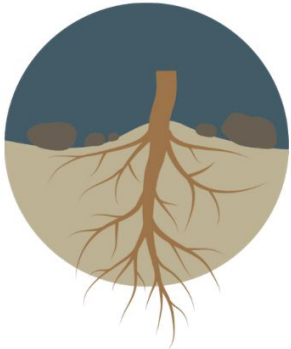


Soil Health Management Plans (SHMP) & Decision-Making

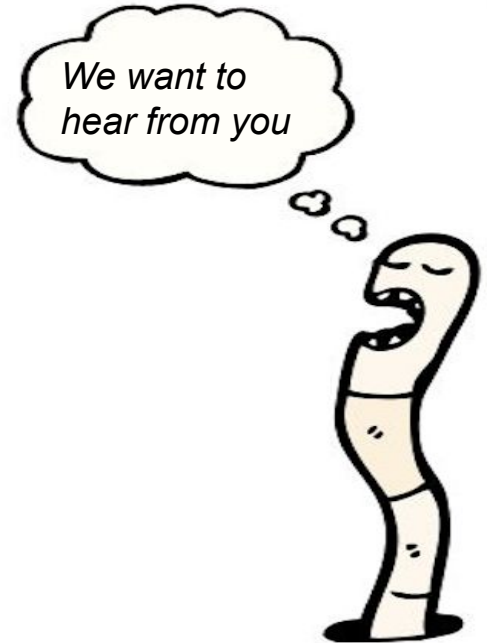
Session 9: Oahu Farmer Soil Health Cohort



An initiative by Oahu Resource
Conservation & Development Council (Oahu
RC&D) funded by USDA-NRCS Cooperative
Agreement NR2192510002C002.



Raffle & Mahalo to Sponsors Sol Vita & Patagonia!



What we'll cover in this presentation:

- Soil Health Management Plan (SHMP) - Example from Hua Orchards and Lonohana Estate Chocolate
- Farmer feedback recommending adding decision-making tools to the SHMP & Poll on which tools would be helpful for you?
- New study out of Ka'u using long-term cover crop in an orchard system resulting in doubling their carbon in two years
- Farmer feedback poll on a feasible monitoring schedule- what tools will help you record what worked, what didn't and to track improvements over time?
- Update on NRCS PIA's SHMP, Jason Hanson, State Agronomist, NRCS PIA
- Farm Bill Programming & Application Timelines- Gavin Jennings, Oahu Field Office District Conservationist, NRCS PIA



Soil Health Plan Overview

SHMP may help to:

- Improve soil organic matter levels
- Reduce compaction
- Improve soil organism habitat
- Increase aggregate stability
- Improve plant productivity and health
- Reduce sediment transported to surface water
- Reduce sheet and rill erosion



RUSLE 2

<i>Description</i>	<i>Cons. plan. soil loss, t/ac/yr</i>	<i>Soil conditioning index (SCI)</i>	<i>STIR value</i>
Baseline: Fallow field of Guinea Grass, mowed	1.18	0.401	0.00479
Outcome: Orchard with managed conservation cover	0.126	1.84	0.00479

Hua's Lab Results

Indicator	Site	
	Hua Orchard	
<u>Physical Properties</u>	Site 1	Median (n=99)
Bulk density (g cm ⁻³)	0.98	0.90
Water holding capacity (%)	89.9	75.2
Water stable aggregates (%)	6.1	33.2
<u>Chemical Properties</u>		
pH	6.23	6.60
Total organic carbon (%)	1.56	2.37
Hot water extractable organic C (mg kg ⁻¹)	242	263
DOC:DON	10.4	10.5
<u>Biological Properties</u>		
CO ₂ burst (mg C kg ⁻¹)	45.3	79.2
Mineralizable nitrogen (mg kg ⁻¹)	13.0	15.9
β-glucosidase (mg kg ⁻¹)	44.4	62.1
β-glucosaminidase (mg kg ⁻¹)	20.7	43.7

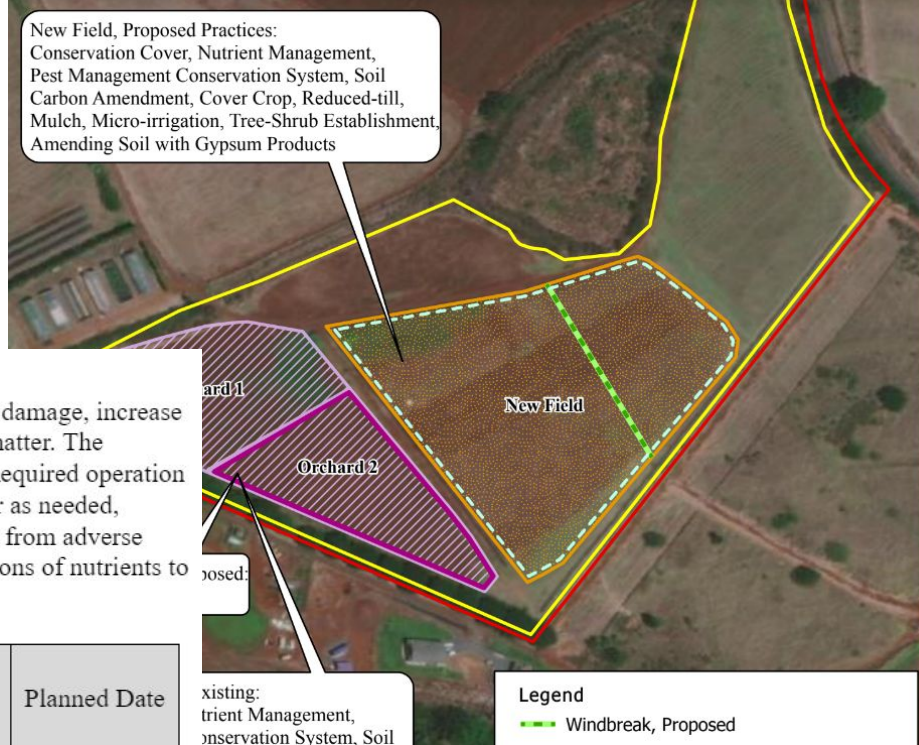
Lab Results/In-Field Assessment	Goal for soil health	Recommended SH Practices
Low scores in Biological Properties	Increase OM by 1 % in 3 years	Cover Crop, Biochar, Compost, Mulching
CO ₂ burst, mineralizable nitrogen, enzymes	Increase biological activity	Compost
Low scores in Chemical Properties	Add carbon to the soil system	Cover Crop, Biochar, Compost, Mulching
Total Organic carbon, Hot water extractable		
Low scores in Physical Properties	Reduce compaction	Cover crop Reduced Till
Bulk density water stable aggregates	Improve Water holding Capacity and aggregation	Cover Crop, Biochar, Compost, Mulching

Farmer's primary objective is to build organic matter and increase water storage

Installing Windbreak will reduce ET/crop water demands and reduce soil erosion

Applying compost, cover cropping, and end goal of perennial cover will raise organic matter, increasing water storage

Identified soil health practices



Windbreak/Shelterbelt Establishment

This practice is intended to reduce soil erosion from wind, protect plants from wind related damage, increase carbon storage, and improve air quality by reducing and intercepting air borne particulate matter. The windbreak will be oriented as close to perpendicular to the troublesome wind as possible. Required operation and maintenance activities include replacement of dead trees, providing supplemental water as needed, thinning/pruning windbreak to maintain its function, periodic inspections of trees to protect from adverse impacts including insects, diseases or competing vegetation, and possible periodic applications of nutrients to maintain plant vigor.

Practice Code	Description	Location	Quantity (~)	Planned Date
Windbreak (380)	Windbreaks or shelterbelts are single or multiple rows of trees or shrubs in linear configurations.	Orchard 1	550 ft	2020
	Maximize soil cover, Maximize biodiversity, Maximize living roots, Minimize soil disturbance	Orchard 2	120 ft	2020
		New Field	450 ft	2022

How much savings anticipated from a windbreak/cover crop design:

Example 2

- 1 acre farm with diverse crop rotation, with annual irrigation cost of **\$3,060**

**Cost of
windbreak to
protect ~1 acre:**

\$2,100

**Years to
break-even:**

Around 3

**Annual irrigation savings
estimate =
\$765**

*Irrigation savings based on an leading research, which estimates 20-30% reduced evapotranspiration rate. For this example, we used a 25% reduction in water requirements & irrigation costs.

****Benefits such as potential increase in plant health & productivity due to cooler soil temperatures, less erosion, and less disturbance were not included in the savings estimate.**

Take the Poll and Win!



Will cost/benefit info help you?

1. Would costing info on your soil health practice help you now? (Single Choice) *

- Yes, but just costing
- Yes, cost and benefit analysis
- No

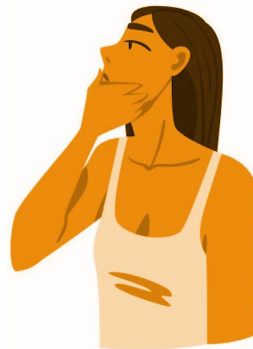
2. Should costing info for each practice be added to a soil health plan? (Single Choice) *

- Yes, but just costs
- Yes, cost & benefit analysis
- No
- Choice 4

3. What costing info will support decision-making on a practice? (Multiple Choice) *

- Cost to install- materials
- Cost to install- labor
- Cost to install & maintain- irrigation/water bill
- Cost to maintain- materials
- Cost to maintain- labor

Example of using a ranking sheet to determine if a windbreak is the best practice for Hua Orchard to install now?



Rank 1-5	Should installing a windbreak be a priority practice now?
4	Meets SH Goals & Addresses Recommendations in Lab Results
1	Low cost to install now
3	Low labor hours to install and maintain
5	Will make it easier to install other soil health practices
5	Will improve the cash crop this season or within this year
1	Will this practice help me manage a fallow field I don't have time to get to right now

Take the Poll & Win!



Will a ranking sheet help you?

1. Would a ranking sheet help you right now? (Single Choice) *

- Yes
- No

2. Should a ranking sheet be included in a soil health plan? (Single Choice) *

- Yes
- No

3. What criteria would you include on your ranking sheet? (Multiple Choice) *

- Low cost to install this season
- Low cost to maintain
- Most immediate benefit to cash crop
- Greatest potential for improving soil properties (lab results)
- Will have a synergistic benefit with other practices
- Easy to integrate with existing practices
- Will 'buy time' on a fallow field
- Will be a good educational demonstration

Lonohana Estate's Lab Results

Indicator	Site	
	Lonohana	
<u>Physical Properties</u>	Site 1	Median (n=96)
Bulk density (g cm ⁻³)	1.37	0.99
Water holding capacity (%)	82.22	76.15
Water stable aggregates (%)	14.73	19.75
<u>Chemical Properties</u>		
pH	7.34	6.50
Total organic carbon (%)	2.21	2.27
Hot water extractable organic C (mg kg ⁻¹)	303.08	268.59
DOC:DON	12.72	10.57
<u>Biological Properties</u>		
CO ₂ burst (mg C kg ⁻¹)	73.82	60.12
Mineralizable nitrogen (mg kg ⁻¹)	14.22	9.80
β-glucosidase (mg kg ⁻¹)	52.60	57.35
β-glucosaminidase (mg kg ⁻¹)	37.45	38.84

Lab Results/In-Field Assessment	Goal for soil health	Recommended SH Practices
NO Low scores in Chemical Properties	Add more carbon to the soil system to increase water holding capacity	Cover Crop, Biochar, Compost, Mulching
Low scores in Physical Properties Bulk Density Water stable aggregates	Reduce compaction	Cover crop
	Improve Water holding Capacity	Cover Crop, Biochar, Compost, Mulching

Farmer's primary objective is to build organic matter and increase water storage

Installing Windbreak will reduce ET/crop water demands, protect crop trees from intense winds

Considering compost or cover cropping practices to increase organic matter, increase water storage, address SH test

Soil health practice 1: Cover cropping system

- **Pigeon Pea between Cacao trees within row**
 - Cost (Plant Plugs & Planting Labor): **\$489**
 - **N Contribution: .5 lbs.**
- **White Clover ground cover between rows**
 - Cost (Seed & Planting Labor): **\$116**
 - **N Contribution: 24 lbs.**
- **Strips of Sorghum Sudan along sides of rows, mowed and used for green mulch (3x)**
 - Cost (Seed, Plant & Mowing Labor): **\$1,486**
 - **N Contribution: 27.41 Lbs.**



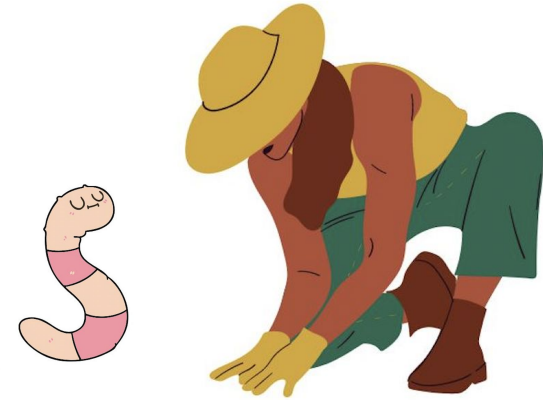
Total Cover Cropping System Estimated Cost: \$3,523

Total Estimated N Contribution: 51.91 lbs

Soil health practice 2: **Compost**

- **Rate of 20 tons/acre throughout field (.52 acres)**
 - **Total Cost (Compost, Delivery Fee, Labor): \$1,179**

Estimated Nutrient Contributions (Lbs.)				
N	P	K	S	C
520	52	52	52	5,200



Area (Ac.)	Application Rate (T/ac)	Method	CuYd needed	Compost Cost (HEP)	Delivery Cost	Estimated Labor Hours	Labor Costs (\$20/Hr)	Total Cost
0.52	20	Condition throughout field	20.8	\$840.00	\$213.00	6.29	\$125.85	\$1,178.85

Comparing ranking tables of each practice

Perennial ground cover and strips of sudan to supply living mulch
 Site Specific Considerations: Needs sunlight, requires additional water use

Positive Effects	Negative Effects
<p>Soil</p> <ul style="list-style-type: none"> •Organic matter will increase with residue and root establishment. •Improve soil moisture use efficiency. •Minimize soil compaction. <p>Plants</p> <ul style="list-style-type: none"> •Permanent vegetation may slow the spread of noxious weeds. •Biological diversity and trap crop potential <p>Water</p> <ul style="list-style-type: none"> •Reduce runoff and increase infiltration. •Improves infiltration, soil structure, and soil water storage. 	<p>Capital</p> <ul style="list-style-type: none"> •Materials & planting costs. •Grass/Legume Seed. <p>Labor</p> <ul style="list-style-type: none"> •Increase in labor to plant, manage, eliminate crop <p>Plant</p> <ul style="list-style-type: none"> •In dry climates (<20 inches/year) or dry periods of the year, will compete for crop moisture. •Potential risk of poor establishment

Compost & mulch application
 Site Specific Considerations: sourcing of mulch, Coconut Rhinoceros beetle

Positive Effects	Negative Effects
<p>Soil</p> <ul style="list-style-type: none"> •Increased soil organic matter. •Reduced evaporation <p>Plants</p> <ul style="list-style-type: none"> •Improve growing conditions and increase plant health and vigor. •Thick and/or impenetrable mulch cover can prevent emergence of undesired weed species. <p>Water</p> <ul style="list-style-type: none"> •Increased infiltration and decreased evaporation results in more available water from irrigation and precipitation. 	<p>Capital</p> <ul style="list-style-type: none"> •Materials & equipment to incorporate compost. <p>Labor</p> <ul style="list-style-type: none"> •Increase in labor to apply compost and spread mulch. <p>Plant</p> <ul style="list-style-type: none"> • Potential for initial nitrogen immobilization, May require additions of nitrogen to balance out the DOC:DON following • Potential spread and habitat for Coconut Rhinoceros Beetle

Ka'u cover crop project

Ka'u United Farmers Cooperative; supported by the
USDA/HDOA Specialty Crop Block Grant Program



Stylo

30 lbs/acre



Cowpea

100 lbs/acre



Perennial peanut

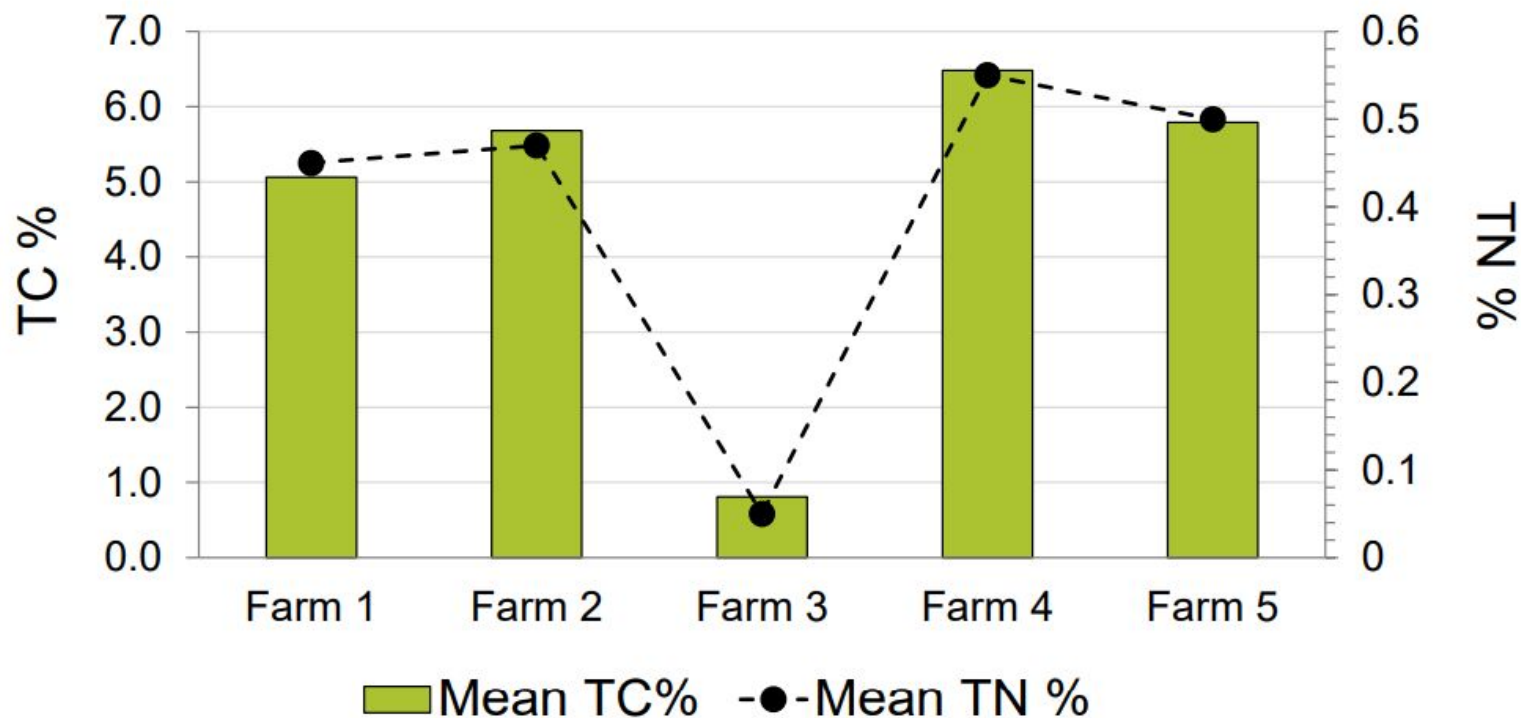
40 lbs/acre



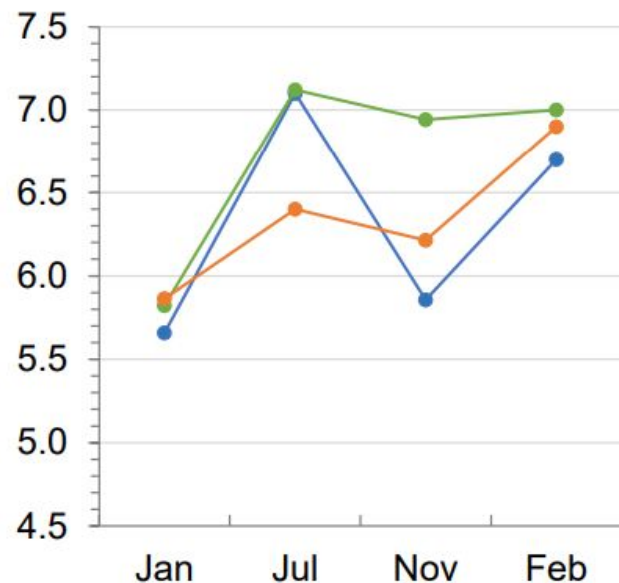
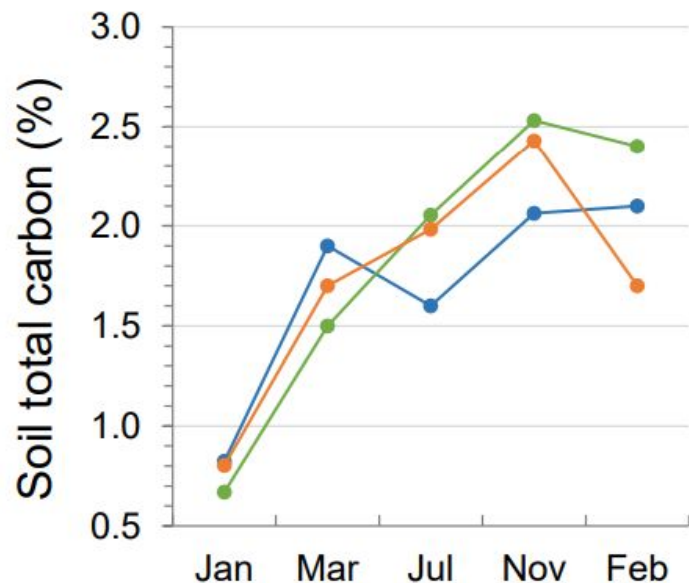
Red clover

40 lbs/acre

Soil carbon & nitrogen of five Ka'u coffee farms



Changes in soil carbon on two Ka'u farms



- Perennial peanut
- Cowpea/Red clover
- Stylo

Monitoring Schedule & Tracking Improvements Over Time

Test/Assessment Type	Frequency	Cost
Fertility Test	Annually	\$50
Soil Health Test	Every 2 to 5 years	\$200
In-Field Soil Health Assessment	Every six months or in fields with new management practices	Free
Crop records	Bi-weekly/monthly/quarterly harvest records on yield, pests & disease pressure and root structure	Free

Take the Poll & Win!



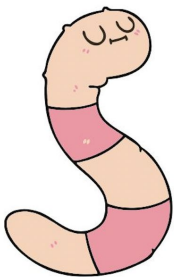
Will a monitoring schedule help you?

1. Which could you commit to doing? (Multiple Choice) *

- Soil fertility lab annually
- Field observations of soil health (compaction, pore holes, aggregates, soil organisms)
- Bi-weekly/monthly crop records
- Soil health lab every 2-5 years
- Text photos or short updates on results of practices to ORCD
- Add/read updates to Soil Health Network (farmers sharing practices)

2. What would help you monitor & track improvements? (Multiple Choice) *

- Too busy, need reminders to do it on my own
- Need someone else to track & monitor my results and share back with me
- Need a system for keeping records on my practices & results
- Need to learn what record keeping systems work for other farmers?
- Need to add to an existing record-keeping system I already use routinely



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Soil Health

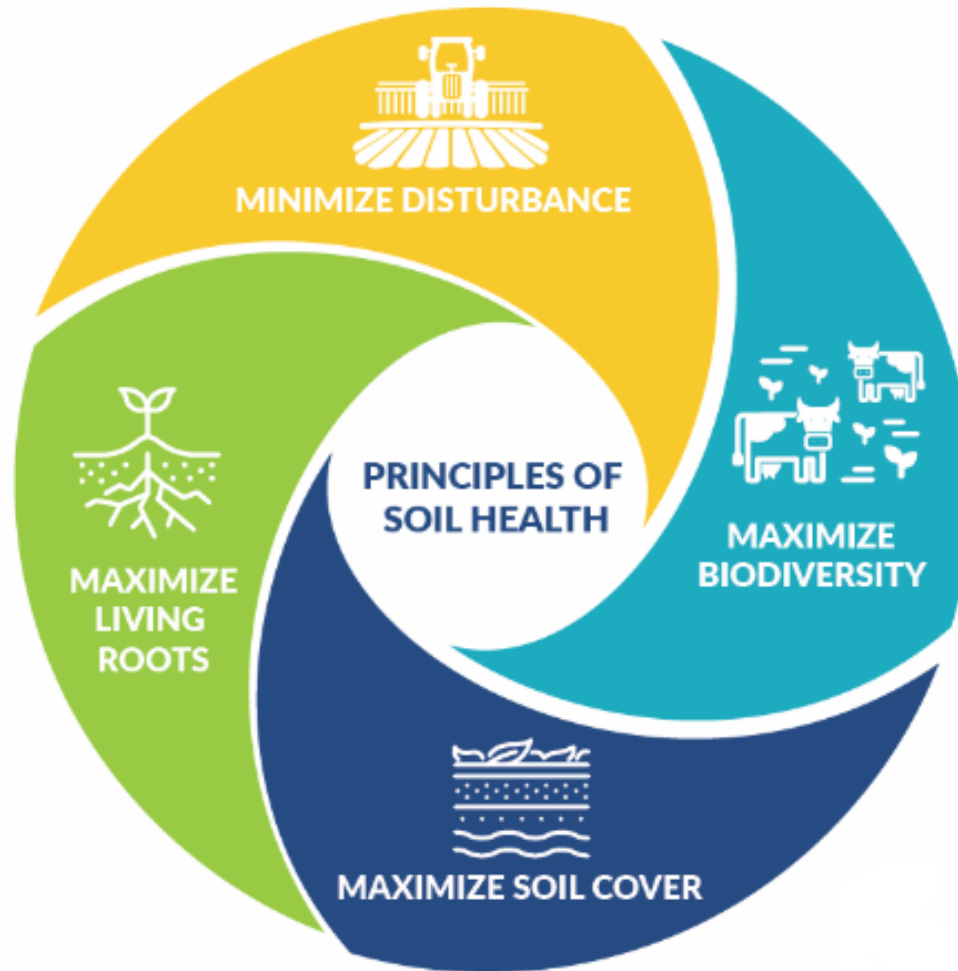
Management Plans



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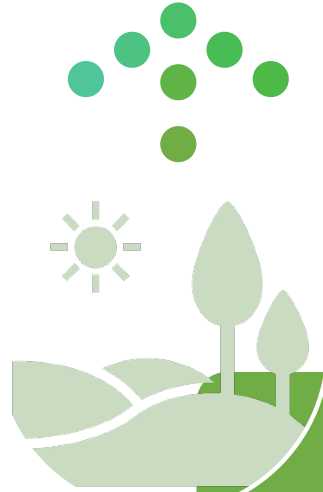
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How do we manage for better soil health?

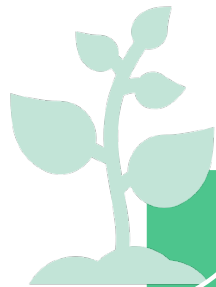


How do we manage for better soil health?

**Soil Health
Management Plan**



**Management
System**



Practices



Principles



The Basics of Addressing Resource Concerns with Conservation Practices within Integrated Management Systems on Cropland



Building a Soil Health Management System (SHMS)

Conservation Practice

Soil Health Principle	Conservation Cover (327)	Conservation Crop Rotation (328)	Cover Crop (340)	Forage & Biomass Planting (512)	Pest Mgmt. Conservation System (595)	Mulching (484)	Nutrient Mgmt. (590)	Prescribed Grazing (528)	Residue & Tillage Mgmt. (329/345)
Minimize Soil Disturbance	✓			✓	✓		✓	✓	✓
Maximize Soil Cover	✓		✓	✓		✓		✓	✓
Maximize Biodiversity	✓	✓	✓	✓				✓	
Maximize Living Roots	✓	✓	✓	✓				✓	



<https://directives.sc.egov.usda.gov/OpenNonWebContent.aspx?content=44340.wba>

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Components of a SHMS



- Tillage systems
- Crop rotation schedule (including cover crops)
- Nutrient, pest, and irrigation management plans
- Prescriptive Buffer system
- Soil Health Assessment
- Soil Health Testing





Need more information?

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Introduction to NRCS PIA

Gavin Jennings, District Conservationist

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Natural Resources Conservation Service

- Agency of the U.S. Department of Agriculture (Previously Soil Conservation Service SCS)
- Created in 1935 in response to the Dust Bowl crisis
- Non-Regulatory-NRCS works with farmers, ranchers, forest stewards and landowners on a voluntary basis



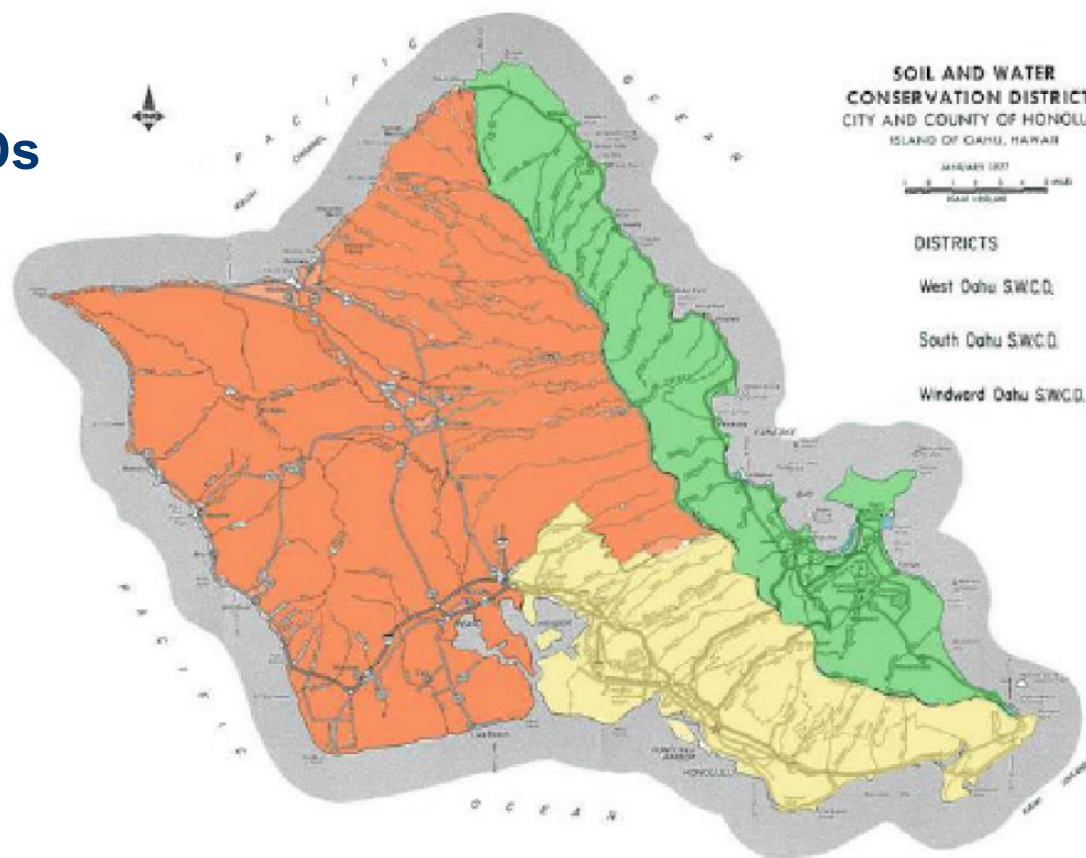
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Oahu Soil & Water Conservation Districts

- DLNR → HACD → SWCDs
- 16 SWCDs in Hawaii, Oahu has 3, the South, West and Windward Oahu SWCD.



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Financial Assistance



- **Financial Assistance Programs**
 - AMA (Agricultural Management Program)
 - EQIP (Environmental Quality Incentive Program)
 - CSP (Conservation Stewardship Program)
- **Partnership Programs**
 - RCPP (Regional Conservation Partnership Program)
- **Easements**
 - ACEP (Agricultural Conservation Easement Program)
 - Wetland, Grassland and Farm and Ranch lands



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How To Get Started



- <https://www.youtube.com/watch?v=ChB4sp2Bq00>

5 Steps to Assistance

How to Get Assistance from NRCS for Farms, Ranches and Forests

- 1 PLANNING**
Visit your local NRCS field office to discuss your goals and work with staff on a conservation plan.
- 2 APPLICATION**
With the help of NRCS, complete an application for financial assistance programs.
- 3 ELIGIBILITY**
Find out if you're eligible for NRCS' variety of financial assistance programs.
- 4 RANKING**
NRCS ranks applications according to local resource concerns.
- 5 IMPLEMENTING**
Put conservation to work by signing a contract and implementing conservation practices.



Step 1: Planning

- **Stop by your local field office to discuss your vision for your land.**
 - We will work together to develop your conservation plan based on your visions and goals and assessed resources. We can also help to determine if financial assistance is right for you.
- <https://offices.sc.egov.usda.gov/locator/app>

Hawaii Field Offices

Big Island

- Hilo
- Kealahou
- Waimea

Maui

- Kahului

Molokai & Lanai

- Hoolehua

Oahu

- Honolulu

Kauai & Niihau

- Lihue



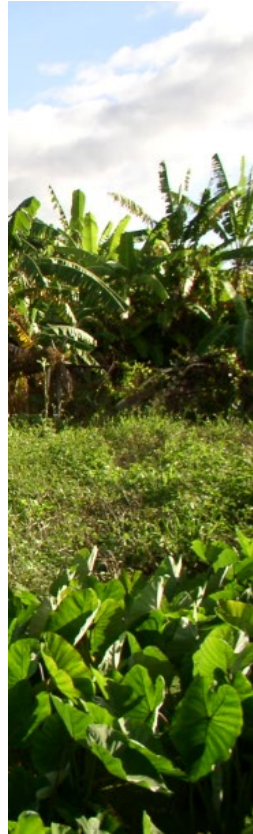
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Step 2: Application

- **If financial assistance is right for you, we will guide you through the application process which includes:**
 - Records being established with the Farm Service Agency (FSA)
 - Program application form
- **Most program applications are accepted continuously but are considered for funding in different ranking periods.**



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Step 3: Eligibility



- **As part of the application process, we will check if you are eligible with the below documents:**
 - Official tax ID (social security number or employer ID)
 - Deed or lease showing control of land
 - Farm and Tract number (from FSA)
 - Average Adjusted Gross Income (AGI) \$900,000 limit

Step 4: Ranking

- **Applications will be ranked based on amount of conservation benefit and national, state and local resource concern priorities.**



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Step 5: Implementing



- **If you are selected, you choose whether you want to proceed.**
- **Once the contract is developed, signed standards and specifications for completing the practices will be provided if they have not already been provided during the planning process.**
- **There will be a specified time to implement each practice by.**
- **Once the work is implemented and inspected, you'll be paid the rate of compensation for the work if it meets NRCS standards and specifications.**



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(116) Soil Health Management Plan

116	No	Soil Health Management Plan				HU
		Crops, <5	No	\$1,250.07		\$1,500.09
		Crops, 5 or more	No	\$1,500.09		\$1,800.11
		Crops+Livestock, <5	No	\$1,500.09		\$1,800.11
		Crops+Livestock, 5 or more	No	\$1,750.10		\$2,100.12
		Organic Crops + Livestock, <5	No	\$1,750.10		\$2,100.12
		Organic Crops + Livestock, 5 or more	No	\$2,000.12		\$2,400.14
		Organic Crops, <5	No	\$1,500.09		\$1,800.11
		Organic Crops, 5 or more	No	\$1,750.10		\$2,100.12
		Small Farm	No	\$1,500.09		\$1,800.11

-BFR (Beginning Farmer, operated a farm for less than 10 years)

-VFR (Veteran Farmer)

-SD (American Indians or Alaskan Natives, Asians, Black/African American, Native Hawaiian or other Pacific Islanders, Hispanics)

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NRCS Contracting Timeline (FY22)

*timelines vary from year to year – NRCS accepts application year round

Fiscal Year: October 1st, 2021-September 30th, 2022

- **Application Sign Up: November 15th, 2021**
- **Eligibility: December 15th, 2021**
- **Assessment/Ranking/Cost Est: February 25th, 2022**
- **Selections Made/Intent to Proceed: March 11th, 2022**
- **Application Approval: May 6th, 2022**
- **Obligation: May 20th, 2022**

Activities may only begin once NRCS has notified client of NEPA clearance (Endangered Species Act & Cultural Resources Consultation) and all signed contract documents have been provided



Conservation Practices:

Grassed Waterway



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Conservation Practices: Cover Crop



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Conservation Practices: Mulching



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Conservation Practices:

Dry Litter Piggery



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Conservation Practices: Rotational Grazing



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Conservation Practices: Forestry

- **Hardwoods, Natives, Mixed (natives + fruits + hardwoods)**



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Conservation Practices:



Wildlife Habitat

- Upland and wetland



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Conservation Practices: High Tunnel Systems



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Conservation Practices: Micro Irrigation Systems



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United States Department of Agriculture

For More Information...



Contact the Oahu NRCS
Office @ 600-2966

Visit NRCS homepage at
www.pia.nrcs.usda.gov

Email
Gavin.Jennings@usda.gov



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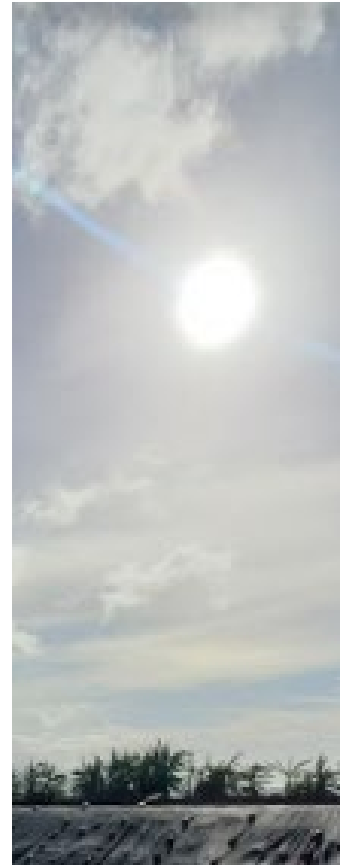
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