

Coconut Based Farming System: A Gandhian harmony of diverse crops, livestock and soil microorganisms

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Gandhian philosophies of living

“Unity in diversity is beauty and test of civilization”. Harmony, unity and tolerance among diverse human beings had been a hallmark of Gandhian thought; a basis of giving space to all and allowing co-habiting in peace, equality and dignity. On 02nd October 2020, the 150th birth anniversary of Mahatma Gandhi was celebrated in grand manner in India with the objective to adopt his living tenets at this crucial juncture of Covid-19 pandemic and other challenges faced by humanity. Hunger had been one of the favorite subjects of the Mahatma. He had said “There are people in the world so hungry, that God cannot appear to them except in the form of bread”.

And it is through means producing nutrition and abundant food through agriculture and farming that one can achieve the zero-hunger status along with other strategies. On his 150th birth anniversary, we expand his principles of living of Mahatma Gandhi to agriculture and farming, particularly coconut farming that has great potential to reduce hunger and poverty of many millions.

Coconut palm is inclusive

Coconut palm, called ‘KalpaVriksha’ is a model crop that allows other crops and livestock to grow in harmony within its interspaces and helps provide livelihood and nutrition to many millions. This is



Fig.3. Coconut-based cocoa farming system



Fig.1. Coconut-based high density cropping system with black pepper, banana, nutmeg/clove and pineapple in border

because; the coconut itself needs wide spacing (7.5m x 7.5m) for its healthy growth. Also because of its typical phenotype of single unbranched stem, rooting pattern (fibrous root system and majority of roots distributed within 25% of the land area leaving 75 % area underutilized), characteristic phyllotaxy of leaves allowing light penetration to the ground, the coconut palm shares its interspaces by allowing different types of crops to grow. In the initial stage of its life, intercropping is well suited and when the palm grows tall and starts bearing, mixed cropping can be adopted.

The coconut-based High Density Multiple Species

Cropping System (HDMCS) is a classic model of shared living, where coconut is grown along with black pepper, banana, nutmeg and pineapple along the border (Fig. 1). The special affinity of coconut palm permitting black pepper to put forth roots within its basin region and allow the spice crop vines grow on its trunk (Fig 1) and yield without any negative allelopathic effect, is a wonderful example of peaceful co-existence in harmony that can be followed by all.

Not only crops, Coconut Based Farming System (CBFS), integrated with fodder grass, is combined with livestock such as milch cows, goats, fisheries and poultry (Fig. 2), allows a circular flow of energy within the system and fetches a very high return to the farmers. In many coconut gardens, it can be seen that the cows freely graze the grasses and weeds that grow in interspaces and then are later tried to the trunk to rest and chew on the food eaten by them is another example of peaceful co-existence. Free range birds (hens and ducks) pecking at the insects and other critters in coconut interspaces and laying farm-fresh eggs cannot be ignored for highlighting harmony of plants and birds. The droppings from the cows and birds enrich the soil with natural manure that benefit the ecosystem services while the milk, eggs and meat from them provide protein-rich nutrition to humans and other living beings. Besides annual crops as intercrops, coconut allows other high value perennial crops such as cocoa (Fig. 3) to be grown in one plot. Several other models for different coconut-based farming system such as i) coconut,

banana, pineapple, tuber crops and vegetables, ginger and turmeric and ii) coconut + nutmeg, coconut + pepper, coconut + cocoa, coconut + papaya are widely noticed too.

The coconut based farming system, thus, embodies Mahatma Gandhi's quote on co-existence: "Relationships are based on four principles: respect, understanding, acceptance and appreciation". The palm allows diverse crops to grow within its interspaces by promoting underground harmony in



Fig.2. Coconut-based fodder grass integrated with milch cows, goat, poultry and fishery

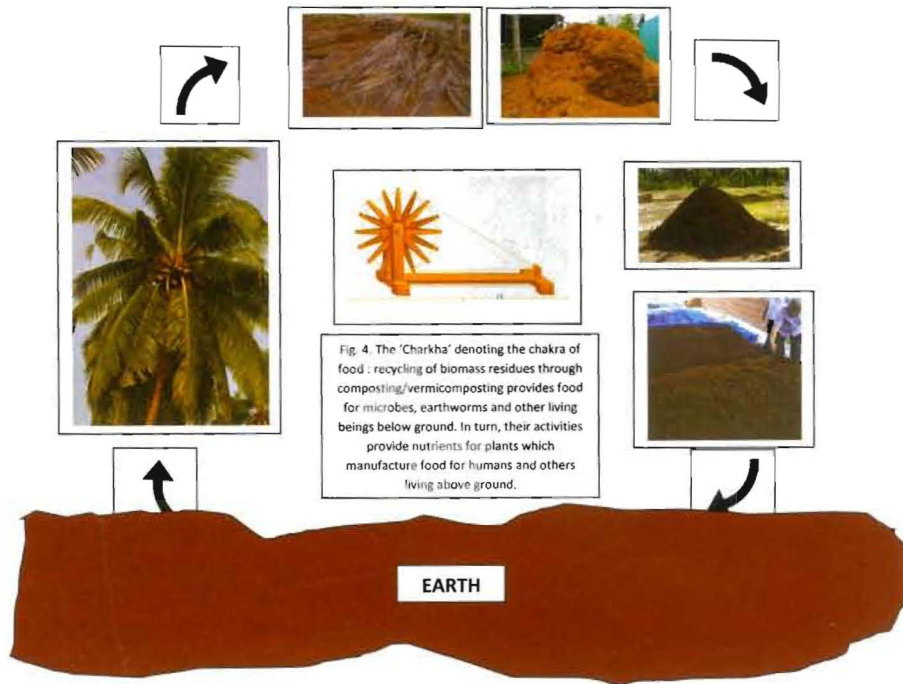


Fig. 4. The 'Charkha' denoting the chakra of food: recycling of biomass residues through composting/vermicomposting provides food for microbes, earthworms and other living beings below ground. In turn, their activities provide nutrients for plants which manufacture food for humans and others living above ground.

terms of root architecture that promotes optimum rather than competitive use of available natural resources such as space, water and nutrients. Above ground, the canopy architecture of coconut palm and each selected intercrop allows optimum exploitation of the solar energy for efficient photosynthesis for production of food for the humans and animals. The system also has enough open ground space for receiving the precipitation and storing the water below ground. The coconut palm respects, understands, accepts and appreciates harmonious living with other crops and animals.

Harmony with nature

Gandhi had quoted "The best way to find yourself is to lose yourself in the service of the others'. Coconut palm is one of the best examples for this quote. The coconut palm serves others through its biomass production. On an average, one hectare of coconut palm generates more than 6-8 tonnes of senescent leaves that can be recycled to good manure by *Eudrilus sp.* earthworm using CPCRI's coconut leaf vermicomposting technology. The vermicompost, not only returns 50% of nitrogen required for 175 palms grown in one hectare area, but also recalcitrant organic carbon and plant-beneficial microbiome that helps improve the soil health and fertility in an eco-friendly manner. The vermicompost with high organic matter content thus becomes the food for

the millions of underground soil microorganisms, earthworms and other subterranean lives, whose activity is central to crop production capacities of the soils. In similar manner, coir-pith, a by-product produced from coir-fibre extraction units can be converted to excellent organic manure using urea-free co-composting technology developed by CPCRI. The application of composted coir-pith also becomes food for the soil microorganisms besides conserving rain water due to its excellent water holding capacity. Thus, even the discards from the coconut palm promote harmony and good growth of the crops, growing above ground, by providing food for the invisible microbes living below ground such as free-living nitrogen fixers, phosphate, zinc, cellulose and silicate solubilizers, siderophore and antibiotic producers, and arbuscular mycorrhizae etc, whose activities recycle the plant-nutrients present in the biomass residues. This is like spinning of the charkha by Mahatma Gandhi, the circular motion of the wheel highlighting the circulation of food to all lives, the unseen microbes below ground and to humans and other living beings above ground (Fig.4). After all, humans or plants or animals or microbes, none can be alive when there is no food, signifying Mahatma's saying "To a man in empty stomach food is God".

The coconut palm happily provides food for all!
It's truly a 'Tree of life'. ■