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Coconut Risk Management and Mitigation Manual for the Pacific Region

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18. COVER CROPPING AND AVAILABILITY OF SEEDS AND CUTTINGS

By R. Bourdeix, J. Ollivier

Description

The risk is that many farmers have little or no knowledge about cover crops and its advantages. Even if they are aware and interested in using a cover crop, there are difficulties finding the planting material adapted in quantity and quality to their needs. Farmers could then give up the use of cover crop, losing the benefit of the nitrogen naturally brought to the soil, and of reducing the working time devoted to weeding.

Documents in the 'References' section below show that a large diversity of species that can be used as a cover crop. These plants have various advantages:

- Some naturally enrich the soil with nitrogen, and a multitude of beneficial bacteria and fungi.
- They contribute to the maintenance of the soil and limit its erosion.
- Vegetation cover, if properly managed, may reduce time spent on weed control.
- Cover crops reduce grasses, whose fast growth is in competition with that of coconut trees, and can harbour disease-carrying insects, which are especially dangerous at a young age.

Occurrence and severity

Pacific farmers use little cover plants. They are not informed, or they are not convinced of the benefits of these plants. In cases where they practice intercropping, they do not know which species are best adapted to their situation. Last, but not least, even if they are interested, they can not easily find seeds or cuttings to grow on their plantation. They may renounce this innovation for lack of means to implement it.

This often leads to a risky 'obsession with fire'. The modern fanatical way of cleanliness in coconut groves is to compulsively use matches instead of machete, so what is thoroughly cleaned away is fertility. At the same time, dioxins are spread because of burning empty plastic bottles forgotten in the fields.

In managed coconut plantations, the most common cover crops are *Pueraria javanica* and *Mucuna prurens*. The opinions concerning these two plants are divided. Some (in Solomon Islands) argue that the *Mucuna* is too aggressive at a young age, that it can cover and smother young coconut and oil palms; those prefer *Pueraria*. Others say that once the palms have grown and make a lot of shade, the *Mucuna* is the only plant that can maintain good vegetation cover. *Pueraria* often collapses in this situation. For both species, when rains are abundant and regular, it is difficult to obtain seeds.

Pueraria phaseoloides is a plant species within the pea family, its largest and more robust variety being *Pueraria javanica*. It is known as puero in Australia and kudzu in many tropical regions. The reproduction can be vegetative or generative. Its main advantages as a cover crop are the high nitrogen accumulation and the improvement of the soil structure due to its deep rooting system, and its ability to overcome the invasive grass *Imperata cylindrica* and local graminea. It can be used as a grazed forage crop and as green manure in crop rotations. Furthermore, it can be used to prevent soil erosion on sloping terrain.

The variety of *Mucuna pruriens* used as cover crop is named *utilis* and has similar properties to *P. Javanica* but grows faster. Beware than in some other *Mucuna* varieties, the hairs lining the seed pods cause severe itching when touched. The calyx below the flowers is also a source of itchy spicules and the stinging hairs on the outside of the seed pods are used in some brands of itching powder.

Mitigation and adaptation

Mucuna seeds will grow in roughly prepared land, provided the seed is covered or rain falls soon after seeding. About 1000 seeds weigh 1 kg. Collect fresh seeds and soak them in water for 24 hours. It can be sown in furrows or dibbled in at 1 x 1 m spacings with two seeds per hill. Seed is sown at the beginning of the rainy season at 22 kg seed/ha. Better results are obtained by sowing into a prepared seed bed. Sow them in raised beds in polybags in the nursery to a half a finger-depth. Maintain two feet between them. In about 4 to 12 days 90% of the seeds germinate. Seedlings are transplanted to the field two months after planting.

Try to find the *Mucuna* cultivar best adapted to your local conditions among the numerous that are in use. The Mauritius bean is a black-seeded type used in green manuring, while the Australian velvet bean has a large, mottled seed. In Tanzania variety J52 yielded 1980 kg dry matter/ha in Tanzania, and 'Somerset' yielded 1780 kg. /ha. Other cultivars include 'Stringless', 'Osceola', and 'Bunch' (Queensland), J54, J77, 'Local White' and 'Local Black' in Tanzania.

Mucuna may be able to be reproduced by cuttings. For another species closely related to *Mucuna* (*Bractea*), the technique is as follows: Select cuttings having three nodes, apply a slanting cut about 5cm below the bottom node. Above the top node leave as much length as possible. Plant in bags filled with potting mixture. The bags are kept in partial shade until the buds open from top node. A decay may start from the tip of the top internode and proceed downwards. The dormant buds will have to sprout before it reaches the middle node. Cuttings can be dipped in water mixed with ascorbic acid (50 mg per litre) to avoid such a decay.

Pueraria javanica seeds should be scarified before being broadcast sown or drilled onto a well prepared, weed-free seedbed. Seed growth is relatively slow, and seed must be sown on weed-free soil. The seeds are sown by the fly or in rows, 15- 20 seeds every three meters, one meter between the lines, and 2.5 cm deep. There are 80,000 to 90,000 seeds per kg. A good seeding rate is 0.5-1 kg seeds/ha, planted at the beginning of the rainy season. In new planting locations the seeds should preferably be inoculated with an appropriate strain of the bacterium that fixes nitrogen (*Bradyrhizobium*). The first months of establishment are somewhat difficult and require weeding. After that, it becomes more aggressive and effectively smothers weeds. When seeds are not available, vegetative propagation can be done by planting rooted stolons at 1-2 m distance. Long cuttings of 70 cm to 1 m can be used, distributed at a rate of two per hole every 2x1 m.

Cuttings of cover crops can be grown in a nursery or in farmer's field, but if moved, the same precautions as those presented in risk n°10 (transmission of pests and diseases through nurseries) apply. It is important to avoid transmission of pests and diseases when releasing seeds or cuttings to farmers.

Choice of cover plants must be tailored to the local ecological conditions. Some are better for coral soils, such as *Vigna marina*. In case of association with livestock, the edibility and digestibility of these plants also need to be considered.

The tropical nitrogen-fixing tree *Gliricidia sepium* can be used at the border of the farm as living fences, which have the advantage of reducing large animals wandering. Stakes of wood

are planted close together (30 to 50 cm), these take root, become a tree, and form a fence difficult to cross.

Actions to undertake

- Make aware farmers about cover crops and their advantages in coconut growing fields (moisture conservation, preventing soil erosion, weed control etc.).
- Establish cover crop field demonstrations with different varieties for the farmers to observe and convince them through observation which will trigger promotion of cover crops.

It seems that the most important consideration for small farmers is not at all to enrich their soil, but to reduce the time devoted to weeding, especially for the elderly, and women who are additionally burdened with extensive caring obligations. If people do not agree on the best cover crop, maybe the best option is not to use only one cover crop, but a mix of different species. Here again, good scientific studies are missing. *Mucuna* and *Pueraria* are imported, may be there are some local plants that are also useful? Research in different Pacific islands should identify and list local alternatives to *Mucuna* and *Pueraria*.

Because of its vigorous fast-growing habit, *Pueraria* was listed as an invasive plant in Costa Rica, Ecuador, Puerto Rico and some Pacific Islands (Hawai'i, French Polynesia, Niue and New Caledonia). This is not the case with *Mucuna* because it does not have stolons that re-root.

References

ATTRA Sustainable Agriculture Program (2017). Cover Crop Options for Hot and Humid Areas. [Film]. https://www.youtube.com/watch?v=_ERXyjX0rHI

Duncan, J. (2017). *Cover crop options for hot and humid areas*. National Center for Appropriate Technology.

Radovich, T., Cox, L. J., Sugano, J., & Idol, T. (2009). *Benefits and costs of using perennial peanut as living mulch for fruit trees in Hawaii.* College of Tropical Agriculture and Human Resources, University of Hawai'i at Mānoa.

Singh-Peterson, L., & Iranacolaivalu, M. (2018). Barriers to market for subsistence farmers in Fiji–A gendered perspective. *Journal of Rural Studies*, *60*, 11-20.

Skerman, P. J. (1977). *Tropical Forage Legumes* (No. SKE 633.3 (BS 511)). Food and Agriculture Organization of the United Nations (FAO).

Somashekhar, B. S., & Manju, S. (2002). Propagation techniques of commercially important medicinal plants. *Training manual, FRLHT, Bangalore*, *118*. https://fdocuments.net/document/propagation-techniques-of-commercially-important-medicinal-plants.html