

KAHUMANA MANDALA GARDEN

By Calley O'Neill, 1981

KAHUMANA DRY LAND INTEGRATED AGRICULTURE/AQUACULTURE SYSTEM

Waianae, Hawai'i

The word Kahumana means guardians of the spirit in Hawaiian. The heart of the Kahumana Community is expressed in their mission.

*Our mission is
to co-create a healthy, inclusive and productive farm-based community with
homeless families, people with disabilities and youth.*

*We accomplish this through the practice of
Mindfulness (maka'ala)
Empathy (aloha)
Working together (lokahi).*

*The way we care for the most vulnerable members of our society
determines our mark as a people and a nation.*

What began in 1974 as a compassionate service oriented intentional community grew into a residential facility for helping individuals and families who are disenfranchised, disabled and/or dispossessed. After they outgrew their Makiki base, they built the facilities at Kahumana with a largely volunteer crew. The garden and farm has grown and changed dramatically with subsequent new owners and decision makers.

The half-acre Kahumana Mandala Garden is a developing, model integrated agricultural/aquaculture system master plan in Waianae, Hawai'i, on the leeward side of the island of Oahu. The garden design therefore has many unique features applicable to the dry land tropics. The garden will be a special one for many more reasons: the integration of agriculture, art, and small-scale aquaculture, maximum plant diversity, and brilliant color harmonies that satisfied

Paul's wish to have every color of the rainbow ('chop suey landscaping') and Calley's practice of separating out harmonious color blends.

The design is singular in its potential as a community educational research and teaching model of a permanent, multistoried, productive, sustainable, residential agriculture; its potential for high food production in a small space; its labor intensive quality of horticulture over machine maintenance, and the subsequent energy, water, and soil-conserving measures; organic techniques for soil building in a seaside environment; and finally, its design aesthetics, color harmonies, and integration.

The garden's main paths will be oriented to the four compass or cardinal points. At its center will be a domelike shade house for shade-loving plant species, climbing plants, moisture-loving plants, tender fruits, and vegetables susceptible to fruit fly and other insect damage. One area of the greenhouse will nurture a garden of container crops as a demonstration area for food production on lanais and rooftops. At the very center will be a raised pond, a major part of the fish production, irrigation and green wastewater fertilization scheme. Doubling as an aviary, the greenhouse will provide critical habitats for predatory insects, birds, and reptiles.

In the ring of raised agricultural beds just outside the central greenhouse will be seven 5' x 5' 650-gallon solar algae ponds ~ translucent 1/16" thick fiberglass cylinders (silo fish ponds) which maximize light penetration, thereby maximizing algal and consequently fish growth. Two valves at the bottom of each tank will connect to a drip and emitter irrigation system. Fairly large holes in the irrigation tubes will allow the passage of algae and nutrient wastes onto the beds. Ultimately this automatic system will be powered directly by the sun. In the ponds' nutrient laden, warm water a full polyculture of tropical food fishes will thrive utilizing the abundant microorganisms in the silos (*Tilapia aurea*, *Tilapia mossambica*, silver carps, Israeli carps, grass carps). These fish are rapidly growing species and an important low-cost protein food for human consumption.

Based on prior experience and research at the New Alchemy Institute in Massachusetts, fish harvests of 100 - 120 pounds per tank per year are projected. Much of the fish feed will be green vegetable matter from the garden. Water analysis and productivity measurements will be recorded as an ongoing

process, since this integrated project will have wide application throughout Hawai'i and the Pacific Basin.

Native, perennial and self-seeding annual flowers will surround the tanks. They will provide beauty, blossoming color, food and habitat for bees, wasps, other beneficial insects, and a diversity of birds. Drought resistant bee forage plants will surround three of the seven tanks. Floating aquatic plants and hydroponically grown vegetables on the surface of the ponds will provide landing pads for thirsty bees and insects, as well as reducing water evaporation.

Adjacent to the pond/flower beds will be large beds of perennial semi-tropical vegetables. Aside from fine eating, these plants, (such as ong choy, bok choy, Okinawan spinach, Tahitian Taro, and sweet potato) are among the most nutritious in the world, are easy and quick to grow, have a long season, are insect and disease resistant, highly productive, and are adaptable to different soils. They are prolific, easily propagated, and beautiful for landscaping. In this context, harvesting, pruning, and trimming are one and the same act. In each bed there will be an 'island' of onions and garlic, and another 'island' of papayas growing in marigolds (for nematode prevention).

In the next ring, there will be 16 biointensive annual vegetable raised beds. As with all of the beds, the soil will be double dug to a depth of 24" if possible, and preserved from foot traffic after the preparation. The beds are 5' wide; thus access to the center is possible from 3 - 4' wide strolling paths on either side. The biointensive method of soil preparation has been found to be 4 to 16 times as productive for commercial row crops, using just 1% of the water, fertilizer, and energy used by commercial row cropping. Research also shows that the soil quality and fertility improves over time, rather than diminishes, despite consistently high yields (Jeavons, 1979; personal communication during author's studies in biointensive methods).

Down the center of each vegetable bed will be a vertical support fence for climbing crops with an overhead arbor on two of the beds. Some of the crops on the 16 food fences will be: the winged bean, Ceylon spinach, toomlong, luffa gourds, buffalo squash, wax gourds, and bitter melons. These crops will grow permanently on the fences, taking virtually no room in the beds. The annuals beneath them, however, will rotate clockwise, one bed each spring. Plants of different heights and water/light requirements will be interplanted to take advantage of the three-dimensional growing space. Companion planting

will be practiced and beds will rarely have an empty space so that essential 'living mulch' is created to conserve soil moisture and soil life.

A primary ingredient for success will be liberal use of a variety of mulches all over the garden to preserve moisture, nutrients, organic matter, and to protect the soil itself from the often relentlessly drying sun and wind on the Waianae coast. Mulching will also keep weeds down, thus protecting the extensive hand labor done during bed preparation. Thus, the garden will require an enormous amount of work in its initial stages, with less and less labor needed each year. After three years, the primary task will be to plant and tend the 16 small annual beds. The rest of the garden will need only harvesting and light trimming. Paths between the beds will be mulched with a permanent material such as used brick, stone, coral and/or gravel. Major paths will be 4' wide to allow for garden carts, comfortable strolling by the frequent farm visitors, and residents alike, as well as some natural plant spillover onto the walkways.

The outermost ring will be a wide, diverse, multistoried, mostly perennial shrub border. Plants on the windward side of the garden will be highly drought and wind resistant, protecting more tender species next to and below them. Together, the permanence of this border will create a most stable, and therefore most important, habitat for beneficial birds, reptiles and insects. It will provide fruits for fresh eating, jellies, juices, and baking.

In the large square corner beds that complete and enclose the mandala, there will be a major collection of herbs organized for educational purposes by botanical families. The square is the symbol of the Earth or the human-made world. The herbs will be planted in a naturalized landscape/rock garden, with attention to the direction they face. The herbs will be used for teas and spices in the Kahumana kitchen, and will play a major role in the integrated pest management systems. A diversity of herbs will be sprinkled throughout the garden as companion, trap and protective crops.

Everything in the 0.5-acre garden will be clearly labeled so that a stroll through it will offer Kahumana's visitors a fairly comprehensive, experiential education in small-scale ecological dry agriculture. It will be a vivid display of edible landscaping as it relates to the homeowner, the small farmer, the community garden and urban gardening enthusiast in the dry semi-tropics, with carefully documented research papers and how-to booklets for the asking.

The goals are many for this multistoried, multipurpose garden:

- A relative food self-reliance system for Kahumana.
- Ecological stability and soil enhancement in the garden through natural farming methods.
- Integrated pest management.
- Lowest possible water and energy usage from renewable sources.
- The blossoming of the land into its highest and best uses – beauty, spirit, ecological sensitivity, and productivity.
- The resultant model documented and recorded as an educational model for East and West.