

EFAO 2021: Research Protocol

Regeneration of Fallow Fields for Vegetable Production continued

Farmer-researcher(s): Eric Barnhorst, Eva Mae Farm - East

Project type: Research trial

Research priorities: Cover crops, Soil health

EFAO Contact: Sarah Hargreaves, sarah@efao.ca

Objective

Eric is continuing his research into different methods to regenerate a fallow field in preparation for organic vegetable production. Specifically, he would like to continue the treatments that he established in 2020 and start another replication of the trial in a second field that has been regularly amended for vegetable production.

Background

2020 Research Report

See <https://efao.ca/wp-content/uploads/EFAO-Barnhorst-2020-final-audio.pdf> for the experimental design.

Experimental Design

Continuation of Field A, 2020-2022

See <https://efao.ca/wp-content/uploads/EFAO-Barnhorst-2020-final-audio.pdf> for the experimental design.

Soil tests to re-calibrate treatments

In early spring, Eric will take soil samples from each of the treatment types to re-calibrate his micronutrient application. This is because the compost and chicken manure will have contributed some amount, so he doesn't want to blanket apply the last year's amounts this year. Note that it would be interesting to sample all of the areas to see how the overall nutrient picture changed in each treatment, but this is too expensive.

- Spring 2021: **Active carbon** in each of the 20 plots as a follow-up to the 2020 results (A plots) and baseline for B plots

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- Spring 2021: A **complete soil test** for each treatment, for a total of 5 samples (consolidated samples for each treatment as baseline for 2021) as baseline for B plots- **sampled separately from active carbon samples**

Plot set-up

After the results are available, Eric will divide each area from last year in two and randomly assign each side to either A and B:

1. In subplots **B**, he will repeat the treatments for a second year.
2. In subplots **A**, he will grow an “indicator crop” of sorghum sudangrass to indicate the impact of last year’s treatment.

In-season management

- Eric will record sorghum sudangrass growth in subplots **A** using the quadrat method. Measurements will be taken **prior to each mowing and one final time at the end of the season.**
- Eric will mow each plot 2-3 times throughout the season based on the size of the tallest sorghum sudangrass.

Follow-up measurements

- **Spring 2022: Active carbon x 20 subplots B**
- Eric will grow an indicator crop for the 2022 season in subplots **B**
- Subplots **A** will be removed from the trial but will be planted back to a cover crop to prepare for vegetable production in future years.

Field B, 2021-2022

Supplemental Research Question

“Do cover crops provide a similar increase in active carbon in established fields that are currently productive?”

Eric will add a new treatment based on the cover crop only treatment in a field that was already planned to be in a full year single species cover crop. The value would be to repeat some of the measurements in an area that has *been regularly amended for vegetables*. The results can be compared to the change in the active carbon in Field A and also to the change in active carbon in a production section of Field B. This will give a rough estimate of how much soil health responds to cover crops and extra amendments in an area that is in balance with nutrients.

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Design

- Cover crop mix (and no additional amendments) in a field that Eric has in cover crop in 2021 as part of his three-year rotation
 - Eric will randomly choose 4 areas (~ same size as Field A plots) to sample soil
 - Eric will mark or record location for follow-up sampling
- Production field randomly distributed across the field Eric has in vegetable production in 2021
 - Eric will randomly choose 4 areas (~ same size as Field A plots) to sample soil
 - Eric will mark or record location for follow-up sampling

Measurements

- Spring 2021: Active carbon x 2 in spring 2021 (4 cover crop, 4 production area)
- Fall 2021: Active carbon x 8 (4 replicates of cover crop treatment, 4 replicates of production area control)

Measurements

Soil health via active carbon

Active carbon from A&L, as described above.

Yield

Yield of sorghum sudangrass, the indicator crop, using a quadrat method. Eric will construct a quadrat, 12" square quadrat, take one randomly sampled quadrat measurement per plot. Quadrats can be made from 12" sections of PVC attached at the corners with PVC elbows, or 12" sections of PVC strung together with shock cord - (shock cord will be easier to pull over biomass).

Before quadrat sampling, Eric will pre-label all bags and check for variance in bag weight. If the bags are not consistent weights, he will also weigh each bag individually and record the bag weight on the bag (using pencil, or indelible pen).

Eric will use random coordinates (or another random method) to select random locations for the quadrat in each plot. He will then clip all biomass within the quadrat at soil level (or consistent distance from the soil) and place it in pre-labeled paper bag. He will place the paper bags in his hoop house to dry. When dried, he will weigh the samples. If his scale isn't sensitive enough, Eric will send the samples to Sarah to weigh at the end of season.

Cost of production

Eric will track cost and labour for each treatment.

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General observations, including photos

Eric will take notes on general observations about crop and cover crop growth throughout the seasons, along with photos.

Research Plan

Time	Task	Methods & Measurements or Action Item
April	Spring soil samples	Sarah will send A&L forms to Eric before sampling
Spring	Set-up plots	
Spring	Amend soils	
Spring	Plant cover crops	
Season	Make quadrat, pre-label and pre-weight bags	For biomass sampling
Season	Mow 2-3 times	Biomass sampling before mowing
Fall	Fall soil sampling	
October 31	Submit data	
December 31	Invoice	Send Sarah invoice for farmer-fee

*Please note that if data is submitted after the submission deadline, EFAO staff cannot guarantee that your data will be analyzed and written up before the Research Symposium and/or the next growing season.

Staff check-ins

Early May - on track to get things seeded

Mid-late June - after first mowing and biomass sampling (~6 weeks)

Fall - before soil sampling

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Materials

Please list all materials, supplies and equipment that will be reimbursed for this project. If possible, please also indicate a short-list of any in-kind materials, supplies and equipment that you will use.

Material	Unit	Quantity Required	Total Cost*	Note
Active carbon - FIELD A	\$15.75	60	\$945 + HST	20 for Field 1 2020 follow-up (spring 2021); 20 for Field 1, subplots B (fall 2021); 20 for Field 1, subplots B (spring 2022)
Active carbon - FIELD B	\$15.75	16	\$252 + HST	2 for baseline + 8 for all plots fall 2021; 8 for all plots spring 2022
Complete soil test - FIELD A	~\$35	5	~\$180 + HST	Consolidated samples of each treatment, spring 2021
Micronutrients			~ 1/2 per last year	
Chicken manure			~ 1/2 per last year	
Woody compost			~ 1/2 per last year	
Cover crop seed - FIELDS A and B			~ per per last year	CC treatments
Sorghum sudangrass seed, 2021			~ \$10	Indicator crop for Field 1, subplots A
Sorghum sudangrass seed, 2022				Indicator crop for Field 1, subplots B
Paper bags				
Total			~0	

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Farmer-fee

\$500 in 2021 and \$500 in 2022, invoiced to EFAO after farmer-researcher submits data.

Invoices for Farmer-Fees & Reimbursements

Research expenses

- Email an invoice along with copies of receipts for all qualified expenses to **research@efao.ca**.
- Expenses can be claimed anytime throughout the year.
- Deadline: December 31, 2021

Farmer-fee

- Email an invoice for your farmer-fee to **research@efao.ca**.
- Farmer-fees can be claimed after your data is submitted
- Deadline: December 31, 2021
- If you collect HST for your farm business, you can choose to add HST to your fee.

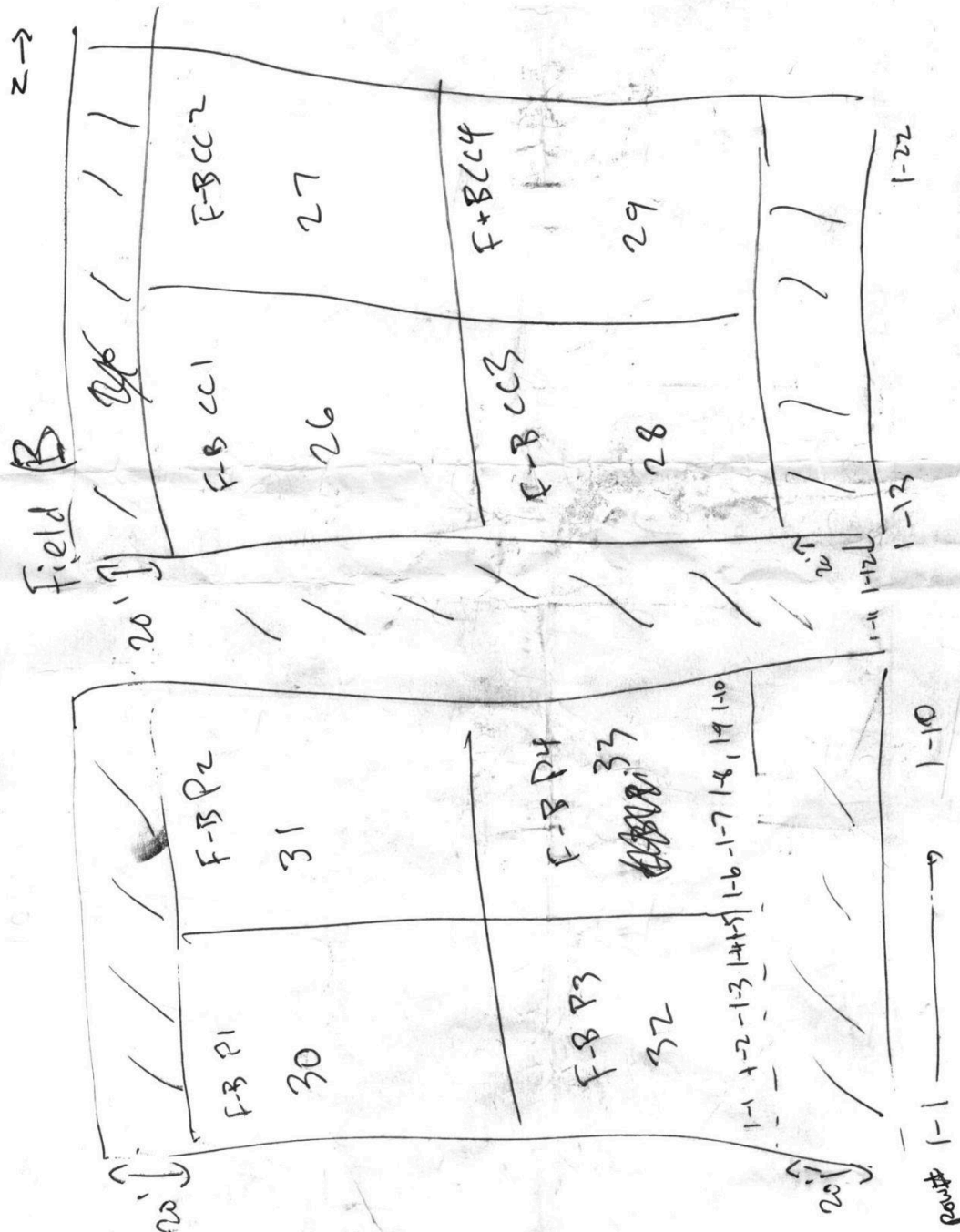
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M + CC + CM 1	M + CC + CM + WC 2	M + CC 2	M + MOW 3	Control 4
CC1 13 partially dry	WC2 18 partially after drought	CC2 10	MOW3 ✓	4
M + CC 1	Control 2	M + CC + CM 2	M + CC + CM + WC 4 partially after drought	M + MOW 4
9	2	14	20	8
CC1	CC2	CC1 + CC2 vs #10	CC4	MOW
M + CC + CM + WC 1	M + MOW 1	Control 3	M + CC + CM 3 partially after drought	M + CC 4
17	5	3	15	12
WC1	MOW1	CC3	CC4	Best M + CC
Control 1	M + CC + CM + WC 3	M + MOW 2	CC4	M + CC + CM 4
1	9	6	11	16
CC1	WC3	MOW2	CC3	steady growth

21. C base 2 → mix #1, 2, 3, 4
22. MOW base 2 mix #5, 6, 7, 8
23. CC base 2 mix #9, 10, 11, 12
mix #13, 14, 15, 16
max 17, 18, 19, 20
max 21, 22, 23
max 24, 25, 26, 27, 28, 29, 30
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max 2021, 2022, 2023, 2024, 2025, 2026, 2027, 2028, 2029, 2030
max 2031, 2032, 2033, 2034, 2035, 2036, 2037, 2038, 2039, 2040
max 2041, 2042, 2043, 2044, 2045, 2046, 2047, 2048,

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