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27<sup>th</sup> September 2008

## Forest gardening, agroforestry, yields and efficiency

Forest Gardening is an intensive form of agroforestry, where trees, shrubs, herbaceous perennials, annuals and climbers all form part of a carefully designed and interconnected agronomic system for growing food and other useful plant products.

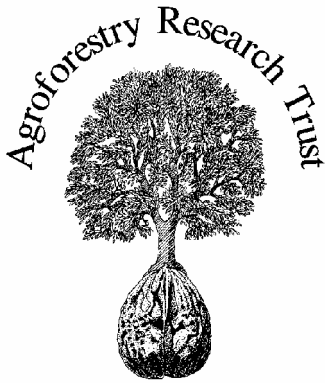
Most forest gardens are partially or entirely self-sustaining in terms of fertility through the use of nitrogen-fixing trees, shrubs and lower plants, and also by the use of mineral accumulators which tap sources of nutrients deep in the subsoil and raise them in to the topsoil layers so they are accessible to other plants.

In terms of the sustainability of any agricultural system, any talk of yields (meaning outputs) without reference to inputs is completely meaningless. Indeed, agricultural economists are misleading people by talking of efficiently yielding systems when they are only talking of outputs.

One of the best ways to measure sustainability is to look at the **efficiency** of a system, which is the ratio of outputs over inputs measured in energy terms. So outputs will include the energy value of foods, wood and any other products, whilst inputs will include human and mechanical energy, chemicals used etc.

When this definition is applied to agricultural systems, complex polycultures like forest garden turn out to be far most efficient systems of growing products than any others. In fact in descending order of efficiency, the common agricultural/horticultural systems in this country rate as follows:

- Complex polyculture / forest gardening
- Organic intensive horticulture
- Chemical horticulture
- Organic arable
- Chemical arable
- Organic dairying
- Chemical dairying



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Scientific research in the field of agroforestry has established beyond a doubt that polycultures, where several crops are grown together in the same space at the same time, can also produce greater yield (outputs) than similar areas of monoculture.

It is also scientifically proven that agroforestry and forest garden systems can improve soil fertility, soil structure, drainage etc. It is also well known from research in the organic agriculture field that soils can be improved very substantially via use of organic matter, nitrogen-fixing and mineral accumulating plants. Past history of the use of a site does not therefore condemn it to similar uses in the future. By use of the techniques mentioned above, in addition to providing wind shelter and other bioremediation techniques (such as the use of mycorrhizal fungi), soils and sites can be dramatically improved in quality and allow for complex agroforestry systems to be established even on poor soils.

I would add that in my view the biggest challenge that we all face in the next few decades is that of climate change. In terms of sustainability, annual plant-based systems are the least able to cope with climate extremes – droughts, floods, heavy downpours etc. which is how the most damaging effects of climate change will be manifested. Perennial and tree-based systems are much more resilient to such extremes, and much more sustainable in the long term.

Martin Crawford

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