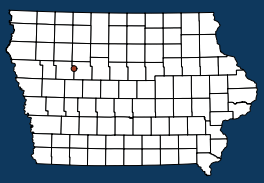
PRACTICAL FARMERS OF IOWA
COOPERATORS' PROGRAM Farmer-Led Research

EXPERIMENT



2021

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Economic and Soil Health Impacts of Grazing Cover Crops in a Feedlot System

In a Nutshell:

- Ben Albright, an integrated beef and crop farmer, grazed cover crops with finishing steers in the fall, winter and early spring. In order to determine the economic and soil health impact of grazing cover crops, he kept cover crop and grazing records and had his soil sampled in 2019, 2020 and 2021.

Key Findings:

- Albright profited from grazing cover crops each year. His profits averaged $45.56/acre or $16.08/head.
- Soil samples from May 2019 through April 2021 show very few detectable trends in soil health.
- Grazing cover crops is becoming standard practice for cow-calf producers, but less so for feedlot producers. Albright proved how a cover crop field adjacent to his feedlot could provide supplemental forage through simply allowing finishing cattle to graze them, which saved him thousands of dollars in feed costs each year.

Cooperators

Ben Albright – Lytton

Funding

Iowa Department of Agriculture and Land Stewardship – Water Quality Initiative

Ben Albright stands in his cover crop field adjacent to his feedlot in Lytton, IA. Photo courtesy of Landus Cooperative.

BACKGROUND

Ben Albright and his family operate a diversified crop and beef feedlot farm. Feedlot cattle were allowed access to a cover crop field adjacent to the lot, which provided supplemental forage to the herd. This allowed Albright to decrease the amount of total mixed ration (TMR) fed to the cattle, thus saving him money.

Evidence has been mounting around the profits that can be achieved when livestock graze cover crops.[1,2] It is known that grazing cover crops can provide benefits to soil health, but the effects are longer term [1] and require proper grazing management. To determine this, Albright tracked economics and soil health data for three years. This report describes the economic and soil health impacts Albright experienced in his field where cover crops were grazed from 2019-2021.

METHODS

Design

In September of 2018, 2019 and 2020, Albright seeded cereal rye and oats in a 79-acre field adjacent to his feedlot with the intention of grazing the forage produced. Cover crops were seeded in fields rotated with corn and soybeans. Cattle in the lot were given access to the cover crop field from fall to late winter/early spring (**Table 1**). For soil sampling, Albright established three treatment fields:

1. No cover crops with no grazing (no cover crop)
2. Cover crops with no grazing (cover crop)
3. Grazed cover crops (cover crop and graze)

TABLE 1. Number and weight of feedlot cattle that had access to cover crops during the three years of the study at Ben Albright's.

YEAR	# of CATTLE	DATE IN	DATE OUT	WEIGHT IN (lb)	WEIGHT OUT (lb)
2018-2019	240	11/10/2018	4/6/2019	1,108	1,404
2019-2020	248	11/19/2019	2/29/2020	780	1,124
2020-2021	193	10/31/2020	2/28/2021	945	1,332

Feed economics

Albright recorded cover crop expenses, cover crop grazing data and tons of TMR amounts offered to cattle. Based on comparing tons of TMR offered to two different pens of cattle, one of which had access to cover crops as supplemental feed, Albright estimated cover crop forage to be valued at $0.05 per pound of gain.

In order to estimate the value of cover crops in Albright's system, the revenue and costs associated with cover crop grazing were taken into account. Revenue includes the value of feed replaced by grazing, cost-share payments received and crop insurance discounts. Expenses include costs for establishing cover crops and additional herbicide needed for cover crop termination.

Cattle were weighed when they arrived and departed from the feedlot in order to calculate average weight gain per animal, which then was multiplied by $0.05/lb gain, representing the value of the cover crop forage. Net profit is reported on a per acre and a per head basis. Net profit was calculated two ways: 1) including cost-share and crop insurance discounts; and 2) without including cost-share or crop insurance discounts.

This economic analysis did not take into account effects on cash crop yield, soil retention value, nutrient retention value, soil health value or nutritional value of forage.

Soil health

Soil samples were collected in spring 2019, 2020 and 2021 and in fall 2019 and 2020 in all three treatment fields to a depth of 6 in. Soil sample locations were marked by GPS and taken within the same soil type.

Samples were sent to AgSource Laboratories (Ellsworth, IA) and analyzed for microbial respiration by determining the burst of CO_2-C following rewetting of dried soil using an infrared gas analyzer. Other soil indicators measured included water soluble carbon (active C) and organic matter (OM).

Soil data were analyzed using JMP Pro 15 (SAS Institute Inc., Cary, NC) statistical software. Means separations are reported using Tukey's least significant difference (LSD). Statistical significance was determined at the 90% confidence level.

RESULTS AND DISCUSSION

Economic impact

Results from Albright's farms are presented in **Table 2**. Three years of data are included, each year representing a full cover crop season spanning autumn to the following spring. On average, cover crop establishment cost $28.18/ac. Net profits from grazing averaged $45.56/ac or $16.08/head. Without the assistance of cost-share and crop insurance discounts, net profits averaged $15.56/ac or $5.51/head. Regardless of financial assistance, Albright scored positive profits from grazing cover crops within the same year of planting cover crops.

Across the three years, Albright saved an average of $3,851 in TMR per year. This is an important finding considering winter feed costs represent the single largest cost in cattle operations.[3] Grazing cover crops reduces winter feed costs. "I think grazing covers in a no brainer for cattle producers, as the numbers show," stated Albright.

TABLE 2. Economic impact of grazing cover crops at Ben Albright's from 2018-2021.

	2018-2019	2019-2020	2020-2021
Total acres	79	79	79
Number of head (steers)	240	248	193
Average gain per steer (lb)	296	344	387
REVENUE/AC			
Value of feed replaced by cover crops/lb gain[a]	$0.05	$0.05	$0.05
Value of feed replaced by cover crops/head	$14.80	$17.20	$19.35
Value of cost-share payment/ac[b]	$25.00	$25.00	$25.00
Value of crop insurance premium discount/ac[c]	$5.00	$5.00	$5.00
Total value of gain/yr[d]	$3,552.00	$4,265.60	$3,734.55
Total value of cover crop/ac[e]	$74.96	$83.99	$77.27
COSTS			
Cover crop establishment/ac	$29.55	$29.78	$25.22
Cover crop termination a/c[f]	$5.00	$5.00	$5.00
Total costs	$34.55	$34.78	$30.22
RETURNS WITH COST-SHARE			
Net profit/ac	$40.41	$49.21	$47.05
Net profit/head	$13.30	$15.68	$19.26
RETURNS WITHOUT COST-SHARE			
Net profit/ac	$10.41	$19.21	$17.05
Net profit/head	$3.43	$6.12	$6.98

[a] Estimate based on cost of total mixed ration calculated by Ben Albright.
[b] Albright was offered $25/ac cost-share for cover crops through IDALS-WQI.
[c] IDALS and USDA Risk Management Agency (RMA) offers farmers in Iowa a $5.00/ac crop insurance premium discount on cover cropped acres.
[d] Total value of gain/yr = (no. head) × (value of feed replaced by cover crops/head)
[e] Total value of cover crop/ac = (no. head) × (value of feed replaced by cover crops)/79 acres + (value of cost-share payment/ac) + (value of crop insurance discount/ac).
[f] Termination costs represent the cost of any additional herbicide above the farmer's typical practice used to terminate cover crops.

Cattle graze a cereal rye and oat cover crop field in early November at the Albright farm.

Soil health – microbial respiration

Figure 1 shows that microbial respiration readings were inconsistent over time. The highest values were recorded in 2019 and the lowest values in 2020. The cover crop field, which was not grazed, scored statistically greatest or among the statistically greatest on each sampling date.

Soil health – active carbon

Figure 2 shows active C in each field which illustrates no general differences among fields from spring 2019 to spring 2020. Active C was overall greatest in fall 2020; on that sampling date, the grazed cover crop field scored the highest value.

Soil health – organic matter

Figure 3 shows OM values differed from date to date but did not differ among the fields at any date. Soil organic matter in the Canisteo soils at Albright's farm range from 2.2 to 5.5%. "We have high organic matter to begin with, so I wasn't expecting any huge improvement. If there was any improvement in soil health that is just another added benefit," explained Albright, who will continue to graze cover crops into the future.

CONCLUSIONS AND NEXT STEPS

The economic results from this project add to a growing body of work by PFI cooperators showing that grazing cover crops provides short-term economic benefits and pay off in one year. Grazing cover crops is becoming standard practice for cow-calf producers, but less so for feedlot producers. In this case, Albright proved how a cover crop field adjacent to his feedlot could provide supplemental forage through simply allowing finishing cattle to graze them. This saved him thousands of dollars in feed costs each year. Albright proclaimed, "I will definitely continue to plant cover crops on all the fields we graze."

Soil health results indicate the soil health impact of grazing cover crops may take more time to realize and research efforts may be better spent focusing on economics, ecological benefits and field fitness.

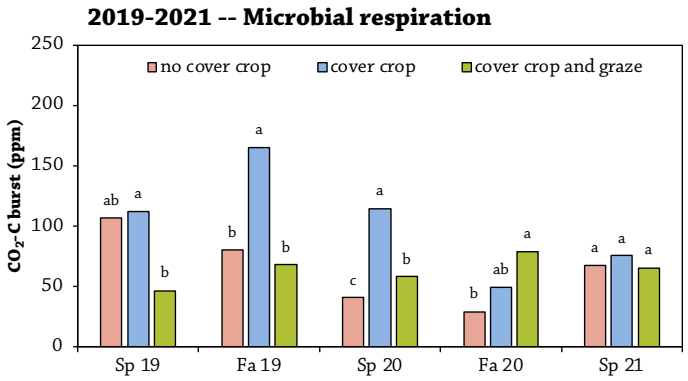

FIGURE 1. Soil microbial respiration (CO_2-C burst from soils) for each field on each sampling date in 2019, 2020 and 2021. Analyses were conducted separately for each date. By date, results that differed by less than the least significant difference (LSD) are followed by the same letter-rankings and are considered statistically equal. Results followed by a different letter ranking are considered statistically different at the 90% confidence level.

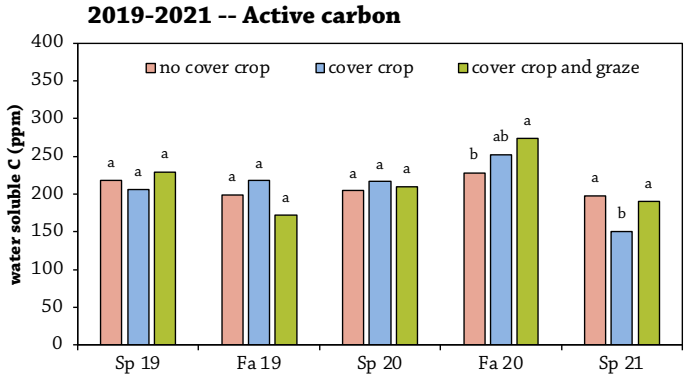

FIGURE 2. Active carbon (water soluble carbon) for each field at each sampling date in 2019, 2020 and 2021. Analyses were conducted separately for each date. By date, results that differed by less than the least significant difference (LSD) are followed by the same letter-rankings and are considered statistically equal. Results followed by a different letter ranking are considered statistically different at the 90% confidence level.

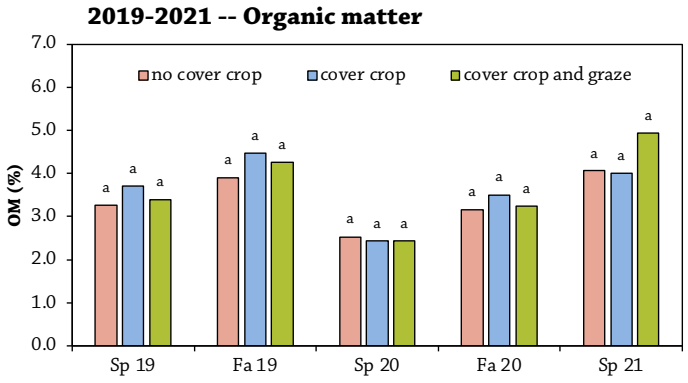

FIGURE 3. Soil organic matter (OM) for each field at each sampling date in 2019, 2020 and 2021. Analyses were conducted separately for each date. By date, results that differed by less than the least significant difference (LSD) are followed by the same letter-rankings and are considered statistically equal at the 90% confidence level.

FUNDING ACKNOWLEDGEMENT

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PRACTICAL FARMERS of Iowa

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PFI's Cooperators' Program helps farmers find practical answers and make informed decisions through on-farm research projects. The Cooperators' Program began in 1987 with farmers looking to save money through more judicious use of inputs. If you are interested in conducting an on-farm trial contact Stefan Gailans @ 515-232-5661 or stefan@practicalfarmers.org.