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Date: May 22, 2026

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Question: Known historical benefits (e.g., reduced costs on fertilizer and gasoline, carbon sequestration, drought/storm resiliency, increased yields) from crops grown with regenerative methods (such as those outlined by the Sustainable Agricultural Initiative (SAI)) compared to conventional methods. Quantitative and repeatable results preferred.

Summary: Research shows regenerative farming practices deliver measurable advantages compared to conventional methods, including significant carbon sequestration (622–1584 lbs/acre/year), reduced input costs (up to 43% lower), improved water management and drought resiliency (6× faster infiltration, double soil moisture), mixed but generally positive yield results (3.7–45% increases in most crops), and substantially higher profitability (up to 78% greater profits).

Abstract

Regenerative practices that emphasize no-till, cover cropping, diverse rotations, and organic amendments lead to measurable improvements relative to conventional methods. Studies report increases in soil organic carbon—from 622 to 1584 lbs/acre/year and percentage rises as high as 78% after organic amendments—with several trials noting statistically significant gains ($p \leq 0.001$ to $p < 0.05$). Reduced reliance on chemical inputs is evident; one study shows seed and fertilizer costs comprising 32% versus 12% of gross income ($p < 0.001$), while others report 43% lower costs and production that is 20–29% cheaper under no-till regimes. Yield comparisons vary by crop and context: some field trials document 30–45% higher wheat yields or gains of 3.7–22% in cereals, corn, and soybean, whereas one study observed a 29% reduction in corn yield. Regenerative systems also improve resiliency; they deliver up to 6× faster water infiltration, 200–400% higher infiltration in some cases, 11–35% less runoff, and nearly double soil moisture in drought conditions. Finally, economic assessments report up to 78% higher profits, twofold greater returns, and favorable cost–benefit ratios (e.g., 1.7 versus 1.0 in conventional systems).

Paper Search

We performed a semantic search using the query "Known historical benefits (e.g., reduced costs on fertilizer and gasoline, carbon sequestration, drought/storm resiliency, increased yields) from crops grown with regenerative methods (such as those outlined by the Sustainable Agricultural Initiative (SAI)) compared to conventional methods. Quantitative and repeatable results preferred." across over 126 million academic papers from the Elicit search engine, which includes all of Semantic Scholar and OpenAlex.

We retrieved the 495 papers most relevant to the query.

Screening

We screened in sources that met these criteria:

- **Comparative Study Design:** Does this study compare regenerative agricultural practices with conventional agricultural practices?
- **Quantitative Outcomes:** Does this study provide quantitative measurement of at least one outcome (e.g., economic costs, carbon sequestration, resilience metrics, or yield data)?
- **Field-Based Research:** Is this study conducted in actual field conditions (not limited to greenhouse, laboratory, or pot studies only)?
- **Agricultural Crop Focus:** Does this study involve food crops, fiber crops, or forage crops in agricultural production systems?
- **Study Duration:** Was the intervention studied for at least one complete growing season?
- **Publication Type:** Is this study peer-reviewed primary research, a systematic review, or a meta-analysis (not conference abstracts, dissertations, or grey literature)?

We considered all screening questions together and made a holistic judgement about whether to screen in each paper.

Data Extraction

We asked a large language model to extract each data column below from each paper. We gave the model the extraction instructions shown below for each column.

- **Regenerative Practices:** Extract specific regenerative agricultural practices implemented in the study including:
  - Type of practices (no-till, reduced tillage, cover crops, crop rotation, organic amendments, etc.)
  - Implementation details (application rates, timing, specific crops/amendments used)
  - Duration of practice implementation

- Whether practices were used individually or in combination
- Any reference to SAI (Sustainable Agricultural Initiative) standards or similar frameworks

- **Conventional Comparison:** Extract details about the conventional agricultural system used as comparison including:
  - Type of conventional practices (conventional tillage, monocropping, standard fertilizer regime, etc.)
  - Specific management details (fertilizer rates, tillage frequency, pest management approach)
  - How long the conventional system had been in place
  - Whether this represents typical local farming practice
- **Economic Benefits:** Extract all economic and cost-related outcomes including:
  - Input cost changes (fertilizer, fuel, pesticide, seed costs with specific amounts/percentages)
  - Net profit/returns per hectare or acre with currency and year
  - Cost-benefit ratios or return on investment
  - Labor cost changes
  - Statistical significance of economic differences (p-values, confidence intervals)
  - Time period over which economic benefits were measured
- **Yield Impacts:** Extract productivity and yield outcomes including:
  - Yield differences between regenerative and conventional (absolute values and percentages)
  - Yield stability/variability measures
  - Statistical significance (p-values, confidence intervals)
  - Which crops showed yield benefits/losses
  - Yield trends over time (immediate vs. long-term effects)
  - Any yield-quality measures (protein content, nutrient density, etc.)
- **Environmental Benefits:** Extract environmental outcomes including:
  - Carbon sequestration rates (g C/m^2/year or similar units)
  - Soil organic matter/carbon changes (percentages, absolute amounts)
  - Greenhouse gas emissions changes (CO_2, N_2O, CH_4)
  - Soil health indicators (bulk density, aggregate stability, microbial activity)
  - Water quality impacts (nutrient runoff, erosion rates)
  - Statistical significance and measurement duration for all environmental metrics

- **Climate Resilience:** Extract outcomes related to weather stress and resilience including:
  - Performance during drought conditions (yield differences, water use efficiency)
  - Performance during excessive moisture/flooding
  - Temperature stress resilience (heat waves, frost)
  - Storm/extreme weather resilience
  - Specific weather conditions tested and quantitative resilience metrics
  - Any measures of system stability or variability under stress
- **Study Context:** Extract contextual information affecting generalizability including:
  - Geographic location (country, region, climate zone)
  - Soil types and initial soil conditions
  - Crops studied (specific varieties if mentioned)
  - Study duration (years of data collection)
  - Farm scale (plot size, commercial vs. research farm)
  - Climate conditions during study period
- **Statistical Quality:** Extract statistical and methodological information including:
  - Sample sizes (number of farms, plots, replicates)
  - Effect sizes with confidence intervals where available
  - P-values for key comparisons
  - Type of statistical analysis used
  - Whether results were adjusted for confounding variables
  - Any mention of publication bias or data quality concerns

Results

Characteristics of Included Studies

Study	Study Design	Geographic Region	Regenerative Practices Evaluated	Duration of Study	Full Text Retrieved
Kenne and Kloot, 2019	Field study, multiple farms	South Carolina, USA	Cover crops, reduced tillage, elimination of synthetic inputs,	2–4 years	Yes

Study	Study Design	Geographic Region	Regenerative Practices Evaluated	Duration of Study	Full Text Retriev ed
			multispecies cover crops, rotational grazing		
LaCanne and Lundgren, 2018	Field comparison, commercial farms	Northern Plains, USA	No-till, no insecticides, multispecies cover crops, livestock integration	Not specified	Yes
Jordon et al., 2022	Bayesian meta-analysi s	Temperate oceanic regions	Reduced tillage, cover cropping, ley-arable rotations	Avg. 15 years	Yes
Montgomery et al., 2022	Paired farm comparison	USA (CA, CT, OR)	No-till, cover crops, diverse rotations	5–10 years	No
Fenster et al., 2021	Field comparison, commercial orchards	California, USA	No-till, perennial ground covers, livestock, composts, hedgerows	Not specified	Yes
Ponnusamy et al., 2024	Field trial	India, semi-arid	Organic and natural farming	3 years	No
West and Post, 2002	Global data analysis	Global	No-till, rotation complexity	5–60 years	No
Nath et al., 2025	Meta-analysi s	Global	Conservation tillage	>3–20 years	No
Gaudin et al., 2015	Long-term field trial	Ontario, Canada	Crop rotation diversity, reduced tillage, legume cover crops	31 years	Yes

Study	Study Design	Geographic Region	Regenerative Practices Evaluated	Duration of Study	Full Text Retrieved
Tian et al., 2023	Field experiment	Illinois, USA	Highly stabilized organic amendments	7 years	No
Tadesse et al., 2021	Field survey, smallholder	Ethiopia	Climate-Smart Agriculture (CSA): soil and water conservation, hedgerows, residue retention, crop rotation, agroforestry	Up to 10 years	Yes
Li et al., 2024	Field trial	Not specified in abstract	Crop rotation, organic amendments	8 years	No
Jacobs et al., 2022	Field trial	Mississippi, USA	No-till, cover crops	3 years	No
Raghuwanshi et al., 2024	Field trial	Central India	No-till, residue retention, crop rotation	1 year (project since 2010)	Yes
Baldwin-Kordick et al., 2022	Field comparison	Midwest US	Diverse crop rotation, organic amendments	2–4 years	Yes
Vendig et al., 2023	Global meta-analysis	Global	Cover cropping, crop rotation	Avg. 7.7 years	Yes
McGregor et al., 1999	Long-term field trial	Not specified in abstract	No-till, conventional-till	14 years	No
Entry et al., 2002	Field comparison	Idaho, USA	Conservation tillage, irrigated pasture	30 years	Yes
Wen et al., 2021	Field trial	US Corn Belt	Biological nitrogen fixation	2 years	Yes

Study	Study Design	Geographic Region	Regenerative Practices Evaluated	Duration of Study	Full Text Retrieved
Naab et al., 2017	Field/farmer trials	Ghana	No-till, reduced tillage, rotation, residue retention	4 years	Yes
Thierfelder and Wall, 2010	Field trial	Zambia, Zimbabwe	No-till, residue retention, rotation	4 years	No
Li et al., 2016	Meta-analysis	China	No-till, straw retention, cover crops	2–17 years	Yes
Padbhushan et al., 2024	Meta-analysis	India	Conservation agriculture	11 years	No
Varvel and Wilhelm, 2010	Field trial	Nebraska, USA	Conservation tillage, crop rotation	15 years	No
Parihar et al., 2020	Field trial	NW India	Zero tillage, permanent beds, precision nutrition	4 years	No
Sapkota et al., 2017	Field trial	E. India	Zero-till, residue retention	7 years	Yes
Poudel et al., 2001	Field trial	California, USA	Crop rotation, cover crops, organic amendments	12 years	Yes
Apfelbaum et al., 2022	Paired ranch comparison	SE USA	Adaptive multi-paddock (AMP) grazing, no inorganic fertilizers	Not specified	Yes
Gopalakrishnan et al., 2014	Field trial	India	System of Rice Intensification (SRI), organic amendments	2 years	Yes

Study	Study Design	Geographic Region	Regenerative Practices Evaluated	Duration of Study	Full Text Retriev ed
Luján Soto et al., 2021	Field comparison	SE Spain	Reduced/no tillage, green manure, organic amendments	2 years	Yes
Naorem et al., 2023	Field trial	Central India	Reduced/no-till, residue retention	8 years	No
Bruelle et al., 2014	Field survey	Madagascar	No-till, mulch, rotation	5 years	No
Rao et al., 2021	Field trial	India	No-till, reduced tillage, rotation, residue retention	7 years	No
Sainju et al., 2017	Field trial	N. Great Plains, USA	No-till, rotation, banded nitrogen	6 years	No
Valenciano et al., 2024	Field trial	S. Brazil	No-till, rotation, cover crops	8 years	No
Sabahy et al., 2024	Field trial	Not specified in abstract	Biodynamic farming	6 years	No
Kersey et al., 2024	Field comparison	BC, Canada	Cover cropping, set-asides, hedgerows	24 years	No
Jha et al., 2020	Long-term field trial	Queensland, Australia	No-till, stubble retention, nitrogen fertilization	50 years	No
Olson et al., 2010	Field trial	Illinois, USA	No-till, chisel, moldboard, cover crops	8 years	Yes

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Study	Study Design	Geographic Region	Regenerative Practices Evaluated	Duration of Study	Full Text Retrieved
Martínez-Gamiño et al., 2023	Long-term field trial	Mexico	Zero tillage, cover cropping	25 years	No

Study Design:

- Field trials: 19 studies
- Field comparisons: 6 studies
- Long-term field trials: 4 studies
- Field surveys: 2 studies
- Paired farm/ranch comparisons: 2 studies
- Meta-analyses (including Bayesian and global): 5 studies
- Global data analysis: 1 study

Geographic Region:

- USA: 14 studies
- India: 8 studies
- Canada: 2 studies
- Global in scope: 3 studies
- Other countries (1 each): China, Ethiopia, Ghana, Zambia, Zimbabwe, Spain, Madagascar, Brazil, Australia, Mexico
- Location not mentioned in available data: 3 studies

Regenerative Practices Evaluated:

- No-till, zero tillage, or reduced tillage: 18 studies
- Cover crops, cover cropping, or multispecies cover crops: 7 studies
- Crop rotation or rotation complexity: 7 studies
- Residue retention, residue, stubble retention, straw retention, or mulch: 6 studies
- Organic amendments or compost: 6 studies
- Livestock integration or grazing: 3 studies

- Conservation tillage or conservation agriculture: 4 studies
- Hedgerows: 3 studies
- Other practices (each in 1 study): Green manure, ley-arable rotations, agroforestry, set-asides, permanent beds, precision nutrition, System of Rice Intensification, biological nitrogen fixation, perennial ground covers, biodynamic farming, elimination of synthetic inputs, no insecticides, no inorganic fertilizers, chisel/moldboard, irrigated pasture, banded nitrogen

Duration of Study:

- 3 years or less: 8 studies
- 4–7 years: 17 studies
- 8–15 years: 15 studies
- Greater than 15 years: 8 studies
- Duration not mentioned in available data: 3 studies

Effects

Soil Carbon Sequestration

Study	Regenerative Practice	Carbon Storage Change	Measurement Depth	Statistical Significance
Kenne and Kloot, 2019	Cover crops, reduced tillage	622–1584 lbs/acre/year carbon fixed; soil organic matter increased 0.11–0.55%	No mention found	$p \leq 0.001$
LaCanne and Lundgren, 2018	No-till, cover crops, livestock	Higher particulate organic matter; improved soil organic matter	No mention found	No mention found
Jordon et al., 2022	Reduced tillage, ley-arable	Soil organic carbon increased 0.06 g C/100g (tillage), 0.05 g C/100g/year (ley)	No mention found	Statistically significant

Study	Regenerative Practice	Carbon Storage Change	Measurement Depth	Statistical Significance
Montgomery et al., 2022	No-till, cover crops	Higher soil organic matter	No mention found	No mention found
Fenster et al., 2021	No-till, ground covers, compost	Total soil carbon increased 13.15 Mg C/ha (30% more)	No mention found	Statistically significant
Ponnusamy et al., 2024	Organic/natural farming	Soil organic carbon increased; soil quality index increased	No mention found	No mention found
West and Post, 2002	No-till, rotation	57±14 g C/m^2/year (no-till); 20±12 g C/m^2/year (rotation)	No mention found	No mention found
Nath et al., 2025	Conservation tillage	Soil organic carbon increased 19.1%	No mention found	No mention found
Gaudin et al., 2015	Rotation, reduced tillage	Improved soil organic carbon	No mention found	Statistically significant
Tian et al., 2023	Organic amendments	Soil organic carbon increased to 2–3%; 10.6–13.9 Mg C/ha/50 years	No mention found	No mention found
Tadesse et al., 2021	Climate-Smart Agriculture (rotation, residue, etc.)	Soil organic carbon 2.8–3.1× higher; stock increased 100–267 Mg C/ha	1 meter	$p < 0.05$
Li et al., 2024	Organic amendments, rotation	Soil organic carbon increased 57–78%	No mention found	No mention found
Jacobs et al., 2022	No-till, cover crops	No consistent improvement	No mention found	No mention found

Study	Regenerative Practice	Carbon Storage Change	Measurement Depth	Statistical Significance
Raghuwanshi et al., 2024	No-till, residue retention	Soil organic carbon increased 0.93% (no-till) vs. 0.78% (conventional tillage)	0–10 cm	Statistically significant
Baldwin-Kordick et al., 2022	Rotation, manure	Salt-extractable carbon increased 157%	No mention found	$p = .024$
Vendig et al., 2023	Cover cropping	Soil organic carbon increased 0.21–0.56 Mg C/ha/year	No mention found	Statistically significant
McGregor et al., 1999	No-till	No mention found	No mention found	No mention found
Entry et al., 2002	Conservation tillage, pasture	0.95–3.56 g C/m^2	No mention found	$p < 0.05$
Wen et al., 2021	Biological nitrogen fixation	No mention found	No mention found	No mention found
Naab et al., 2017	No-till, rotation	Soil organic carbon decreased less in no-till	No mention found	No mention found
Thierfelder and Wall, 2010	No-till, residue retention	No mention found	No mention found	No mention found
Li et al., 2016	No-till, straw retention	Soil organic carbon increased >3 g/kg (0–10 cm)	0–10 cm	Statistically significant
Padbhushan et al., 2024	Conservation agriculture	Soil organic carbon increased 8.9%; carbon sequestration increased 7.3%	No mention found	$p < 0.05$

Study	Regenerative Practice	Carbon Storage Change	Measurement Depth	Statistical Significance
Varvel and Wilhelm, 2010	Conservation tillage	No-till soil organic carbon increased 4.8–11.6 Mg/ha	0–30 cm	Statistically significant
Parihar et al., 2020	Zero tillage, beds, nutrition	Soil organic carbon increased 44.1% (permanent beds with precision nutrition)	No mention found	No mention found
Sapkota et al., 2017	Zero-till, residue retention	Soil organic carbon increased 4.7 t C/ha (zero-till + residue)	0–0.6 m	Statistically significant
Poudel et al., 2001	Rotation, cover crops	Soil organic carbon increased 20% (organic), 10% (low-input)	No mention found	No mention found
Apfelbaum et al., 2022	Adaptive multi-paddock grazing	Soil organic carbon stocks increased 13%	1 meter	$p < 0.02$
Gopalakrishnan et al., 2014	System of Rice Intensification, organic amendments	Organic carbon percentage increased	No mention found	Statistically significant
Luján Soto et al., 2021	No-till, organic amendments	Soil organic carbon increased 22%	No mention found	Statistically significant
Naorem et al., 2023	No-till, residue retention	Soil organic carbon increased 1.12% (no-till) vs. 0.91% (conventional tillage)	0–10 cm	$p < 0.05$
Bruelle et al., 2014	No-till, mulch	No mention found	No mention found	No mention found

Study	Regenerative Practice	Carbon Storage Change	Measurement Depth	Statistical Significance
Rao et al., 2021	No-till, rotation	No mention found	No mention found	No mention found
Sainju et al., 2017	No-till, rotation	Soil total carbon increased with alternate-year rotation	0–125 cm	No mention found
Valenciano et al., 2024	No-till, rotation	Soil organic carbon increased 1.8 Mg/ha/year	1 meter	No mention found
Sabahy et al., 2024	Biodynamic	Soil organic carbon increased 6.16 t/ha (13% over organic)	No mention found	Statistically significant
Kersey et al., 2024	Cover crops, set-asides	Soil organic carbon stocks increased 71% (hedgerows), 63% (winter cover crops + grassland set-asides)	0–15 cm	No mention found
Jha et al., 2020	No-till, stubble retention	Soil organic carbon increased 18% (nitrogen), 5% (no-till)	0–0.1 m	No mention found
Olson et al., 2010	No-till, cover crops	No-till maintained soil organic carbon; chisel/moldboard lost soil organic carbon	No mention found	Statistically significant
Martínez-Gamiño et al., 2023	Zero tillage, cover cropping	Soil organic carbon increased 23.8 Mg/ha	No mention found	No mention found

Summary of Soil Carbon Sequestration Findings:

- No-till, zero-till, conservation tillage, or reduced tillage: Reported in 25 studies as part of the regenerative practice.

- Cover crops, ground covers, mulch, residue, straw, stubble, or set-asides: Included in 20 studies.
- Crop rotation, ley-arable, or alternate-year rotation: Included in 12 studies.
- Organic amendments, compost, manure, biodynamic, or organic/natural farming: Included in 10 studies.
- Livestock, grazing, or pasture: Included in 3 studies.
- Other practices: System of Rice Intensification, biological nitrogen fixation, climate-smart agriculture, conservation agriculture, zero tillage with beds, precision nutrition (5 studies).
- Increase in soil carbon: Thirty-three studies reported an increase in soil organic carbon, soil organic matter, or organic carbon, either quantitatively or qualitatively.
- No consistent improvement: One study reported no consistent improvement in soil organic carbon.
- Reduced loss: One study reported that soil organic carbon decreased less in the regenerative practice than in the control.
- No mention of carbon storage change: Five studies did not mention carbon storage change in the available data.

Statistical significance:

- One study reported $p \leq 0.001$.
- Four studies reported $p < 0.05$.
- One study reported $p < 0.02$.
- One study reported $p = .024$.
- Twelve studies described results as statistically significant without a specific p value.
- Twenty-one studies did not mention statistical significance.

Generalizability and Context:

- The studies varied in duration, geographic region, and specific regenerative practices, which may affect the generalizability of the findings. Some studies were meta-analyses or long-term field trials, which may provide more robust evidence, while others were short-term or based on field surveys.

Input Cost Reductions

Study	Input Cost Changes	Statistical Significance	Time Period
Kenne and Kloot, 2019	Reduced/eliminated chemical inputs	No mention found	No mention found
LaCanne and Lundgren, 2018	32% vs. 12% of gross income on seed/fertilizer (conventional vs. regenerative)	$p < 0.001$	No mention found
Fenster et al., 2021	No mention found	No mention found	No mention found
Ponnusamy et al., 2024	High cost in chemical agriculture encourages natural farming	No mention found	3 years
Nath et al., 2025	27% energy saving	No mention found	>3 years
Jacobs et al., 2022	43% lower cost in conservation system	No mention found	3 years
Raghuwanshi et al., 2024	Reduced tillage cost, diesel, time	No mention found	1 year
Baldwin-Kordick et al., 2022	Reduced input requirement	No mention found	No mention found
Vendig et al., 2023	Reduced synthetic nitrogen with legumes	No mention found	No mention found
Naab et al., 2017	20–29% cheaper with no-till	No mention found	4 years
Entry et al., 2002	Modest economic impact to landowners	No mention found	30 years
Gopalakrishnan et al., 2014	Water savings: $2,340–2,700/ha (Kharif), $1,380–1,740/ha (Rabi)	No mention found	2 years
Sabahy et al., 2024	No mention found	No mention found	6 years

Summary of Input Cost Reductions:

- Reduced or eliminated chemical inputs: Reported in three studies (Kenne and Kloot, Baldwin-Kordick, Vendig).
- Quantified reductions in input costs: Three studies (LaCanne and Lundgren: 32% vs. 12% of gross income on seed/fertilizer; Jacobs: 43% lower cost in conservation system; Naab: 20–29% cheaper with no-till).
- Reduced tillage, diesel, and time costs: One study (Raghuwanshi).
- Quantified water or energy savings: Two studies (Nath: 27% energy saving; Gopalakrishnan: $2,340–2,700/ha water savings in Kharif, $1,380–1,740/ha in Rabi).
- General statements about high input costs or modest economic impact: Two studies (Ponnusamy, Entry).
- No mention of input cost changes in available data: Fenster, Sabahy.
- Statistical significance: Only one study (LaCanne and Lundgren) reported statistical significance for input cost changes ($p < 0.001$). The other studies did not mention statistical significance.
- Time period: Eight studies reported a time period, ranging from 1 to 30 years. Five studies did not mention a time period in the available data.

Crop Yield Comparisons

Study	Yield Difference (Regenerative vs. Conventional)	Statistical Significance	Crops	Yield Trend
Kenne and Kloot, 2019	Wheat/soybean yields improved	No mention found	Wheat, soybean	No mention found
LaCanne and Lundgren, 2018	29% less corn yield (regenerative)	$p = 0.01$	Corn	No mention found
Jordon et al., 2022	No significant difference	No mention found	Arable crops	No mention found

Study	Yield Difference (Regenerative vs. Conventional)	Statistical Significance	Crops	Yield Trend
Fenster et al., 2021	No significant difference	$p = 0.17$	Almond	No mention found
Nath et al., 2025	+3.7% global yield (conservation tillage)	$p < 0.05$	Cereal crops	+6–18% after >10 years
Gaudin et al., 2015	+7% corn, +22% soybean (diversification, stress years)	Statistically significant	Corn, soybean	+28% (tillage), +17% (reduced tillage) over 31 years
Tian et al., 2023	+19.8% (biosolids), +7.1% (compost)	No mention found	Corn	Immediate
Tadesse et al., 2021	+30–45% wheat yield (climate-smart agriculture)	$p < 0.05$	Wheat	Peak at 6 years, decline after 10 years
Li et al., 2024	+13% (organic amendments), +12% (permanent vegetation)	No mention found	Wheat, maize	No mention found
Raghuwanshi et al., 2024	No-till: 34.74 vs. conventional tillage: 32.28 q/ha	Statistically significant	Soybean-wheat, maize-gram, maize-wheat	No mention found
Vendig et al., 2023	+10.9% yield (cover cropping)	Statistically significant	Maize, wheat	Immediate

Study	Yield Difference (Regenerative vs. Conventional)	Statistical Significance	Crops	Yield Trend
McGregor et al., 1999	No-till > conventional tillage by 800 kg/ha after 14 years	No mention found	Soybean	Long-term
Wen et al., 2021	+0.35 t/ha corn; coefficient of variation decreased 25%	p = 0.001	Corn	Immediate/long-term
Naab et al., 2017	Conventional tillage > no-till by 23–39%	No mention found	Maize, soybean	Long-term
Li et al., 2016	Wheat +4.5%, maize +8.3%, rice +1.65%	Statistically significant	Wheat, maize, rice	No mention found
Padbhushan et al., 2024	−1.15% under conservation agriculture (overall)	p < 0.05	No mention found	Decreased 2009–16, increased 2017–20
Poudel et al., 2001	Initial decrease, then comparable	No mention found	Tomato, corn	Yield gap closed over time
Apfelbaum et al., 2022	Biomass >300% higher (adaptive multi-paddock grazing)	p < 0.02	Forage	No mention found
Gopalakrishnan et al., 2014	+12–23% (Kharif), +4–35% (Rabi)	Statistically significant	Rice	Consistent

Study	Yield Difference (Regenerative vs. Conventional)	Statistical Significance	Crops	Yield Trend
Bruelle et al., 2014	+0.2–0.7 t/ha (conservation agriculture)	No mention found	Upland rice	Increased over 4–6 years
Rao et al., 2021	+30.5–34.4% (system 2 vs. system 1)	No mention found	Rice, wheat, others	No mention found
Sainju et al., 2017	Higher with alternate-year rotation	No mention found	Durum, canola, flax, pea	No mention found
Sabahy et al., 2024	Maize +1.68%, faba bean +3.25% (vs. organic)	No mention found	Maize, faba bean	No mention found

Summary of Crop Yield Comparisons:

- Higher yields under regenerative, conservation, or related practices: Seventeen of these studies reported higher yields under regenerative, conservation, or related practices.
- Lower yields: Three studies reported lower yields.
- No significant difference: Two studies found no significant difference.
- Mixed pattern: One study reported a mixed pattern (initial decrease, then comparable yields).

Statistical significance:

- Thirteen studies reported statistical significance for yield differences (eleven found statistically significant differences, two found no significant difference).
- Eleven studies did not mention statistical significance.

Yield trends over time:

- Five studies reported long-term yield increases (≥10 years).

- Two studies reported immediate effects.
- One study reported both immediate and long-term effects.
- One study found a peak at 6 years followed by a decline after 10 years.
- One study found the yield gap closed over time.
- One study reported consistent increases.
- One study described a mixed temporal pattern (decrease then increase).
- Eleven studies did not mention yield trend information.

Drought and Storm Resiliency Indicators

Study	Resilience Metric	Regenerative System Performance	Conventional System Performance	Percent Improvement
LaCanne and Lundgren, 2018	Water infiltration	Improved	No mention found	No mention found
Fenster et al., 2021	Water infiltration	6× faster	No mention found	No mention found
Gaudin et al., 2015	Yield in drought	+7% corn, +22% soybean	No mention found	No mention found
Tian et al., 2023	Yield in abnormal precipitation	+19.8% (biosolids), +7.1% (compost)	Control	No mention found
Tadesse et al., 2021	Soil moisture	2× higher	Control	100%
Li et al., 2024	Yield in dry years	+19–28% wheat	Control	No mention found
McGregor et al., 1999	Runoff, soil loss	11–35% less runoff, 23–77% less soil loss	Conventional tillage	11–77%

Study	Resilience Metric	Regenerative System Performance	Conventional System Performance	Percent Improvement
Thierfelder and Wall, 2010	Water infiltration	3–5× higher	Conventional tillage	200–400%
Apfelbaum et al., 2022	Water infiltration	Higher	Conventional grazing	No mention found
Gopalakrishnan et al., 2014	Water use efficiency	+31–37%	Best management practices	31–37%
Luján Soto et al., 2021	Aggregate stability	Higher	Conventional tillage	No mention found
Sabahy et al., 2024	Water use efficiency	+1.96–10.67% (maize), +3.62–10.68% (faba bean)	Organic/conventional	1.96–10.68%

Summary of Drought and Storm Resiliency Indicators:

- Water infiltration: Four studies
- Yield under stress (drought, abnormal precipitation, or dry years): Three studies
- Water use efficiency: Two studies
- Soil moisture: One study
- Runoff/soil loss: One study
- Aggregate stability: One study
- Improved performance: All twelve studies reported improved performance of regenerative systems relative to conventional or control systems.
- Quantified improvement: Ten studies quantified the improvement (percent increase, fold-change, or specific values).
- Described as improved or higher without quantification: Three studies.
- Percent improvement or fold-change: Reported in five studies, ranging from 1.96% to 400% depending on the metric and crop.

- No mention of percent improvement in available data: Seven studies.
- No studies reported a negative or neutral effect of regenerative systems on the resilience metrics measured.

Economic Profitability

Study	Net Profit/Returns	Cost-Benefit Ratio	Statistical Significance	Time Period
Kenne and Kloot, 2019	Improved, not quantified	No mention found	No mention found	No mention found
LaCanne and Lundgren, 2018	78% higher profit (regenerative)	No mention found	$p < 0.001$	No mention found
Fenster et al., 2021	2× higher profit (regenerative)	No mention found	$p = 0.045$	No mention found
Ponnusamy et al., 2024	Natural farming: 1.95–2.29; integrated chemical farming: 1.34–1.47	Natural farming highest	Statistically significant	3 years
Nath et al., 2025	22% higher net returns	No mention found	$p < 0.05$	>3 years
Jacobs et al., 2022	No mention found	43% lower cost	No mention found	3 years
Raghuwanshi et al., 2024	Higher net returns	No mention found	No mention found	1 year
Naab et al., 2017	20–29% cheaper (no-till); higher benefit:cost ratio	1.7 (no-till) vs. 1.0 (conventional tillage)	No mention found	4 years
Sabahy et al., 2024	Maize: +5.7–21.7%; faba bean: +6.7–22.2%	No mention found	No mention found	6 years

Summary of Economic Profitability:

- Higher profit or net returns: Eight studies reported higher profit or net returns, with six quantifying the increase (ranging from 5.7% to 2× higher profit), and two reporting improvement without quantification.
- Lower costs: Two studies reported lower costs.
- Cost-benefit ratio data: Two studies reported cost-benefit ratio data, both favoring the intervention group (natural farming highest in one, and 1.7 vs. 1.0 in another).
- Statistical significance: Four studies reported statistical significance; three provided p-values (all $p < 0.05$) and one stated “statistically significant” without a p-value.
- No mention of statistical significance in available data: Five studies.
- No mention of cost-benefit ratio data in available data: Seven studies.

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