

# Integrated Farming: Growing of Fruit Trees and Rearing of Ruminants

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## Abstract

A large number of people in the tropics have trees and shrubs growing around their compounds mostly to provide shade from the sun in most sunny afternoons as well as providing sustainable supply of fresh fruits. A less number of house occupants or house owners keep livestock as well. Ensuring constant good harvest from the fruit trees is a challenge because the soil fertility starts dwindling after much harvest of fruits without replenishing the plant nutrients extracted from the soil. In addition, feeding of those ruminants kept in the homestead is big challenge. Purchase of concentrate feeds to boost the production of ruminants is mostly beyond the financial capability of the livestock keeper. The use of inorganic fertilizers to replenish the plant nutrients that have been removed from the environment along with the fruits is associated with a number of environmental hazards such as soil acidity, depending on the type of fertilizer used. The physical and chemical properties of the soil are sometimes adversely affected. It is also to be noted that most of the people involved in this integrated farming are resource poor peasant farmers. This paper looked at the existing practice and possible adjustments that can be put in place and considered some of the ways forward.

**Keywords:** Integrated farming, raising fruit trees, mulching, rearing ruminants

## 1. Introduction

Small ruminants such as sheep and goats are reared around homesteads mainly by subsistence farmers who also have one or more fruit trees such as plantain and banana as well as cashew, citrus and mango growing around their houses. Integrated farming of this nature ensures regular supply of animal protein from sheep and goat rearing while the fruit trees supply carbohydrates from plantain or banana. Mangoes and cashew as well as oranges will ensure regular supply of minerals and vitamins both for home consumption and for sales. Moyo *et al.*, (2010) noted that for most of the 2.6 billion people who depend on smallholder farming systems, livestock production is an important way of diversifying income sources and maintaining soil fertility.

Adequate feeding of the ruminants and sufficient nutrition of the fruit trees are difficult to achieve at the same time. Adequate provision of feed for ruminants that are reared in homestead is a challenge because if they are left to roam around the community, they are likely to destroy neighbours' crops and flowers found around their houses; the animals are therefore confined to avert such destructive tendencies, the resource poor farmers may not have sufficient finance to purchase feeds or source for enough browse plants to meet the dietary needs of the confined animals. Concentrate diets could ameliorate problems relating to small ruminants feeding but this would be at a cost which is out of the reach of subsistence farmers. Use of inorganic fertilizer after soil test could reduce the challenges of fruit trees' nutrition in homestead but the category of farmers involved in this practice may not have the financial power to back it up. Objectives of this paper include provision of information regarding how to provide a cost effective nutrition for both ruminants and fruit trees grown in homestead.

## 2. Existing practices of rearing small ruminants and growing fruit trees

Sheep and goats in southern Nigeria are reared mainly by subsistence farmers, who practice mixed cropping. They periodically restrain their animals at the commencement of the rainy season when crops are planted to prevent the animals from destroying the crops. In most urban, semi-urban and organised rural communities in southern Nigeria, small ruminants may only be reared in confinement to prevent the ruminants from feeding on crops grown around households as well as preventing their faeces from causing nuisance and bad smell in the environment.

Many African countries do not attach sufficient importance to the plants that grow in their environment (Gurib-Fakim, 2009). Fodder plants may be growing luxuriantly in the vicinity of the home compounds yet farmers may trek over

long distance in order to fetch twigs of browse plants which they have knowledge of. In some other cases, browse plants may not be found around their compounds at all. Small ruminants in most organized urban and semi-urban communities may only be reared in confinement; therefore, sourcing of browse plants becomes inevitable in order to keep ruminants.

Clash of interest arises when a farmer who is in search of browse plants gets into the compound of another person who may have planted such species for an entirely different reason. Quarrels bordering on trespassing may ensue. As dry season approaches, such clash of interest heightens, more so, if the owner of the browse plants wants the twigs as fodder for his own ruminants or for mulching fruit trees growing in his compound.

It is suggested that production of confined ruminants may go on along with the growing of fruit trees in compounds by giving priority in the use of twigs from browse plants to feeding the small ruminants, when there is additional supply, then such is used for mulching of fruit trees. Fodders around the homestead are hardly sufficient for ruminants kept in confinement, except the animals in captivity are very few.

The animal dung generated by ruminants after feeding on fodder is commonly seen as a waste material, and a burden that is not recycled. The animal dung is heaped in dumpsites or thrown over the animal fence which has been used to confine the animals. Some farmers are known to use such waste materials to improve soil around fruit trees.

### **3.1 Possible adjustments in the contemporary practice of raising small ruminants and fruit trees in compounds**

Raising pasture broadleaf and grass plants around households are seen by people as encouraging weeds proliferation around homes. People expect that such plants should be kept in check. However, planting browse shrubs and trees around homes is encouraged. Some portions in the home garden should be marked out for raising grasses such as guinea grass (*Panicum maximum*) plus leguminous perennials which have high nutritional values and are cherished by ruminants.

In order to provide a suitable space for the raising of pasture plants for confined ruminants, shrub and tree species as well as the fruit trees may be arranged in rows while the alleys are planted with pasture species.

Ruminant farmers need not suffer because of lack of knowledge of integrating keeping of ruminants and the various shrubs and trees which could be valuable to ruminants, the link between researchers, extension officers and the farmers should be strengthened, exploring the use of English and other languages of communication in local radio and television stations as well as in print media. The research findings on the various shrubs and trees such as how the seedlings are raised or procured, established and maintained for optimal performance should be made known to the farmers. Spacing and land area required for specific number of plants may provide suitable guide on the number of animals that such browse plants could sustain.

Animal dung generated by confined ruminants rather than being considered as a burden should be composted and used as a source of nutrients for shrubs and trees which provide fruits in compounds. Crop residues are generated by shrubs and trees grown in association with fruit trees. Regular weeding of the homestead will also generate crop residues; animal manure is generated by ruminants fed with fodders and left-over foodstuffs from households. Crop remains, animal manure, leftover foodstuffs, urban and industrial waste could be added to the animal dung for composting. The resulting compost is applied to improve soil fertility, thereby improving the soil environment in terms of releasing more plant nutrients to fruit trees and enhancing their yields.

Shiawoya and Musa (2003) noted that mango and banana leaves as well as Tridax plant are forages easily available in homesteads. They have been known to be relished by small ruminants and micro livestock like rabbits. All the three items improved the growth rate in rabbits.

Ruminant animals ought to be selected based on their ability for high growth rate while feeding on the readily available browse plants and the wastes from the fruit trees in the home gardens. It may cost more to acquire and require more effort such species, they are usually more productive and make better use of their feed and use resources more efficiently. Eventually, the efforts and investments in that direction pay off.

It is suggested that such old poor performing animals be culled; this should also apply to all categories of animals. Animals that give poor growth performance relative to the amount of feed intake may be removed from the confinement. Selection should be made for animals that are productive and prolific. Provision of extension services through well trained resource personnel will improve livestock production among homestead farmers.

### **3.2 Rewards of pruning from trees and shrubs to crops and small ruminants**

Pruning from shrubs and trees planted in compound garden could be used as mulch and placed around crop stands. Schonbeck (2010) reported that when a cover crop is killed by temperature extremes, mowing or rolling residues left

on the soil surface as a mulch can continue to hinder weed growth for some time. By keeping the soil surface shaded and cool, and by reducing daily fluctuations in soil temperature, the organic mulch reduces the number of weed seeds that are triggered to germinate.

Kang (1993) noted that the past work on hedgerow intercropping indicated that application of tree mulch was effective in controlling weeds. In this way Anebebe *et al.* (2010) postulated that high labour input for weeding is avoided. Mulch from *Inga edulis* provided good ground cover, and results in better suppression of weed growth. Thick layer of the applied Inga mulch and leaf fall of the tree species prevented noxious weeds like *Axonopus compressus* SW. Beauv., *Cyperus esculentus* Linn and *Aspilia africana* (Pers) C.D. Adams from receiving enough sunlight to proliferate (Anebebe *et al.*, 2010). Pruning from shrubs and trees could check weed growth around fruit trees. In most cases, materials from trees and shrubs have more lignified materials hence are able to last longer on the soil surface before being converted into humus by biodegradable agents. Hutchinson and McGiffen (2000) in agreement with the above statement added that warm moist weather combined with high soil biological activity accelerates decomposition of cover crop residues and their allelochemicals, thus shortening the weed control period. Straw, low-N residues last longer than succulent, high-N residues. Pruning from *Gmelina arborea* is reported to be very useful for mulching crops (Obiazi and Ojeifo, 2000). *Gmelina* is rich in nitrogen, the nitrogen is vital for good growth and yield of crops.

### 3.3 Preference of tree and shrub species

Shrubs and trees species which could play the dual role of supplying fodder to ruminants and twigs for mulching fruit trees in compounds require identification. Nwoboshi (1982) stated that species like *Tectona grandis* and *Gmelina arborea* owe their popularity in forestry to their capacity to establish and grow well in plantations. Obiazi and Ojeifo (2000) reported that pruning from *Gmelina* is useful for mulching and that it produces an appreciable amount of foliage and fodder for livestock.

Sempebwa and Kagumaho (1992) noted that for most farmers the immediate benefit of fuelwood and fodder made planting *Leucaena leucocephala* and maintaining the hedgerows in banana worthwhile. They added that a farmer had continued to use *Leucaena* to mulch her banana plot and fed her cattle she observed that the milk production from her cattle has improved. She also collected a lot of fuelwood from the leucaena which she used at home and also sold to her neighbours.

Diversification of nutritive fodder species which maintain their leaves during the dry season is crucial to sustainable management. Any undesirable effects a species might have when used as the only source of feed (such as abundance of tannins) would be offset by using many species at the same time such species could provide many other services essential to local community well being (Mizrahi *et al.*, 1998). It is known that most tree crops maintained in compounds bear fruits. Such fruits like pawpaw and plantain are also liked by birds. The attraction of birds into a compound is a source of good recreation where birds of varied plumage visit the fruits, snap-shots of such birds is encouraged. Their songs used to lively up the environment too.

Some of the suggestions of Obiazi (1995) for selection of trees and shrubs for stake procurement also hold for choice of trees and shrubs species for mulching and fodder. They include quick establishment and development and capacity of the stock to sustain itself on available plant nutrients on minimally improved soil after several removals.

### 4. Further research needs

Most tree and shrub species are eaten by small ruminants such as sheep and goats; such species may have high nutritional values, however, not much work has been done on their feeding values. Information on nutritional values of such edible species is required by farmers and extension agents in order to make proper choice of plant species to plant and use as browse plants. In cases where such plant species have been established, information on species nutritional values would guide farmers in sowing plants with high nutritional values. More studies are required on establishment techniques, optimal planting density, and pruning intensity for promising fodder species.

Ruminants need regular feed intake both in the rainy and dry seasons. Observations on various plant species are required in the dry seasons to discern if they loose or retain their growth performance relative to what obtains in the rainy season. It will be very useful to conduct research to ascertain drought-tolerance levels of the promising species as well as their ability to tolerate zero-level fertilizer application, having in mind that the target of most of these studies is to model out a production package which is sustainable and adaptable by resource deficient farmers.

### 5. Conclusion

Appreciable amount of fodder for confined ruminants is supplied from planted shrubs and trees. In some instances any excess foliage is used to mulch fruit trees which repress weeds by providing excellent ground cover. If all the browse

twigs are used for the ruminants, most of it still goes back to the fruit trees as farm yard manure; there is therefore no stiff competition between the fruit trees and the animals for what the browse plants are able to generate. Open spaces between fruit trees and browse plants may be used to raise pasture grasses and leguminous cover crops to supplement ruminant feedings. Composting of animal dung plus plant materials generated in the homestead results in organic matter; which when applied to fruit trees and shrubs, improves fruit quality and yields. Burden of ruminant dung disposal from the confined animals is minimized or completely reverted by composting it together with waste plant materials into organic material to fertilize the soil where fruit trees and shrubs are planted.

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