BASIC PRINCIPLES FOR ORGANIC CULTIVATION AND LIVESTOCK PRODUCTION

MANUAL FOR SMALL SCALE FARMERS TO START ORGANIC AND LIVESTOCK PRODUCTION

Compiled by Ralph van der Poll & Marianna Smith
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Cape Town

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INTRODUCTION

The current global food and economic crisis, arguably, have demonstrated the inability of the chemical industrial model of agriculture to solve the issue of hunger, poverty and food insecurity in the world. This model is responsible for the current economic, social and environmental problems faced by the populations of the South. The corporate chemical industrial model of agriculture contributes to global warming and the destruction of our natural resources. Moreover this form of (monoculture) also resulted in the wholesale deskillng of the rural populations by systematically destroying traditional or indigenous methods of agriculture.

A movement of resistance is growing in the world where agro-ecology for food sovereignty is proposed and implemented as an alternative. This movement of resistance is rejecting the agri business control of seed, land, water and the use of questionable technologies like Genetically Modified Organisms(GMO’s). Our animal diversity and livelihoods are also being destroyed by the industrial model of agriculture. Agro-ecology is being presented as an alternative to the dominant model of agriculture. Agro-ecology is a counter movement to empower farmers and farm workers to take control of their natural resources and manage their environment in a sustainable manner. Miguel Altieri defines “agro-ecology as the science of the ecological management of natural resources and the self management of local resources through agro ecological productive practices”. In essence agro ecology is building a community of resistance and emancipation that is based on an agriculture that is ecologically sound, socially and economically just. It is based on the belief that another agriculture is possible and is being developed through struggle.

A section of small scale farmers continue to remain sceptical about agro-ecological farming and regard it as a step backward in agricultural development. It is in this context that this manual was produced to begin in a modest way to address the questions and issues raised by farmers and to challenge the assumptions farmers have about agro ecology and organic farming. It is important to emphasize that organic farming falls within the ambit of agro-ecology. However organic farming has taken on a particular form where certification and a premium on farmers produce are the key considerations. This form of “organic” farming one could argue has shifted to the industrial model of agriculture where the single most important objective is profit maximisation.

The history of this manual needs to be located within this context where farmers have increasingly requested a document on organic farming and how do they proceed with certification. SPP has over the last few years through popular education and practice engaged with farmers on the importance of agro-ecological production. The manual is a first attempt to introduce farmers to an alternative way of farming and also outlining how the organic farming industry operates. In this regard the manual offers only the basic principles to start organic crop and livestock production.
The manual in this sense is riddled with ambiguities and contradictions which stems in part from the form “organic farming” has taken in South Africa. One of these is the issue of certification which goes against the grain of agro ecology and in most cases cannot be afforded by small scale farmers. In this regard SPP and others in India and Brazil are exploring the alternative of a Participatory Guarantee System (PGS) where farmers themselves guarantee or “certify” the agro ecological nature of their produce. The PGS system moves away from a third party system, which is costly, and places farmers at the centre of the certification or guarantee system.

The manual builds on earlier sets of information tools distributed to farmers like the booklet on the “Health Effects of Pesticides on Small Scale Farmers” in 2008. It is also in response to the inability of the state to provide appropriate extension support, research and development and overall support to agro ecological farmers. This is seen by farmers as the state violating their right to extension and support, because nowhere in policy is it stated that support of the state is on condition that farmers should farm in the conventional chemical intensive way.

It is important to highlight from the onset that the manual is not exhaustive and only provides a set of principles for organic farming. It however achieves the aim of addressing the questions frequently asked by farmers on the principles and how to start organic farming. Thus the manual is the first in a series of information tools that would be provided to small scale farmers and farm workers/dwellers engaging in alternative forms of agriculture. The next edition would be greatly enhanced by the agro-ecological learning sites that SPP has launched in 2009 to build a movement of agro ecological practice. The follow up manual would include issues such as farmer to farmer extension, horizontal learnings, resource conserving production systems, water conservation, management and harvesting, seed conservation, traditional seed, seed banks, agro forestry and other practices that falls within the ambit of agro-ecology. In essence it would cover a broader spectrum of agro-ecology based in part on the experiences collectively gained from the agro ecological learning sites.

The manual is divided in two parts covering the basic principles of organic and livestock production. It is hoped that the manual would stimulate debate and steer us as a collective to deepen our theory and practice of agro-ecology. We present this manual with the distinct aim to build a movement of resistance and agro-ecological practice with the battle cry that “Another Agriculture Is Possible”.

Ricado Jacobs
Surplus People Project
Basic Concepts

Organic food and even organic clothes, made from organic cotton, are becoming more popular. This manual is aimed at informing producers about the nuances of organic production, how to become a certified organic producer and to stress the importance of organic production. Organic production implies that the producer works in harmony with nature to produce a better and healthier product and to create a better environment and lifestyle.
WHAT DOES “ORGANIC” MEAN?

The word organic means “coming from or related to life”. Organic material is something which is living or alive or was alive at some or other stage. An example is paper, made from trees which were alive at some stage. Other examples are vegetable peels, decomposing in a compost heap, and yields very good quality organic material.

**Organic cultivation** is aimed at a healthy environment, healthy food and healthy consumers. Organic cultivation is a cultivation method aimed at reaching these targets. If vegetables are cultivated in a healthy environment, the product will be healthier and the consumers using the product will also be healthier and will be able to build a better immunology in their bodies to fight against diseases.

**Organic agriculture** use natural and environmentally friendly methods and materials in agriculture. No chemical fertilizer and pesticides or weed killers are used. Organic producers only use inputs and materials which are of organic origin. A variety of crops or plants are planted together to increase the biodiversity or diversity of life in a production system. It is not the same as biological agriculture, but is more strict and controlled as biological agriculture. Organic farmers make a conscious effort to improve the quality of the soil.

**Biological agriculture** is environmentally friendly and makes use of organic fertilizers and pesticides as far as possible. It allows for the use of added nitrogen to improve the soil from time to time. Sometimes fertilizers or other inputs from chemical origin is used, but its usage is limited.

**Conventional agriculture**

This term applies to agricultural systems and methods aimed at reaching the highest possible plant production, harvest or yield. Excessive chemical fertilizers, pesticides and weed killers are used at will and mainly one crop is planted (monoculture).

**Soil**

Soil and soil health is one of the basic principles of organic cultivation. In conventional agriculture the producer buys fertilizer to add to the soil and plants to increase the yield. The organic producer has to use other pertinent methods to increase soil health to obtain more fertile soil. These methods will be described in this manual. If the soil is healthy, plants are not stressed and will considerably reduce the amount of diseases, fewer infestations by pests and weeds will also be less problematic. It is important that the organic producer understands the soil and working of plants to obtain the best results.

**Biodiversity**

Biodiversity (bio = life; diversity = variety), also known as the variety of living organisms is another important factor in organic agriculture. The organic producer’s aim must be to have as many different living organisms on his/her farm as possible. It includes a variety of insects, birds, small mammals and small predators, as well as a large variety of plants. We call this an ecosystem. If an ecosystem is not in equilibrium (in balance), and there is too much of one type of animal for example, that animal will become a plague. A practical example is if a producer kills owls on his farm, mice will become a plague, because there will be no natural predator for the owls any more.

**Why organic crop cultivation?**

Nowadays people are better educated and informed and more conscious of their health than a couple of decades ago. This caused consumers to become more aware of inputs used on crops for human
consumption and the bad effects some of the insecticides, fungicides and weedkillers have on the human body and health. The inputs are used to kill bacteria, fungi, weeds and insects, but some may be bad for human health. Short term negative effects of these inputs can be detected as a stomach ache after eating fruit or vegetables which have not been washed properly. Long term negative effects such as the increased risk of developing cancer and other pesticide related diseases. Because of increased consumer education and awareness there is a movement towards organic produce, which are not treated with these detrimental inputs. The market for organic produce is on the increase and there are a variety of market possibilities for producers who want to grow certified organic crops. Moreover the environmental destruction of the chemical industrial model of agriculture necessitates a shift towards agroecological forms of production.

Nowadays, when people get sick, they go to doctors who recommend expensive diets. Unemployment in South Africa is high and people cannot afford these expensive diets. Fruit and vegetables treated with chemicals have a lower nutritional value than organic vegetables and also loses their nutritional value quicker than organic foods. The required and necessary nutritional value is not obtained from these vegetables. People who are HIV/AIDS positive have a low immunity and need to improve their immunity through diet. Organic foods will help improve the immune system. Organic foods contain the necessary nutrients which the body needs to be healthy.

Another advantage of organic cultivation is environmental sustainability. Chemical fertilizer used by conventional producers are often applied in excess, resulting in the nutrients being washed into the soil and into rivers, causing pollution. Chemical fertilizers also kill small, living organisms, not visible by the naked eye, in the soil.

Insects - and other pesticides containing poisonous substances, used by producers have a negative influence on nature as a whole. Birds eat insects sprayed with insecticides and die as a result of the poison. This causes a loss in bio-diversity. Conservation of bio-diversity and soil health are contributors to environmental friendly practices and helps to lessen the negative effect caused by climate change.

**WHAT IS A PRODUCER?**

A producer is someone (or a group of people) who are producing, manufacturing or growing something (a product) to sell to consumers.

**WHAT IS A CONSUMER?**

Consumers are people using products produced by producers, or in factories. The person buying vegetables for her family is a consumer.
THE ORIGIN OF SOIL

- Soil is a mixture of weathered rock and decomposing organic material from plant and animal origin. Example - vegetable peels or decomposing bones of dead animals, or dead bacteria.
- Soil forms very slowly, at a rate of about 1 mm per 10 years.
- Soil fertility is the ability of the soil to release nutrients to plants. Many soils contain nutrients, but if the pH (acidity) of the soil is not correct, it cannot release the nutrients for use by the plant.

What is fertile soil?
The organic producer does not use chemical or synthetic fertilizer (made in factories) to improve the fertility of the soil, but instead uses natural forms of fertilizer. Nowadays, with increased awareness of organic cultivation, organic fertilizers are for sale, but often the organic producer has to produce the bulk of his/her organic fertilizers on the farm. The best example is compost; others are green manure or cover crops.

Fertile soil:
A. has the ability to release nutrients in the soil to plants
B. contains a lot of organic material
C. has the ability to keep water bound to the soil particles for longer periods, which means the soil stays moist for longer periods.

Incorrect and unsustainable agricultural practices causes damage to the soil structure and is one of the causes of erosion. It takes thousands of years for soil to form and the wrong cultivation methods can destroy soil very quickly. It causes the fertile topsoil to blow or wash away through erosion.

Soil erosion occurs when the soil is:
- overgrazed
- the wrong irrigation practices are used
- Plant cover on the soil is destroyed
- cultivated incorrectly

A. The ability to release soil nutrients to plants
Soil contains nutrients. Sometimes the nutrients in the soil is in a form which makes it unavailable for uptake by the plants. The soil holds the nutrients and plants cannot take it up and use it for growth and development. Soils holding nutrients, and in the process making it unavailable for plant use is called infertile soil. If the soil has nutrients and can make it available to plants, or can change the nutrients to such a form where it is possible for the plant to take it up, it is referred to as fertile soil.

Bacteria and fungi are present in all soils, but it is so small and cannot be seen with the naked eye. Some soils have more fungi and bacteria than others. Some bacteria and fungi are bad for plants and cause diseases, but others are to the benefit of plants.

Why are bacteria and fungi beneficial to the plant? Bacteria and fungi can help to change nutrients in the soil to a form which is available for uptake by the plant. Therefore we can say it makes the soil more fertile. Fertilizer (used in commercial agriculture) kills beneficial bacteria in the soil and in the long term the soil loses its fertility because the bacteria making nutrients available to the plant is no longer present in the soil. Compost contains large numbers of beneficial bacteria and fungi which is beneficial to the soil.
Types of soil organisms:
- Earthworms
- Arthropods
- Bacteria

a. **Earthworms**
   - Earthworms improve the penetration of water and air in soils.
   - Earthworms operate much better in the soil than machines, like ploughs and tillers, and mixes soil, putting air into the soil.
   - The faeces of earthworms, which is soluble in water contains a lot of nutrients.
   - An earthworm population can easily process 10,000 kg or 10 tons of top soil per year.

b. **Arthropods**
   - Arthropods are primary decomposers.
   - They eat and decompose the larger parts of plant and animal rests.
   - Some kinds eat smaller soil organisms like fungi. Examples of such organisms are collembolas, springtails and millipedes.

c. **Bacteria**
   - Most abundant of all soil organisms
   - Some species assist plants in taking nutrients from the soil
   - Some species release nitrogen, sulphur and micro-elements from organic material for use by plants
   - Some species can fix nitrogen
   - Breaks down soil nutrients and releases potassium, phosphate, magnesium and calcium
   - Increases the solubility of plant nutrients in water, improves the soil and fights root diseases.
B. Organic material

Organic material is any material which is living or from living origin. In other words, it was alive at some stage. Examples are dead and decomposing plant material, plant roots and compost. This material contains nutrients which are released for uptake and growth by the plant. Organic material in the soil contributes to the fertility of the soil. Soil which is rich in organic material is black in color and has an earthy smell. Sand contains little or no organic material; no black color or earthy smell.

C. The ability to hold water for longer periods, or soil stays moist for longer

One of the properties of organic material (as described above) is to hold water for longer periods than soil without organic material. To hold water for longer periods means that the soil stays moist for longer periods, water is used more efficiently and crops needs to be irrigated less frequently. Sandy soils do not stay moist for long because it contains little or no organic material.

The function or purpose of the soil is also to store water and make it available to plants for growth and development. The ability of soil to hold water is known as the water holding capacity.

Factors influencing the water holding capacity of soil:
- Amount of organic matter in the soil
- Soil texture
  - sandy soils hold little water
  - clay soils hold more water
- Soil cover
  - soil not covered with vegetation (plants) absorbs less water and the water runs off quickly
- Rainfall
  - type of rainfall
    - hard rain, where the water runs off quickly does not wet the soil properly
    - soft, penetrating rain waters the soil better and deeper

HOW DO I BECOME AN ORGANIC PRODUCER?

Producers wanting to become organic growers or producers must have knowledge of the system and related requirements and regulations. The system refers to the following factors:

1. What is expected from an organic farmer
2. Which inputs are allowed and which are prohibited in organic agriculture
3. The production methods used in organic agriculture; why and how it is used
4. How to register as a certified organic farmer
5. How to market organic produce to get the utmost advantage for the producer
The organic producer has to obtain a set of the organic regulations from the certifying body they want to register with. The aim in this regard is to supply the producer with the same information as is given in the regulations. The regulations can also be obtained from the organic certification body.

The decision is with the producer to register as organic or just to produce their products organically. If the producer is only an organic producer, without being certified, he or she cannot sell the products as certified organic and get a possible advantage of a higher price. Certification or registration takes place through one of the organic certification bodies (a list appears at the back of this manual). An annual fee is payable to the certification body and an inspector is sent out to the farm to ensure the producer adheres to organic regulations. Inspections take place annually.

Certified organic producers receive a membership number and logo of the certification company, which they have to show on the products to sell it as certified organic. Producers are then legally certified as organic producers and have to adhere to the organic regulations to remain certified organic producers. The entire farm of a producer can be certified, or a portion or any number of crops. There has to be a clear distinction between certified organic crops and conventional crops. This remains one of the areas that small scale farmers and consumers have to challenge, particularly the cost involved in certification. In Brazil and India the Participatory Guarantee System (PGS) is used where farmers guarantee or certify the agro ecological or organic status of their produce.

Below are examples of how producers can certify their production units:

1. **Question:** Producer A has 6 hectares where she keeps 12 sheep and two cows. She has 1.5 hectares under vegetable cultivation and 500 orange trees. She only wants to certify her vegetables. Is that acceptable?
   **Answer:** Yes, the vegetable cultivation can be separated from the rest of the production and only the vegetables can be certified, as long as the producer adheres to the organic regulations.

2. **Question:** Producer B has 3 hectares of vegetables. One hectare potatoes, one hectare lettuce and one hectare tomatoes. He only wants to certify the potatoes as organic. Is that allowed?
   **Answer:** Yes, the potatoes can be separated from the rest of the vegetables and can be certified and marketed as organic. The producer has to keep record of the inputs, land use and crop rotation plan, because the soil should not receive conventional inputs.

3. **Question:** Is Producer B allowed to certify only 0.5 ha of potatoes and not the additional 0.5 ha?
   **Answer:** No, because it is not possible to proof that the producer does not mix the organic and conventional potatoes.
Requirements for producers to fulfill before certification:

- Complete a detailed form about the cultivation methods and inputs used on the production unit or farm.
- Keep complete records of the production history of the farm, with maps included - which crops were produced on which fields and when.
- Complete sets of documents are required to show which crops were produced on which fields and the amount of inputs used for the fields. It is quite easy to do it on a map. Inputs include compost and manure.
- No disallowed chemicals should be used – that is fertilizer, pest control and weed killers.
- A transition (conversion) period at the beginning of the certification is applicable - two to three years, depending on the crop being cultivated.
- The certification authority will send an organic inspector to the farm to gain information about the cultivation system on the production unit and to check the records.
- A certification committee (from the certification authority) will make a decision whether the farm can be certified organic and make recommendations regarding changes and improvements.
- Audits or inspections take place annually and an annual licence and inspection fee is payable. This will allow the producer to use the organic emblem.

WHAT ARE INPUTS?

Inputs are products used by the producer on the farm or production unit to produce crops. It may include fertilizer (compost), certified organic nutrients, pest control, weed control and fungicides.

WHAT IS A TRANSITION PERIOD?

It is the time it takes [determined by organic regulations] to switch from conventional agriculture to organic agriculture. The transition period STARTS when the producer applies for certification, regardless of how long before the producers have started following organic production methods. Transition is two years for annual crops like vegetables and three years for annual crops like fruit and olive trees.

The producer may apply for a shorter transition period if he/she can prove that no disallowed or prohibited materials have been used for a number of years.
A. ORGANIC PRODUCTION METHODS FOR HOUSEHOLD GARDENS AND SMALL PRODUCTION SYSTEMS

There are various methods for cultivating vegetables organically on a small or non-commercial scale. The three most important and popular methods will be discussed. The methods contribute to the soil fertility and will have definite advantages for vegetable cultivation. These methods are also helpful when money, water and soil is a limitation. Vegetables cultivated in this manner will be healthier than conventionally produced vegetables.

1. TRENCH BED METHOD

Make a hole in the ground. Fill the hole with organic material and soil. It is possible to plant immediately in a bed prepared in this way.

Digging a trench

The trench should be 1 meter wide, two meters long, with a depth of 50 cm (knee depth). Make a distinction between the top and bottom soil. Separate the two soil types, because the topsoil is more fertile than the bottom soil (more organic material originating from roots).

Hint!
Always dig the trench from east to west. This ensures that plants receive adequate sunlight throughout the day. If dug from north to south, the bed will get too much shade. If there is not enough space to make an east-west bed, it may be done in a north-south direction. Make sure the beds are level, with a slight gradient to allow water to flow downwards, but only very slowly so that the soil does not wash away and cause erosion.

If the soil is at a steep incline (gradient) there are ways to dig the bed to overcome it.

When there is a moderate incline, the beds can be made to obtain a step effect, as illustrated in Figure 1. The steeper the incline, the more “steps” can be created in the 2 meter long bed.

Figure 1

Land: bedding preparation on a mild or slight gradient.

Develop a terrace as illustrated here (right), should you have a steeper gradient.

Bedding preparation on a steeper gradient.
Filling of the Trench bed

Fill the trench with organic material (garden refuse, vegetable peels, egg shells, egg cartons). Do not use plastic, rubber or glass in the trench. Animal manure (sheep, cattle, goats, chickens and pigs) can also be used, but do not use cat or dog manure, raw meat or fat.

1. Fill the hole half full with the material mentioned.
2. Place rough material such as branches, maize cobs, straw and dry grass at the bottom. This ensures good air flow through the system.
3. Place about six small, squashed and rusted tins on top of the rough material. This is to supply the micro nutrients (nutrients needed in very, very small amounts) such as zinc and iron to the soil.
4. Cover the tins with a layer of newspaper or carton, cut or torn into smaller pieces.
5. Add the rest of the organic material (organic kitchen refuse, etc).
6. Compact the material and add more organic material if the trench is not yet full.
7. Sprinkle some dry animal manure over. This provides the necessary bacteria needed to start the decomposition process of the organic material.
8. Wet the material in the trench properly, using a garden hose or bucket. The dampness will assist in the decomposition process.
9. Cover the organic material with the soil from the trench. This will prevent bad smells and flies during the decomposition process. Fill the trench with the soil taken out - bottom soil first and then top soil. Do not stand on the bed.
10. The filled trench should be about 15cm above the soil surface.

11. Mark the four corners of the trench bed with sticks to keep the shape and area of the trench.
12. The soil on top of the trench or bed should be fine and loose and can be loosened further with a rake.
13. Any other soil left over can be used for making compost.
14. If the bed is prepared with enough organic material it will be sufficient to supply nutrients to the soil for ± 5 years, without adding more organic material.

Figure 2

Figure 3

Figure 4

Figure 5
As time goes by organic material will decompose further. At the start of the bed it will be higher than ground level, but as the organic material decomposes and nutrients are used by the vegetables, the height of the trench will decrease and will become level with the soil (closer to the end of five years). The area adjacent to the trench can be turned into a trench after five years.

How is the soil improved?

• Organic material helps the soil to keep moist for longer. The soil drains well, water penetrates deeper and the soil holds moisture for longer, because there is more organic material in the soil.
• Root systems of plants develop better and deeper and gives origin to healthier plants.
• Organic material and better soil penetration by roots which aerates the soil attracts earthworms. Earthworms assists in the decomposition of organic material which add to soil fertility.
• More air in the soil supplies more oxygen to the roots which is available to plant roots for growth and respiration.

Some farmers may have larger pieces of soil and would want to plant more vegetables to sell. They can make a couple of beds, or beds can be longer than 2 meters, but should never be wider than 1 meter. Reasons for this is:
• Narrower beds are easier to water
• It is easier to examine plants for pests and diseases and to weed the bed
• Plants can be easier and more effectively protected against animals and birds
• If it is possible not to walk on the soil in the bed it will prevent compaction of the soil.

Advantages of the Trench bed method

It is a cheap and effective method, producers do not need to buy nutrients or fertilizer. Because the crop is healthier it will suffer less attacks from pests and diseases and the cost for pest control will be less.

This method yields more and a higher quality crop for the following reasons:
• Organic material used at the bottom of the trench acts as a sponge which takes up water and releases it as needed by the plants. It uses less water.
• Organic material attracts beneficial insects.
• It saves money using less nutrients and pest control.
• Income can be generated by selling good quality vegetables, or producers can produce their own vegetables, cutting cost by not having to buy food.
• Organic “refuse” is used to fertilize the soil.
• By using organic refuse, the environment is kept cleaner.
• This method yields more vegetables per unit area than conventional methods.

2. STACKED BEDS

In areas where it is impossible to make holes in the soil, or dig a trench, stack beds are used. This method can be used successfully by physically disabled individuals; those in wheel chairs who still want to cultivate vegetables. The method has the same advantages as the trench bed method because it saves water and the organic material added to the soil yields higher amounts of vegetables per unit area. The stacked bed method is applied when the topsoil is topped up to supply more fertile soil to the roots of the plant.
The starting process for stacked beds is the same for trench beds (see page 12, BUT start at number 2. Follow the instructions through to point number 8. Take soil from around the stacked bed (about the width of a spade) and put this on top of the organic material. The level of the bed will be at a higher level than the surrounding soil, but has the same advantages in the sense that it will also be useable for approximately 5 years.

3. CONTAINER PLANTS

The container method is very useful where garden soil is a limiting factor. In this method, containers are filled with organic material and a layer of soil is put on top of the organic material. Remember to wet the organic material properly before adding soil on top. Plant seedlings in the containers. The most common containers for use is car or truck tyres.

The method is useful for the cultivation of potatoes and carrots.

- The method can be adapted for the type of crop cultivated by stacking up to 5 or 6 tyres on top of each other
- When the potatoes have finished flowering and the leaves turn yellow, the potatoes are ready for harvesting.

About 5 to 6 kg of new potatoes can be harvested from one set of tyres. Big black rubbish bags and drums can also be used for planting potatoes.