

DEVELOPING A STRATEGY FOR SUSTAINABLE IMPROVED SOIL PRODUCTIVITY IN THE TROPICS – EFFICIENT MANAGEMENT OF CROP RESIDUE/FARM WASTE

E.C. Odion¹, U. Ibrahim¹, B.E. Sambo², A. Ahmed¹ and A.A. Mukthar¹.

*¹Department of Agronomy, Institute for Agricultural Research, Ahmadu Bello University
Zaria.*

²Dept. of Crop Production and Protection, Federal University Wukari, Taraba State.

INTRODUCTION

- Tropical and subtropical soils contain heavily weathered clay minerals with poor ion exchange capacity and their potential to absorb nutrients is low; resulting in the washing of mineral fertilizers applied.
- In addition smallholder's production practices result in soil mining; as crop residues are burnt or carted away for other uses.
- If no attempt is made to return such nutrients to the soil it will lose its productive capacity; and such a soil is said to be degraded.
- Thus land productivity among small-scale farmers has stagnated for years.
- For example, 8 t/ha of wheat harvested in Germany takes 180 kg of nitrogen, 37 kg of phosphorus and 124 kg of potassium from the soil (LFL, 2006).
- If however, only grains are harvested and the straw left on the land to be worked in or spread in stables and returned to the fields as manure, the volume of nutrients taken from the system will be reduced to 64 % of the original crop withdrawal in the case of nitrogen, 41 % of the phosphorus and 18 % of the potassium,
- Showing that farming withdraws enormous amounts of nutrients from the soil; and the more intensively the land is farmed, the higher the yields and the greater the withdrawal.

INTRODUCTION contd.

- Preserving and sustaining soil productivity is very important in the tropics due to the vagaries in the production climate.
- Sunshine and temperatures are high and sometimes for very long periods during the dry season.
- Rainfalls are sometimes scanty, resulting in poor crop establishment, growth and development.
- Thus application of chemicals could exacerbate harsh conditions created by unfavourable conditions; increasing stress in the production environment still further.
- Zingore *et al* 2011, reported that only a third of a village cropland could be covered with manure produced with its own livestock population in equilibrium with the carrying capacity of local grasslands.
- Hunger, food insecurity and environmental harms will continue if current trends in population growth, food and energy consumption, and food waste are not curtailed (Tilman *et al.* 2011; Tomlinson, 2013);

INTRODUCTION contd.

- To maintain the soil's capacity to produce food, it is imperative that we adopt sustainable and resilient agricultural practices as soon as possible.
- The shifting cultivation, the bush fallow, the improved fallow, conservation agriculture currently employed can be improved upon by practicing the clipping/thinning management of legume crops for green manure (Odion *et al.* 2007).
- It improves the soil's fertility as well as detoxify acid soils (Woomer and Muchena, 1993; Hue et al 1986; Bell and Besho, 1993).
- The process alone may not sufficiently feed soils to ensure for intensification of production among smallholders; thus necessitating composting - the biological and chemical decomposition and conversion of animal and plant waste into high quality humus.
- Thus crop/farm residues will be available for use on the farm instead of either burning or used for land filling as it is currently being done.

Materials and Method

- In this initial trial, residues from the farm or market were either used whole or chopped into smaller sizes
- Chopped materials were mixed with the rumen contents from the abattoir together with some water.
- The mixtures are then put in a polythene container and tied to reduce draught and improve the temperature so that decomposition of the residues can take place.
- They were put in a bucket, covered up and allowed to ferment for some weeks.
- The chopping was to mimic chewing of the crop residue by animals; while reducing air draught was to mimic the condition in the rumen. The mixing with the contents of the rumen gotten from the abattoir was done using rubber gloves.

Results and Discussion

- This initial trial demonstrated the feasibility of digesting crop residues; thus crop/farm residues can be returned to the farms to improve the soil's fertility.
- This process is akin to VERMICOMPOSTING (where large populations of earthworms are used).
- Since abattoirs waste are more readily available than large populations of earthworms, this process will be more versatile than vermicomposting.
- However, observations made are that very dry materials are difficult to digest properly and so freshly harvested materials should be ensilaged as soon as possible instead of keeping them to dry.
- Chopped materials digest better than whole material as they seem to produce more surfaces for the rumen content to interact with the residue.

Results contd.



Results contd.



CONCLUSION:

- Farm, household, market and abattoir wastes are from productive lands and grazing areas
- Loss of these wastes from these productive lands result in degradation
- Composting the wastes will facilitate return of the waste to farms and grazing areas; if large quantities are composted
- Composted materials can improve the soil's productivity resulting in improved production
- Such improved production could result in the sustainable intensification of production among smallholders, food security and eradication of poverty

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