

Promoting Adaptive Management with 'Tropic Sun' Sunn Hemp (*Crotalaria juncea*) in Hawai'i for Ecological Weed Control, Nematode Suppression and Nutrient Management

James Leary (Hawai'i – Professional Development Program Grant)

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Title: Promoting Adaptive Management with 'Tropic Sun' Sunn Hemp (*Crotalaria juncea*) in Hawai'i for Ecological Weed Control, Nematode Suppression and Nutrient Management

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Fully established sunn hemp at Hāmākua.

Context and Need:

Diversified agriculture will always be part of Hawai'i's heritage, and may expand as the islands' geographic isolation prompts increased demand for more fresh, local foods.

Agriculture also shares the environment with some of the most endangered natural ecosystems in the world. So it is incumbent upon producers to mitigate nonsource pollutants that can harm the surrounding environment.

This need for environmental stewardship, coupled with rising costs for fertilizer and fuel, is compelling farmers to engage available conservation technologies, reduce tillage and adopt permanent or rotational cover crop systems that reduce dependence on nonrenewable resources.

Sunn hemp has been recognized since the 1930s as a high-contributing cover crop, and 'Tropic Sun' sunn hemp is one of the best cover crop selections for tropical sustainable agriculture. Not only is Tropic Sun a nitrogen-fixing legume highly adaptable to poor quality soils, producing up to 150 kg of N per hectare in as little as 60 days, it has been recently been characterized as a nematode suppressant.

Project Assumptions:

- In conservation tillage systems, cover crop residue, if grown in sufficient quantity, can mitigate soil erosion as well as suppress weeds.
- In Hawai'i, sunn hemp has been grown at sufficient levels to have exhibited weed suppression qualities associated with rapid establishment and canopy closure.
- Sunn hemp has been most often used as a green manure, providing immediate N release when tilled under, but at the expense of weed or erosion management.
- The project team believes that a sunn hemp cover cropping system, implemented as an ecological management strategy, can add nutrients and suppress pests, and that a no- or strip-till approach that leaves a significant portion of residues on the soil surface and incorporated manure only within the row can maintain all of the qualities.

Project Inputs:

On-farm demonstrations on O'ahu, Maui and Moloka'i will attempt to maximize sunn hemp establishment and biomass productivity by manipulating seeding rates and planting times. The demonstrations, on half-acre plots split in two and seeded at 30 (the recommended rate) and 50 kg ha, will also attempt to show sunn hemp as a surface residue in no-till and strip-till systems, with residue incorporation in the row and mowing and windrowing between rows.

Plots will be analyzed for weed emergence, parasitic nematode populations and soil nutrition using prescribed scientific protocols.



A hand-held spreader is used for seeding.

A harrow incorporates cover crop seed at a demonstration site.



Human Resources:

Three producer participants will contribute land and water to establish cover crop demonstrations:

- Clyde Fukuyama, taro, eggplant and papaya, Kahuku, O'ahu
- Jerry Ross, organic corn and potatoes and sunn hemp, Kula, Maui
- Rick Tamanaha, organic papaya, Moloka'i

A fourth farmer participant, John McHugh, is directly involved in Tropic Sun seed production and sales.

The following University of Hawai'i CTAHR (College of Tropical Agriculture and Human Resources) multi-disciplinary team will monitor field activities and subsequent field days:

- James Leary, weed scientist, responsible for coordinating demonstrations and field days and compiling and disseminating outreach materials
- Koon-Hui Wang, nematologist
- Cerruti Hooks, entomologist
- Jonathan Deenik, soil agronomist
- Ted Radovich, sustainable agriculturist
- Jari Sugano, O'ahu extension agent
- Alton Arakaki, Moloka'i extension agent



Nitrogen nodule formation on sunn hemp.

Outputs:

Field days will be conducted at each of the island demonstration sites for farmers, NRCS and Cooperative Extension.

Upon completion of the demonstrations and before the field days – scheduled for April, May and June 2010 – each producer participant will be given 50 kg of Tropic Sun seed for scaled-up spring planting, to be used at their discretion in consultation with the CTAHR participants.

The field days will show the results of no-till and conservation tillage sunn hemp cover crop systems and describe the mechanisms for ecologically based weed control, along with nutrient inputs and nematode suppression. The farmer plantings will serve as major educational pieces.

Products:

- Information from the field demonstrations will be compiled for publication as an NRCS Technical Note, with formal federal review under the guidance of Bob Joy, plant materials specialist on Moloka'i. The note will include growth rates, dry matter yield and N content of sunn hemp as well as organic management techniques and weed and nematode suppression characteristics.
- All CTAHR University of Hawai'i participants will produce narrated presentations in PowerPoint for loading onto CDs and the CTAHR sustainable agriculture website, www.ctahr.hawaii.edu/sustainag/.

Outcomes:

Cooperative Extension and NRCS personnel will develop closer relationships with the seed producer and growers, cultivating a better awareness of the potential for Tropic Sun in Hawai'i agriculture. Armed with new information, they will be better able to identify new clients and stakeholders with similar needs. By leveraging this effort, and maintaining communication among participants, new knowledge can be gained for other legume and grass species.

Evaluation:

Follow-up surveys will be conducted six months after demonstration field days to assess the level of sunn hemp integration cover crops in established agriculture. Key points:

- How many referrals have been made to clients and stakeholders for Tropic Sun?
- How many new buyers are there?
- How many acres have farmers dedicated to Tropic Sun rotations?



Sunn hemp planted with oats and buckwheat.