Cover Crop in Agroforestry

Stewart Johnny, Joe Tuquero, and Mark Acosta
Cooperative Extension & Outreach, College of Natural & Applied Sciences,
University of Guam

Sunn hemp (*Crotalaria juncea*) used for cover crop in a Guam farm.

Introduction

Farmers in the Pacific islands face a number of challenges in raising their crops. Loss of soil from runoff is one major challenge. Fertility is another challenge where soils that are lacking in organic material which helps retain water and necessary plant nutrients. Fortunately, there are sustainable agricultural conservation practices that can help overcome these problems. We will take a closer look at the use of cover crops.

Cover crops are typically legumes or grasses but can consist of other types of plants. Most often, a cover crop is grown during fallow periods of crop rotations in specific crop fields. In essence, a cover crop readies the land for an incoming cash crop (Arcuri, 2020). Cover cropping is a sustainable agriculture practice primarily aimed to reduce soil erosion and improve soil fertility and quality. Cover crops also break weed cycles, help control pests and diseases, and can provide as an additional production crop (Clark, 2007).

Benefits of cover cropping

Reduce soil erosion

SCover crops help reduce the amount of soil water from leaving a field which maintains soil quantity of a field by reducing soil erosion. Roots of cover crops open space in the soil allowing water to enter deep into and through the soil profile (Arcuri, 2020). Plants root also reduce erosion by holding soils in space. While growing, cover crops are live mulch protecting the soil from running off-site, particular by buffer potential impacts of heavy rains to the soils (Arcuri, 2020).

Improve soil fertility and quality

Cover crops improve soil fertility and quality by providing nutrients to the soil as cover crop residues decompose in the field. Cover crops also increase organic matter content of soils. Residues of nitrogen fixing cover crops provide increased nitrogen levels to the field. Such nutrients can be used from a following cash crop.

Control weeds

Cover crops control weeds by breaking life cycles of weeds that result in poor development of weed growth. Cover crops are effective at suppressing weeds by being a suffocating crop that outperforms weeds by outcompeting weeds for growing space, water, nutrients, and sunlight (Clark, 2007).

Control pest and diseases

Some cover crop species that are disease resistant and/or non-hosts to pests may reduce harmful bacteria and fungi in the field by breaking their life cycle and reducing populations (Arcuri, 2020). However, cover crops can also be hosts for pests and diseases. It is important to learn about a potential cover crop that best fits your goals and environment.

Provide additional crop production

Crops such as daikon radish, sweet potato, various bean species (mung bean, bush bean), and corn can be used as cover crops while providing additional cash crop production. In compacted soils, roots of daikon radish penetrate compacted soil layers better than other commonly used cover crops. This also results in daikon roots creating deeps holes in the soil that enable water, air, and subsequent primary cash crop roots to proliferate through the soil more efficiently (Figure 1). Because sweet potatoes are allelopathic, they can be rotated with other crops to help prevent insect and soil borne disease issues (Hill, 2019), produce abundant residue, and provide as a cash crop (Figure 2).

Figure 1. Daikon radish roots penetrating through compacted soils
Source: https://www.nrcs.usda.gov/Internet/FSE_PLANTMATERIALS/publications/arpmcpg11828.pdf

Figure 2. Sweet potato as a cover crop
Source: https://www.sustainablemarketfarming.com/tag/winter-rye-cover-crop/

Disadvantages of cover crops

- Establishing cover crops includes additional labor and input costs
- May increase pest and disease populations
- Depending on species, cover crops can be difficult to incorporate with tillage
- Some cover crops may be allelopathic, and may adversely affect subsequent cash crops
- Cover crops take up the space of a desired cash crop

Choosing a cover crop

Incorporating cover crops in a crop rotation should be planned strategically to benefit producer's goals and maintain soil quality. Selecting a cover crop species is important. It is best to choose plants that are suitable for the environment and for the region's climate. Before choosing a cover crop, identify what problems may be occurring in your field that cover crops can address. If you are aware of cover crop species that can address your field issues, check for local availability. If cover crop seeds need to be ordered from the internet, ensure they can be delivered to your area. Tables 1 and 2 provide examples of some appropriate cover crop species for the region with additional planting information. For more information on cover crop species and planting advice, contact the Cooperative Extension & Outreach Service of UOG.

Table 1. Some Recommended Grasses and Legumes as Cover Crops by USDA Natural Resources Conservation Service, Pacific Islands Area (Non-cash crops)

Nitrogen Fixing Legumes				
Species	Common Name	Pounds of Seed per Acre	pH Range of Soil	Approximate Growing Time in Field (days)
Vigna unguiculata	cowpea	60	5.5-8.3	90
Lablab purpureus	lablab	60	4.5-6.5	60
Vigna radiata	Mung bean	80	5.4-8.3	60
Cajanus cajan	Pigeon pea	40-60	5.0-8.3	90
Glycine max	soybean	75	5.5-8.3	90
Crotalaria juncea	Sunn hemp	40-60	5.0-7.0	60
Grasses				
Sorghum spp. (hyrbid)	Sorghum x	50	5.5-8.3	60
Sorghum bicolor sso. drummondii	Sundan-grass	50	5.5-8.3	60

Source: https://www.nrcs.usda.gov/Internet/FSE_PLANTMATERIALS/publications/hipmstn14436.pdf

Table 2. Cover Crops as Additional Cash Crops

Species	Common Name	Spacing	Spacing Between Rows	pH Range of Soil	Approximate Growing Time in Field
Ipomea batatas	Sweet potato	1-2 ft.	4 ft.	5.5-7.5	90-120
Raphanus sativas	Daikon radish	4-6 in.	2-3 ft.	6-7.5	60-70
Zea mays	corn	10-12 ft.	2-3 ft.	6-7.5	70-100

Where to apply cover crops

Cover crops are planted in designated fields where cash crops are grown. They are planted prior or between desired planting of cash crops in a crop rotation system during a fallow period of a field. Depending on species, cover crop time in the field varies.

Planting Cover Crops

There are two main methods of planting cover crop seeds, broadcasting and drilling. Site preparation for cover crops typically consists of terminating existing crop or vegetation of a field followed by light tilling. Plowing may also be needed in some cases.

Most cover crops are established by broadcasting. Some cover crop planted as broadcasting and incorporating seed into the soil. Broadcasting is done by hand or a mechanical seed spreader (Figure3). Another popular method is the drilling method, which requires a special device/implement (Figure 4). This device drills, drops seeds, and covers seeds at desired spacings. Other methods of planting cover crops include direct hand sowing of seeds (or transplanting from plant containers) for crops like corn and daikon radish, or hand planting of cuttings (sweet potato) into rows/beds at recommended spacings, particularly when using cover crops for additional crop production.

Maintenance

Initial weeding may be needed as cover crops establish and develop. Depending on cover crop species, irrigation varies as some cover crops need more water than others. Initial frequent irrigation of newly planted cover crops is recommended for at least 2 weeks. Some cover crop species sun hemp only requires initial watering for up to 2 to 3 weeks as seeds germinate and plants establish, while others like corn and sweet potato may require frequent watering.

Figure 3. Broadcasting by hand
http://www.knowledgebank.irri.org/step-by-step-production/growth/planting/direct-seeding

Figure 4. A seed driller as a tractor implement
https://blog.machinefinder.com/17491/utilizing-john-deere-box-drills-get-seed-ground-fast

Pest and disease management

Like cash crops, cover crops should be monitored frequently and controlled regularly when pests and diseases are present. For technical advice and information on pest and disease management, seek advice from the Cooperative Extension & Outreach Service of UOG.

Reference

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