

Going organic

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Only when farming is based upon “natural principles” can it be truly sustainable. Ecological farming is based on nurturing and nourishing the soils. Emphasizing soil conservation and building up organic matter are key to maintain these natural ecological balances in crop ecosystems. Mojo plantation is one such attempt.



Mojo Plantation grew out of an idea which prompted us to walk away from promising careers in lab research and urban living, and find a piece of land where we could live a more organic way of life. This is our story which we wish to share with a wider spectrum of subsistence farmers who strive to live off their lands in sustainable, productive and non-destructive ways.

Mojo Plantation is located in one of the highest rainfall zones of Kodagu District, Karnataka which lies in the heart of the Western Ghats of India. At 1100m altitude, we receive 3500–5000mm (200 inches) of rain annually, most of it between June and September. The plantation is also densely forested with native trees. While this environment places limitations on the types and quantities of crops we can grow, it creates its own unique flavours which are reflected in the quality of our organic produce. The unique and most attractive feature of this area is that the local crops such as cardamom and pepper (which are indigenous) and coffee and vanilla (which were introduced) are grown under the shade of rainforest trees. We cultivate crops that can be grown in the shade of the rainforest trees, employing practices which are in tune with the forest ecosystem. We have been completely organic for the past 15 years and have encouraged others to do the same.

Applying Organic Principles

We welcome and encourage all forms of organic farming whether it be revival of traditional practices (such as panchagavya), biodynamic farming, permaculture or natural farming; they all result in sustaining live and healthy soils which is the foundation of a strong agri-ecosystem. We have endeavored to develop this plantation along the principles by which Nature “manages” land and water resources. Our aim has been to strike a balance between time-tested traditional practices and modern scientific approaches.

Since agriculture is a dominant human activity and occupies about 38 percent of available land space, the decisions that agriculturists make can dramatically effect biodiversity levels. Loss of habitats is a major threat to loss of species diversity world wide.

Using organic farms and fallow lands to provide primary habitats for encouraging species of local small wild life and wild life linkages can contribute significantly towards supporting beneficial organisms and processes. As a result, beneficial microorganisms contribute to a rise in detritus activity of the soil, increased nitrogen fixation, and increase in nutrient cycles. Areas where grasslands are encouraged become sponges for harnessing rain water to replenish water tables and aquifers. The integration of fallow lands into cultivated areas also enable pest-predator balances, promotes an even distribution of predators which offer effective pest control in the field, and attract pollinators. On organic farms such as ours which have no trace of chemicals around, parasitic insects colonize native plant species and play significant roles in controlling pest populations.

The weeds which grow rampantly all over the farm, provide a sustainable source of biomass which we use for its nutrient value, being processed through our livestock of cattle, goats, turkeys. The rich detritus of the rainforest ecosystem gives us excellent humus soils with a varied microbial population. We use weeds, (particularly the foliage of legumes, medicinal plants, and insect repellent plants), cow dung, cow urine, wood ash, neem cake (occasionally), organic farm wastes, to make our compost. Drenching the heaps with a dilute preparation of EM (Effective Microorganisms) bacteria decreases composting time from 6-8 months to 2 months. EM is a mixture of “good” bacteria, isolated from soils, and include photosynthetic bacteria, (*Rhodospseudomonas* spp), lactic acid bacteria (*Lactobacillus* spp),

and various yeasts (*Saccharomyces* spp), all of which work towards very rapid enzymatic breakdown of large organic molecules into smaller compounds which can be effectively taken up by plants as nutrients.

Protecting crops from diseases

The major crops are cardamom, coffee, and black pepper. Vanilla, turmeric, ginger and spice trees are also integrated into the growing valleys. Fruits like banana, oranges, jack, lemons, bitter lime, pineapple do well. We multicrop at all levels and use the shade of the forest canopies as far as possible to avoid clearing the valleys. We also grow a variety of fresh foods and spices (on a small scale) that are consumed by us and our guesthouse, Rainforest Retreat.

During the early years, we had heavy infestations of the cardamom stem borer (larva of a moth called *Conogethes punctiferalis*). It is not unusual to find pests co-evolving with the crops that have been indigenous to an area for a long time. To combat the borer pest of cardamom, we developed bioassays which enabled us to screen a host of indigenous plants for their insect-repellent properties. (This study was funded by a small grant from National Geographic Society, USA). The plants showing positive results were field tested for their efficacy under natural growing conditions. The advantage of using antagonistic properties of plants is that they do not create a significant selective pressure on the insects and do not allow them to develop resistance in their populations. Foliar sprays made from infusions of these plants enabled us to bring the borers under control.

We have also found that introducing native strains of a soil-borne fungus *Trichoderma* by culturing them on compost, has significantly decreased damage caused by the fungal pathogen, *Phytophthora*, different species of which devastate local crops of cardamom, pepper, and ginger. *Phytophthora* is a global menace and has a history of destruction of a wide range of crops.

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Nurturing biodiversity

Protection of crops against diseases can be manifested at the ecological level through natural predation of pests, as well as by inducing the natural defenses of the plants themselves. One of the features of a natural forest that we have tried to conserve here is the rich biodiversity prevalent under the canopy of rainforest trees. By leaving uncultivated sectors of natural weeds and fauna in each valley, we have been encouraging insect predators to flourish in these valleys. As a result, we now have excellent populations of spiders, wasps, dragonflies, frogs, lizards, snakes, and a wide range of birds, all of which contribute towards building up of a diverse and healthy agri-ecosystem. Birds are amazing for their ability feed on insects and caterpillars; spiders are indiscriminate trappers

Agricultural Practices at Mojo

We maintain the forest canopy to conserve fragile top soil, replenishing it with compost, and incorporate forested spaces within the cultivated areas.

All organic wastes generated on the farm are composted and recycled through use of native bacterial cultures.

Native weed populations are conserved through use. Weeds are invaluable in providing biomass which we require in abundance for composting, mulching and returning nutrients to the soils; and for creating native habitats for all the other supportive species which constitute an integral part of the rainforest ecosystem.

Fallow stretches of land are integrated into cultivated areas to encourage and increase the populations of predatory species like birds, spiders, dragonflies, mantids, frogs, shrews, wasps, etc which have enabled us to keep a check on the pest populations.

All fields are multiple cropped, with thick layers of forest mulch to always keep the soil moist and protected from erosion.

Riparian areas (stretches of land bordering streams at the base of all valleys) are preserved as buffer zones for minimizing impact of fragmentation. Natural vegetation like reeds and grasses not only filters the water but also decreases erosion. Tanks have been built to harvest and hold water within the fields which has helped in decentralizing irrigation activities.

Hill slopes are terraced and banded with coffee, pepper, spice trees amidst the native trees which help in preventing habitat loss through erosion, and minimize the negative impact of heavy rainfall in this belt.

Any land management technique that increases the use of organic farming towards building up local biodiversity and natural resources.

We maintain nurseries for all crops. The location is changed every few years to avoid pathogens from developing in one area.

Animal husbandry constitutes a significant part of farm management practices. Integrated into the agri-ecosystem are cows, goats, geese, poultry, and turkeys. Cattle offer us one of the most efficient "bio-converters" and cowdung is used for composting and generation of biogas for domestic purposes.

of a whole range of insects. Wasps lay their eggs on larvae, which hatch and being carnivorous, start feeding on the grubs which could otherwise be a crop pest. Bats, frogs, salamanders, lizards, shrews, mantids, are all insect feeders, and form a link in the intricate food web of a forest ecosystem .

In nature, plant defense traits are polygenic and thus this variation becomes a fantastic reservoir of natural adaptive mechanisms in response to changes in biotic stress. We have found that over the years, crop losses due to diseases have become negligible, the plants require no sprays (we have not used the botanical repellents for the past 8 years) and exhibit an overall vigour that is gratifying for any farmer to see.



Planting cardamom sapling on Mojo farm

Human agricultural practices have evolved in very destructive ways. Use of chemical fertilizers and pesticides have killed the living components of soils, and much of the biotic factors that constantly stimulate the natural defense-related chemistry in plants. As a result, if plants are not exposed to inducing stimuli, their natural defense systems cannot be developed, nor expressed. Each application of a pesticide kills not only one species which is considered a “pest” of the crop, but also completely destroys the complex network of biotic life that supports that ecosystem.

Organic farms try to emulate forest ecosystems as far as possible. The diversity of creatures in the field enables increase in complexity of plant-insect-microbe-fungal interactions both above and below-ground. It is this diversity which is responsible for incessantly stimulating the myriad of self-protective chemistry of plants; it is this diversity, both within the crop genotypes, and in the fields surrounding the crops, which enables healthy cropping systems. If one encourages diverse species of native weeds to be integrated into the cropping areas, the need for artificial crop protection becomes minimized.

Finally, we have come to realize that it is only when farming is based upon “natural principles” can it be truly sustainable. Ecological farming is based on nurturing and nourishing the soils. Having healthy predatory populations within the agri-ecosystem naturally reduces the pest damage caused to crops. Having genetic diversity amongst the cropping system also enables us to select and maintain resistant germplasm. The heavy rainfall zones in the Western Ghats have a fragile ecology and are extremely prone to soil erosion. It is important to try and adopt agricultural practices which emphasize soil conservation and build up organic matter rather than conventional farming techniques which depend upon heavy use of chemical pesticides and fertilizers which destroy the

natural balances and lead to further destruction of this rich environment.

Eco-Retreat and Educational Outreach Programs

Our NGO (WAPRED) was established in 1996 to raise environmental awareness and develop sustainable means of agriculture for our fragile ecosystem, using Mojo plantation as a model organic farm nurtured on ecological principles. We have shared our research and organic practices with other local growers, although we still perceive some resistance to changing agricultural practices. WAPRED has also been instrumental in establishing an association of certified organic planters from different parts of this district (OAK, www.organicassociationkodagu.org)

We also initiated the formation of an association of local growers (Galibeedu Organic Association, GOA) with help of a First Prize Award from *Eco-Club International*. Through this project we encouraged the local small farms to adopt sustainable techniques and practices by initially providing the participants with both material and technical inputs for their land, and marketing assistance for their organic produce.

The NGO also hosts educational workshops and programs for farmers and student groups. We have particularly been encouraging young people to participate in farming activities, through imparting knowledge of the self-sustainability of the rainforest ecosystem.

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