

SUSTAINABLE ORGANIC FARMING IN AFRICA

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Introduction

The poor results obtained with organic farming in South Africa and the lack of research and information, were crucial in the decision to do research in organic farming. By going back in the history of Africa and to observe nature, together with diligent research we came to a workable method that is suitable for Africa. This is a holistic approach as no single method was effective.

The conventional method of replacing chemical fertilizer with compost were not acceptable as 50 to 100 tons of compost per hectare created problems with high levels of Phosphate and heavy metals in the soil. The yields were poor and the high cost of making compost together with poor disease control forced us to look at a different approach.

Affmech cc was involved with waste management with earthworms and vermicompost was a by-product. With the excessive vermicompost a vegetable production unit was started. Initially the same results were achieved but by experimenting with different cultivation practices, based on the history of Africa as well as by observation of nature, a very cost effective and simple method was the result. The research work and subsequent papers were presented in 2004 at the 2nd International Conference on Earthworms and Organic Farming in Vladimir Russia. Here follows a summary of all the research work.

Results and discussion

Land preparation and cultivation

With the extreme climate that varies between very wet and very dry and sun for 365 days a year, a different approach was needed. The first factor that was researched was the soil temperature. On bare soil in summer the soil temperature reaches 50° to 70 °C, to a depth of 10 cm. The rate of evaporation of water reach on windy days 25mm per day and that up to 80% of water after rain was lost by evaporation. This observation led to the practice of heavy mulch and as little disturbance of the soil.

The following results were obtained:

Soil condition	Evaporation	Run-off	Effective
Bare soil	83%	10%	7%
Covered with mulch	10%	10%	80%

The only way this cover could be maintained was by no-till. The only cultivation done is with a narrow tine ripper moving very slow to break up compaction and only when necessary. For marking planting lines a spring tine cultivator is used to open a little furrow where vermicompost is placed. As the soil improves the need of a ripper disappear. This cultivation change was successful and this lead to a trail done on

Sweet Potatoes where half the plot was ploughed and half not. The following results were obtained;

Crop	Ploughed with mulch	No-till with mulch
Sweet Potatoes	37t/h	200t/h
French Beans	6t/h	24t/h
Swiss Chard	4t/h	15t/h

These yields were rounded off to the nearest ton

With such a big difference in yield we realised that the mulch on top made such a big difference. Subsequent results in open fields showed the same results.

Fertilizing

The only fertilizer used is Vermicompost at 2m³/h and bonemeal at 50kg/h and then only initially as the soil in South Africa are very low in phosphates. The 2m³/h at planting is enough and no other fertilizer is needed. Different application rates were tried and the following results were obtained.

Crop	2m³	5m³	10m³
French Beans	17t/h	20.5t/h	22t/h
Cabbage	97t/h	101t/h	104t/h

These close results surprised us so we realized there are other factors that influenced the result.

Microorganisms

With vermicompost, rich in microorganisms, we realise that this could be the major contributing factor. After research and own trails we found that it was so indeed. The discovery of the importance of microorganisms, explain why the baring of soil and removing soil cover has such a great impact on soil and yields under African conditions. Where in Europe with it's relative moderate climate, cooler moist summers and snow and cold whether in winter, microorganisms survive and ploughing and green manure in organic farming are more successful, the practice of bare lands and ploughing do not work here. Cover crops are successful in Africa context for mulch production. The cover crops, mostly legumes, are grown and cut down to form mulch where in Europe it is ploughed in. The European farming method that is used here also helps to explain why Africa has a problem feeding itself. The following trail was done to proof this:

Crop	Only mulch	EM (effective microorganisms)	Vermicompost
French Beans	5t/h	11t/h	22t/h
Swiss Chard	3t/h	7t/h	17t/h

Using vermicompost together with no-till and mulch proved to be a very cost effective way of farming. My own farming operation proof that 10 cattle together with plant waste can supply enough vermicompost for 50 hectares.

An added bonus of this farming practice is that disease and pests disappeared. When we started the practice of no-till, mulch and vermicompost the occurrence of disease and pests disappear. This started a new field of research. As cutworm damage use to be a major pest we were surprised that it also disappeared. By trail we found that with no-till and all the organic material and especially the decaying rootstock in the soil, which is the natural food supply of most soil borne insects, no more damage was done to seedlings. A trial was put together with Swiss Chard seedlings and the following results was obtained:

All plant material removed	Plants pulled and left as mulch	Plants cut and left as mulch
68% seedlings destroyed	21% destroyed	>1%destroyed

This trial was repeated with very similar results. All the seedlings were lost in 48 hours after planting. This is not surprising as the major food source for cutworms, according to entomologist, are decaying plant material. By ploughing or removing all the material, the only food source is seedlings.

Not having any aphids, red spiders, white flies, thripes, bollworms or any caterpillars eating crops for 11 years while using this system, an explanation was needed.

This was found in research by- Francis Chaboussou researcher from INRA in *Les plantes malades des Pesticides – bases nouvelles d’une prevention contre maladies et parasites (Plants made sick by pesticides – new basis for the prevention of diseases and pests)*

The basis of his research was that any pest or disease was caused by water-soluble chemical substances in the soil or sprayed on the plant. According to him any of these substances causes an excessive production of amino acids, which these insects and pests uses for food. The mechanism of how this work is not known but this is the only logical explanation of why no insects of pests attack these plants. Nitrate fertilizers, herbicides and insecticides all cause this unbalance. When the pH of plants is measured this extra amino acid production can be measured.

Summary

With all these facts, one can understand why Africa cannot grow enough food to feed itself. This NEPAD conference shows that they are at chemical fertilizer as the solution. The reason is that the more wealthy farmers in Africa from European origin, **who has enough money to buy crops**, are used as examples. There is no way a poor African farmer will spend €400 to €500 per hectare to grow a crop if he can live on €1 per day as many do. For the money he has to spend on one hectare he can live for a year. This is the message that has to get across to Africa but with all the money that chemical giants are prepared to donate to governments for so called uplifting programs, there is very little chance of it happening.