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## Agriculture

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#### 1. **Earthworms and their benefits to the farmer.**

Earthworms are one of the most useful little creatures that one can have in the soil. With over 4000 species worldwide it is no wonder real research has only been done on about 15 species . The most common one is Eisenia foetida or Red Wiggler as it is commonly known . Some call this variety 'Kariba' worms .

The reason for using this earthworm is that it can stand temperatures from 0 deg. C . up to about 36 deg.C., it breeds very fast, doubles it's population every 30 to 60 days, and lives above ground in any organic matter . This, together with its ability to maintain a high population density, makes it ideal for earthworm farming.

The presence of earthworms in the soil are an indication of good healthy soil which is rich in organic matter. The ideal earthworm count are 250 to 300 per sq. m . and that will give you, on top of other nutrients, 80 to 100 kg N per Ha. for free . Cultivation does not affect their population but cultivation depletes the soil of organic matter which in turn starve the earthworms and reduce their population. The earthworms positive impact on the population of other organisms like bacteria, actetemicide and fungus is also an important factor for good healthy soil.

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#### 2. **How to make and use earthworm casting as fertiliser in organic farming.**

Earthworm castings or vermicompost, can be produced from any organic waste. Waste such as animal manure or garden and kitchen waste can be fed to the worms . A small "kitchen unit " or a larger "garden unit " from Affmech cc. can be

used to process small amounts of waste, for large amounts a windrow system is used .

Vermicompost a natural organic fertilizer which can be used on all crops without fear of 'burning' the plant, even seedlings. It contains all the natural hormones a plant needs and as it is slow release, fungal disease and insect damage are minimal. A very small amount is needed in comparison to ordinary compost and the recommendations are 6 cubic m/ha or 600 gm/sq.m . On seedlings ,10 - 30 gm per plant are enough to give it a good start. With good management, most crops can be grown with vermicompost.

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### 3. **How to convert from conventional to organic farming.**

Our experience and that of others, is that the most difficult part of changing to organic farming is the paradigm shift. As somebody once said; An organic farmer is an " oddball with a thick skin " and this is very true. It is very difficult to change from "chemical" farming to organic as there is very little research done and no real support. In addition to this the NPK ghost continues to haunt, as do all the easy "cures" you are used to spraying.

One of the first things an organic farmer has to come to terms with is the fact that all problems with growing crops arise from mismanagement of the soil and the environment. This means that the first thing one has to do is get the soil right. Cover crops, mulching and no or the absolute minimum tillage of soil are the keys to good and healthy crops. The perception that organic crops cost more to produce, that they are of inferior quality and that they should be sold for more, are not true. Yes, if one farms in the conventional way by composting outside the fields in bins or heaps and by turning it etc. and then carting it back into the fields, it is more costly - which must have an impact on market value. We use a different method that works well and costs less than conventional methods. The composting of animal waste with earthworms is done in windrows outside the fields and as about 6 cubic m per ha are needed when band placed or broadcasted, the amount of material is less to handle. With enough organic matter on and in the soil the situation quickly arises that very little or even no external assistance is needed.

As in conventional farming one must look for deficiencies in crops and soil and these have to be attended to. Unfortunately we have no source of soft rock phosphate in this country but adequate results can be obtained with bonemeal. Rock potash is not a viable source either so KCl can be used together with lime. Trace elements and minerals can be used as most of them are available in a natural form. No nitrogen deficiency will be experienced with enough organic matter in and on the soil providing it is not ploughed in. Yields as good or nearly as good can be achieved once the soil has recovered.

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### 4. **How to make compost and use mulch.**

The only way to produce good conventional compost is to have a source of animal manure plus lots of organic matter stacked in layers with humus rich soil with a high soil bacteria and organism count .The temperature in this compost should never be above 55 deg.C as above this all the living organisms will be destroyed. To control this the compost has to be turned regularly, or aired in some manner,

which is very time and labour intensive. The method we prefer is to use earthworms on animal manure and other organic material as a mulch in the fields . This is less labour intensive and the earthworm composting can be done close to the source of manure. Any type of manure can be used but chicken and pig have additional requirements due to high ammonia levels. The earthworm compost or vermicompost is full of organisms that are beneficial to the soil and once they are in the soil, together with the conventional soil earthworms, the organic material will be converted to humus in a very short time.

For large scale operations there are mechanised solutions available to plant seeds or seedlings in mulch. The most important thing is never to turn the soil. A narrow tine may be used but only at a slow speed and when absolutely necessary . The reason for this is that every time you turn the soil, the organic matter gets destroyed by the hot sun and the whole object of composting is defeated.

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#### 5. **Disease and their control in organic farming.**

Diseases in crops are of big concern when organic farmers have conventional farmers that use chemical control as neighbours. Not only do they have to cope with drift from insecticide and herbicide spraying but they also have to contend with the problem of beneficial insects being killed by the sprays. Additionally blight and rust etc. in abandoned crops will have the affect that the spores may get blown onto your crops. All this is besides instances where fruit flies and other insects that are hosted in wild growing fruits and berries growing closeby. Unfortunately none of these problems have easy solutions. Ideally buffer zones should be put in place around your fields, or (in Nirvana) all the adjacent neighbours should convert to organic methods.

We overcame these problems by taking into account the prevailing winds for spores and co-ordinating with neighbours on what crops to grow when and where. After 3 years we found that as the soils improved the incidence of disease and pests decreased. The only way to control disease is to have all the relevant micro-organisms in the soil. In China farmers have been planting tomatoes on the same fields for 400 years without disease by spraying the necessary microbes on the crops. The biggest carrier of disease is water soluble nitrogen of any form. Large scale application of cattle, chicken or pig manure will cause disease in the same ways as chemical fertilisers do, as the nitrogen is instantly dissolved in water which makes the plant susceptible to disease. As earthworm castings are not water soluble, this problem does not occur when farming with vermicompost.

We have recipes for organic sprays, although these are now seldom put to use.

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#### 6. **Organic vegetable farming.**

Organic vegetable farming suffered for a long time under the misconception that you have to pay more for poor quality vegetables . In certain instances this is still true where small scale gardeners grow some vegetables part time and sell it on the open market. A contributing factor to this is the belief that permaculture (with 'companion' planting) is the only way to grow vegetables. Larger vegetable farmers believe it impracticable and are not interested in doing organic farming. Permaculture has it's place in rural subsistence farming where labour is not a factor. In our opinion we have serious doubt about the sustainability of this

system and whether it is an economically viable practice. When I first started growing organic vegetables this was how I did it but as the area under crops got bigger the companion planting and the whole permaculture method proved too labour intensive, and failed.

We have found that the method that works best is a no till system with heavy mulching using vermicompost as fertiliser. Using this method large fields can be grown and good crop rotation can be implemented . Yields under this system are as good is, if not better than that produced by conventional methods. Additionally the vegetables are of good quality, and exhibit long shelf life. There is also evidence that they are more nutritious than chemically grown crops.

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#### **7. Organic herb, medicinal and culinary herbs.**

For organic herbs the same method of cultivation is used as for vegetables, with a few exceptions. As most of the medicinal herbs are of European origin, planting times are critical. It is not only the northern and southern hemisphere difference but also length of daylight and rate of growth . Crops that are bi-annuals in Europe will flower and seed in 6 months here which affect root crops and result in reduced yield. Autumn planting instead of spring planting can increase the yield by 300% .Foliage crops on the other hand give a much higher yield as the long growing season benefits them but additional vermicompost may be needed. Up to 3 additional light dressings of vermicompost may be needed to give good quality crops and a very good crop rotation program must be adhered to. Some trace elements are also more crucial in herbs than in vegetables . The pH of the soil is also of paramount importance as some herbs originate from the mountains of Europe where the soils have a very low pH. .

Most of the herbs require similar conditions to that required by vegetables and some even grow well in very poor rocky soil.

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