

eucalyptus, casuarina, *acacia auriculiformis* etc. Lately, medicinal plant monocultures, bio-diesel plantations or mono species fruit tree plantations, subsidised by some or other agency are invading the traditional bio-diverse home gardens.

The third area where biodiversity has survived somewhat are small farms in flood prone and drought prone areas, as the external input intensive, market led, hybrid - seed based packages have mostly failed in these disaster / stress prone areas.

In flood prone regions, rice is the main food grain. In rice field, along bunds and canal edges, the only trees seen are babool / *acacia nilotica*, some varieties of *sesbania* and *caesalpinia* etc as they can tolerate waterlogged soils. Few palm trees, Jamun or wood apple trees, neem and sissoo trees, rain-trees, soursop shrubs, ficus trees and shrubs may also be present.

The diversity is mainly in aquatic plants, most of which grow voluntarily and are harvested from rice fields or wet lands and their edges as food, fodder or medicinal plants.

In the rice fields of coastal India, 30-40 kinds of edible herbs are found in large quantities; 'Kalmi (*Ipanea*)', 'thankuni' (*Centella asiatica*); 'brahmi', 'Sushni', 'kanchire', 'kulekhara', etc are even sold in some town and city markets of West Bengal.

During rainy season all the wetlands and paddy fields get connected, wherever agricultural use is less, a wide range of fish (mainly insect eating mud fishes), frogs, snails and crabs, shrimps breed in or migrate through the farms. Farmers have developed a wide range of traps (mostly bamboo cages) to harvest this diversity. Some are consumed immediately; some are nurtured in a jar ditch or pond to be consumed later.

Many aquatic weeds such as duckweed, azolla etc are used as duck or pig feed; some are used as mulch or compost material, some as fuel. Water chestnut, water lily, lotus etc. are cultivated in wetlands as food plants and their seeds, stems etc are both consumed locally and sold in nearby markets.

The main plant rice / paddy itself has many varieties, adapted to deep water, saline soil, late rain etc. Rice varieties were also selected for their aroma, shape, texture, taste etc. Even now 150-180 varieties of rice are known / used by small farmers living in Sunderban delta and coastal east midnapore districts of Bengal. Every part of rice plant has many uses or the by-products too are valuable as food or fodder. Rice straw is used as roofing material, to make ropes and paddy storage bins, as winter bedding material for cattle, as substrate for mushroom cultivation, as cattle fodder, as packaging material, as construction material etc. The rice hull is used as fuel, as incubation / insulation material for hatching eggs, as mulch or soil amendment material (especially in charcoal form), as colouring agent in pottery etc. Broken rice and rice bran is used as feed for fish, duck, chicken, pig. Various food items are made from rice powder; puffed rice, popped rice, flattened rice etc are still popular snacks in Bengal. Rice beer is liked by farmers, though the technology used has not developed much as state authorities consider this as illegal / immoral to brew liquor.

In the rainfed / low rainfall regions, maize, sorghum, pearl millet, finger millet have remained as the main food grain (though rice and wheat have entered into many kitchens via public distribution system). Pigeon pea, black gram, chick pea, horse gram in the plains and rice bean in the hills are the main pulses of dry regions grown together or in rotation with cereals. Niger, sesame, safflower, mustard linseed, castor, groundnut etc are the main oilseeds.

Small farmers in Central India and in hilly regions have practiced mixed planting over many centuries. Land is ploughed only once

a year and fast maturing, slow maturing and very slow maturing grains, vegetables, spices etc were inter planted. Only a few of these systems have survived as the seeds and associated knowledge has eroded.

In dryland farms and bunds and surroundings the trees that are commonly seen are babuls, flame of the forest, kendu or tendu, Palmyra, date palm etc. More common are thorny shrubs and bushes with inedible leaves such as castor, various cassia plants with milky saps (often poisonous / medicinal), agave etc together with a wide range of grasses.

In low rainfall areas, some of the edible weeds are prickly amaranth, lambs quarter, ivy gourd etc - with limited availability. Main strategy of the small holders is to raise animals / birds that can convert low quality vegetation into human food. A wide range of insects and small reptiles are also used as food or feed in the dry regions. Wherever there are forests, roots and tubers, mushrooms, tree leaves, flowers and fruits / seeds supplement the diet especially of low income households.

### Our misplaced priorities

In India, we have dramatically increased food supply but have achieved only marginal success in reducing malnourishment, hunger and indebtedness. This is because of (a) common lands, forests, grasslands, wet lands have been degraded or commercialized (b) farmlands have become mono-crop based and soils are eroded / poisoned / exhausted (c) our research has focused on more of the same and high external input reliant hybrid plants and animals (d) indigenous communities have always been seen as 'beneficiaries', 'backward' never as source of knowledge or partners in progress (e) cropping and farming systems are not designed to take advantage of local climate and biodiversity.

Farms of future will have to be *Cost effective* - as farmers will have to deal with open markets, where support prices will not be guaranteed by Government; *Energy efficient* - as fossil fuel prices and electricity charges are likely to keep rising; *Water efficient* - as sources, are drying up and resources are increasingly being privatized; *Productive* - both in forms of land and labour as the prices will keep rising; *Resilient* - yielding a minimum quantity despite soil degradation and climatic variation and regenerative; as many natural ecosystems such as forests, wetlands etc won't be able to perform these ecological functions. To achieve these objectives:

- Farms will need to be multi-storey arrangements, some combination of plants (seasonal / perennial) animals and aquatic life, insects and micro-organisms.
- Farms will need to be well integrated or zero waste. All crop and animal residue will need to be utilized through multi step processes often using a bio-digester, gasifier, fermenter to accelerate nutrient release. Bio-activators, earthworms, algae etc., will also have to play a role.
- Use of renewable water and renewable energy will have to be maximized, use of synthetic fertilisers will have to be reduced drastically and use of synthetic biocides totally stopped. Use of plastics and other persistent organic pollutants also have to be minimized.
- Farms will have to be designed to take advantage of local landform, soil and climate as well as biodiversity and cultural diversity. Top down extension systems and lab to land approach will have to be replaced by participatory action research and participatory technology development / assessment approaches.