <https://doi.org/10.1371/journal.pone.0217069>.
- Francis, C.A., Harwood, R.R., & Parr, J.F. (1986). The potential for regenerative agriculture in the developing world. *American Journal of Alternative Agriculture* 1:65–74.
- Gabel, M. (1979). *Ho-Ping: A world scenario for food production*. World Game Institute.
- Giller, K.E., Hijbeek, R., Andersson, J.A., & Sumberg, J. (2021). Regenerative agriculture: An agronomic perspective. *Outlook on Agriculture*, 50(1), 13–25. <https://bit.ly/3qE0a2a>
- Hilimire, H. (2011). Integrated crop/livestock agriculture in the United States: A review. *Journal of Sustainable Agriculture*, 35, 376–393.
- LaCanne, C., & Lundgren, J. (2018). Regenerative agriculture: Merging farming and natural resource conservation profitably. *PeerJ*, 6, e4428. <https://bit.ly/3zBFpbb>
- Rodale Institute (2014). Regenerative organic agriculture and climate change: A down-to-earth solution to global warming. Rodale Institute. <https://bit.ly/3jsSbU0>
- Rodale, R. (1983). Breaking new ground: The search for a sustainable agriculture. *The Futurist*, 1, 15–20
- Sulc, R., & Franzleubbers, A. (2014). Exploring integrated crop-livestock systems in different ecoregions of the United States. *European Journal of Agronomy*, 57, 21–30. <https://bit.ly/3qAvHSl>

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1. Regenerative ag systems have no impact on soil moisture levels or irrigation needs.
  - a. True.
  - b. False.
2. Which of the following is NOT among the general principles of regenerative ag?
  - a. Year-round soil cover.
  - b. Year-round living roots in soil.
  - c. Following a set of consensus standards.
  - d. Integrating livestock in cropping systems.
3. Certified Crop Advisers and farmers can expect to find proven models to guide implementing regenerative ag systems in nearly every cropping system and region.
  - a. True.
  - b. False.
4. Which of the following DOES NOT contribute to greater farmer profitability in regenerative ag systems?
  - a. Simpler system to implement based on naturally occurring processes, requiring less expertise to maintain successfully.
  - b. More nutrients contributed by natural nutrient cycling, reducing need for commercial fertilizer.
  - c. Crop rotations including cover crops that suppress weeds with less reliance on herbicides.
  - d. Lower input costs.
5. Challenges likely to be faced by CCAs asked to support client transition to regenerative ag systems DO NOT include which of the following?
  - a. Integrating multiple familiar components commonly used in the cropping system and region with less common/familiar elements.
  - b. Locating soil test labs that can provide alternative tests for macronutrient content.
  - c. Accessing expertise in unfamiliar elements and overall integration.
  - d. Ensuring sufficient service revenue to maintain profitability if input sales decline.
6. Regenerative ag benefits **do not** generally include which of the following?
  - a. Improved soil health measures.
  - b. Maximum yields.
  - c. Improved farmer profitability.
  - d. Drought resistance.
7. Documenting the benefits of regenerative ag is best described by which of the following?
  - a. More challenging than comparing individual components, such as cover crops vs. no cover crops.
  - b. More easily accomplished than single-component comparisons because fewer variables need to be monitored and controlled.
  - c. Both a and b.
  - d. None of the above.
8. Determining if a farm qualifies as a regenerative ag operation depends on which of the following?
  - a. Farm must incorporate five of the six principles.
  - b. Farm must incorporate livestock to provide nutrients for crops.
  - c. Farm must be audited by an accredited certifier.
  - d. None of the above.
9. Regenerative ag is NOT likely to be supported by land-grant university scientists or Extension due to conflicts with other established approaches.
  - a. True.
  - b. False.
10. In the study reported by LaCanne & Lundgren (2018), regenerative ag production costs were less than conventional except for which of the following?
  - a. Crop insurance.
  - b. Herbicide costs.
  - c. Tillage costs.
  - d. Irrigation costs.
  - e. None of the above.