

## **ANIMAL PRODUCTION AND SUSTAINABLE AGRICULTURE IN THE TROPICS**

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It is of course possible to write books about the topic given to me as there are no unique systems. The chosen system will depend on the soil quality, rainfall and rainfall distribution and possibly even more important the culture and socioeconomic conditions of the people living there. It is very tempting sometime for Western Scientists to dream up solutions based on their experience and set up projects which would take them in the direction of what they consider normal. Such projects often do more harm than good and will generally stop whenever the project funding is stopped which is what could be expected. Had a proper understanding been sought before the project was set up and started some very useful results could have materialized.

In the following I will address some points related to sustainable agriculture in the tropics bearing in mind that there is no one solution so the discussion will mainly relate to principles considering also that most of my experience relate to small farmers.

### **Large scale versus small scale units**

This aspect is complex. In rich countries generally large scale farming is encouraged as the need for labour is less per unit output and labour is expensive as industries can generally pay more for labour than agriculture. This has also in some countries eg. China sometimes led to the conclusion that future farming is large scale "Large is beautiful, small is primitive" However in most parts of Asia the rural population is between 50 and 80% of the population. Going for large scale and less labour will lead to migration to cities leading to urban poverty rather than rural poverty as in many countries in Latin America. However a different philosophy is needed to support poor rural farmers. Here livestock is multipurpose not single purpose. The major reason for keeping livestock is risk minimization rather than profit maximization ie. security in a large product. Animals are sold when money is needed rather than at a certain age or weight. This again is a philosophy that can take many pages to discuss. Can small farmers make use of some large scale advantages? YES Here there is no doubt communities can form strong co-operatives which can give them many advantages. Such as a good price for products standardization of products, purchase of equipment by communities which would not be possible or economical for small scale farmers themselves. There are many excellent community projects. The problem is while governments sometimes see the advantages of co-operatives sometimes they like to control them. Co-operatives to be truly successful have to be bottom up not top down as man Indonesian co-operative are.

### **Monoculture vs complimentary multiculture**

In Western countries large scale monoculture has become the norm. This is largely because labour became too expensive relative to fossil fuel and monoculture lends itself to mechanization so in effect labour became substituted by fossil fuel. However this has let too many problems of soil fertility and pollution of water ways. In



almost all of Asia labour has not be so expensive and by far the largest proportion of the population live in rural areas rather than urban areas. Here complimentary multiculture is successfully used. This is particularly so in Indonesia. Cassava is grown together with leguminous plants eg. Groundnut and Soya. Also leguminous trees are grown in edges of small fields. Such trees compliment the crops by N uptake and also provide feed for livestock. In Kwarasan farmers are allowed to grow leguminous trees eg. Leucaena, Glyricidia, Sespania and Caliandra between state owned eucalyptus trees. Better yield of eucalyptus as well as feed for farmers animals. While multiculture is no doubt more labour consuming than monoculture as mechanical harvesting is difficult, if labour is not a problem labour saving device is no solution. Furthermore it increases crop production and soil fertility. Here however I find insufficient research effort to assist farmers as to the optimum combination of crops. In fact I often learn more from farmers about that than from research workers! We need to help farmers to find the best crop combination for best yield of desirable crops and best soil fertility. These crop combinations will no doubt vary accordingly to soil, climate rainfall and distribution irrigation and type of livestock who may be fed on leguminous trees and other crop by-products. More work is urgently needed on all aspects of multiculture. An area of reseach requiring input both from plant, animal and soil scientists as well as socioeconomics.

#### **Crop/Livestock interactions**

There are endless combinations of how crop and livestock can interact. In many cropping areas of Indonesia the livestock are kept in stables close to the house and fed on crop by-products tree leaves and branches on a cut and carry system. In other areas the animals are kept outdoors grazing for part of the day or part of the year. The main effect for soil and plants is that crop residues ,roadside grass and plants from edges of fields are passed through animals and manure is used instead of crop residues etc. being left in the field or burned. In almost all comparisons made the equivalent amount of manure is better for the soil than the crop residues themselves. When animals are kept inside and fed on a cut and carry system it is also possible to produce biogas for domestic use, and use slurry as fertilizer. Results from Vietnam have shown that biogas slurry is as good as or better than the equivalent manure. Biogas production however requires access to water on a scale that is not always possible. Crop livestock interaction is extremely complex. There is no unique pattern it will vary with type of animal, type of soil, climate, culture and socioeconomic circumstances. Like aspect of multiculture it is a subject where animal, crop and soil scientists have to work together to assist in making progress for farmers as well as on input from socioeconomist

#### **Livestock in agroforestry**

I have discussed this topic before which always intrigues me and where I see so much waste and so many unexplored possibilities. In Sri Lanka it was quite clear that simply grazing under coconut trees increased coconut yield by about 15% due to more rapid turnover of biomass and better water holding capacity of the soil. There is insufficient information on the interaction of livestock in other trees like Mango, Rubber, Coffee.etc. Often the trees maybe owned by people with no knowledge or interest in livestock. In the oil palm plantations in Benkulu Sumatra introducing cattle to pull the carts with oil palm bundles increased the capacity of the workers by 50% and

provided food for several cattle . Work from Malaysia has shown very clearly that grazing under oil palm plantations not only feed cattle but also increase yield of all palms. Indonesia has about 5 million ha of oil palms and under each ha it may be possible to graze 2 cattle ie. theoretically this could feed 10 million cattle. At the moment Indonesia is importing cattle for fattening from Australia. There is a great deal of research needed to quantify this. Again it seem a win win which can situation to assist in poverty alleviation. As well as increase production from forestry.

#### **Integrated crop livestock system vs non integrated or crop and livestock**

Which principle can be extracted wich can address the tittle of this paper . Well there are certain issues which are becoming more and more important and which has global implications on what we do in the future and here unfortunately the West has not provided a good model .That has to do with aspects of sustainability so that the soil and climate can in the future sustain plants and animals equal to or possible better than today. This involves recognition of the aspects discussed as well as recognition of necessary action . We need urgently to address problems g about climate change caused by excess human use of fossil fuel. Development of renewable resources is going to be increasingly important and here the tropics have a great advantage. There is a great potential for more use of solar energy for generation of electricity, heat and indeed when needed cooling. There is room for a great deal of innovation here. Last but not least scientists concerned with plants, animals, soils, energy and people must learn to work together for common goats of sustainability and preservation of the planet to be fit for future generations and dare I say, we should not follow the patterns set out by multinational agri-businesses whose only goat is to feed greedy shareholders and exploit poverty for that purpose if necessary.