The Organic Farmer

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Conventional versus organic agriculture

Maize under organic and conventional farming systems at KALRO Thika: *Results of 6 years of study have shown that organic farming systems can give higher yields and income to farmers after the initial conversion period. Profitability of organic farming system is also higher especially when farmers are given premium prices for their produce.*

Organic agriculture can feed the world

TOF - Organic farmers can get the higher crop yields as conventional farmers if they observe good organic crop management practices. Organic farming also improves soil fertility and increases farm productivity and income for farmers. These are the findings of the first six years of the Long- Term System Comparison Trials (SysCom) that are going on in Kenya, aimed at

comparing the performance of maize, beans and other crops when grown under conventional practices and organic practices where farmers use on-farm resources to grow food crops using natural and environmentally friendly methods to improve soil fertility and control pests and diseases).

More yields, more profits

The results of the study show that organic systems start to give farmers better returns than conventional farms after three years during which the soils in organic farms build fertility and structure and start giving higher crop yields. The results also show that organic farming system can give the same crop yields including profits as conventional farming system. However, organic farmers stand to earn more if organic produce is sold at a premium price due to its health benefits.

"Our results show that soil under organic system, had soil fertility improve significantly in calcium, magnesium, and potassium and soil pH. Furthermore, the profitability was similar in both systems, but when premium price was considered, organic farming was more profitable starting from the fifth year," says Dr. Noah Adamtey the SysCom Project Coordinator.

Organic controls nematodes

The results show that organic SysCom also can suppress Plant Parasitic Nematodes (PPN), which damage crops, much better than conventional methods. Organic systems were also found to increase the number of termites in the soil.

On-farm trials, which are going hand-in-hand with on station research have enabled participating farmers adopt some of the technologies being used in the trials which they practise in their farms. The farmers have learnt how to improve the quality of compost, fodder production, maintaining hygiene in animal sheds and fodder conservation and recycling of farm waste.

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Dear farmers,

For many years now, organisations campaigning for adoption of organic agriculture into the Kenya's national agricultural production systems have been viewed more as activists than people with genuine agenda for improvement of agriculture. However, with the release of partial results of the ongoing Farming Systems Comparison trials (SysCom) that are meant to compare the performance of organic and conventional agriculture, all preliminary indicators point to organic agriculture as best system that can revive the depleted soils, which have led to declining agricultural production across the country caused by overuse of chemical fertilizers.

In spite of these findings, it may not be easy to change the mindset of our policy makers to encourage farmers to adopt organic agriculture. Currently there is a very strong push for promotion of conventional agriculture mainly by vested interests despite all indications showing that some of the methods pose great threat to our soils and country's ecosystems. The agricultural sector in Kenya is dominated by big multinational companies selling chemical fertilizers, pesticides, fungicides and other inputs. These companies hold sway at the highest level of government since tendering for fertilizers involves a lot of vested interests that influences decision making.

Luckily, agriculture has been devolved to the Counties and this should be the focus of any effort that seeks to encourage organic farming and other sustainable agriculture initiatives to farmers. More than 80 per cent of Kenya's farming population lives in the rural areas where 64 per cent of the population depend on agriculture as a source of income. Rural areas have become centres of poverty due to environmental degradation and depletion of soils, deforestation and other destructive farming practices.

Another big issue that is facing organic farmers is that although organic produce is healthy and beneficial to the environment there is no differentiation in the market because many are unable to pay for certification in order to sell their produce as organic. There is need to complete the organic agricultural value chain through support to farmers in certification of their produce in order for them to get premium prices. This is the only way more organic farmers can be encouraged to produce for the market.

Long Term Farming Systems Comparison Trials (SysCom)

Organic farming system is effective in cont

The results show that organic farming systems can reduce the need to buy expensive and poisonous chemicals to control PPN nematodes while conventional PPN control has negative effect on the soil ecosystem.

Peter Kamau | Insects and other microorganisms in the soil play an important role in soil health, plant life and the environment. The insects and soil microorganisms are very critical to any healthy ecosystem. The most common insects found in the soil are termites, earthworms and nematodes (though these are barely visible with the naked eye). Thousands of microorganisms such as bacteria, fungi and viruses also live and interact and create an ecosystem in the soil.

They recycle nutrients, dig or burrow tunnels that allow air into the soil structure and in the process increase the activity of microbes in the soil. The presence of these microorganism is essential for the proper functioning of the ecosystem because they help break down and add organic matter into the soil structure. All plants and even crops we grow rely on mycorrhiza fungi which facilitate the release of nutrients to feed the crops and enable them to grow well while regulating the amount of moisture in the soil.

Most chemicals used in conventional farming kill beneficial organisms in the soil.

However, the activities of these soil organisms can be severely affected in conventional farming systems where chemical fertilizers and pesticides are used to enrich the soil and control pests and diseases. It is against this background that the ongoing Long Term Farming Systems Comparison trials (SysCom) of comparing conventional and organic farming to determine the effect the two systems have on termites and nematodes were setup. These two soil organisms that are considered as pests also play an important role to the environment.

Termites can be destructive to crops and wood based products, but they play a very important role by breaking down wood material and converting it into organic matter. All species of termites have bacteria in their digestive system which help break down wood material (cellulose) that they feed on. They also create tunnels that help to aerate the soil by allowing oxygen to get into the soil for use by other living organisms in the soil.

Nematodes are classified in two groups- the Plant Parasitic Nematodes (PPN) that cause great damage to many crops including beans and maize and the Free Living Nematodes (FLN) which are beneficial; their presence in the soil is taken as an indicator that the soil is healthy. Scientific studies have established that organic farming systems can reduce the destructive PPN nematodes in the soil to a level that does not cause damage (*Farahal and others, 2012*). When chemicals are used especially in conventional systems to control PPN nematodes, they have been found to affect the beneficial (FLN) nematodes (*Neher, 1999*).

Photo: IN

Termites in a nest: *Organic farming systems have been found to increase the number of termites in the environment, enabling them to break down organic woody material and aerate the soil.*

In the ongoing Long Term Farming Systems Comparison Trials (SysCom) two studies - *Effect of farming systems on termite abundance and damage on maize crop* and *Field evaluation of soil nematode communities under organic and conventional farming systems* are being done to determine the effects of organic and conventional farming systems on termites and nematode abundance in scientific experimental sites and farmers' fields at KALRO-Thika and Chuka.

Termite experiments

During the study, four experimental plots were put under different organic and conventional treatments. Two of the plots were put under Organic High (Org. High) and Conventional High (Conv. High). The remaining two plots were placed under Organic Low (Org. Low) and Conventional Low (Conv. Low) and repeated 4 and 5 times in Chuka and Thika experimental sites respectively.

In the Conventional High plots, 7.5 tonnes of Farm Yard Manure (FYM), 225kg of DAP and 100kg of CAN were applied on maize per hectare. Chlopyrifos chemical for termite control was used as recommended in conventional production system. In the Organic High Plots 11 tonnes of compost, 5.4 tonnes of tithonia and 364kg of rock phosphate and 3 tonnes of dry grass for mulching were applied in one hectare of maize crop. For pest control 2kg of *icipe 69* biological pesticide and fungicide was applied for termite management.

In Conventional Low (Conv.

The Organic Farmer is an independent magazine produced monthly for the East African farming community. It promotes organic farming and supports discussions on all aspects of sustainable development. The articles in the *The Organic Farmer* do not necessarily reflect the views of ICIPE nor Biovision Foundation.

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Long Term Farming Systems Comparison Trials (SysCom)

trol of destructive nematodes

Low) plots, 5 tonnes of Farm Yard Manure (FYM) and 50kg of DAP fertilizer were used per hectare. In Organic Low (Org. Low) plots, 5 tonnes of compost 1.4tonnes of tithonia and 100kg of rock phosphate were applied. During the experiments, the number of termites was determined weekly from the soil surface and at different soil depths and termite damage assessed in every plot.

The results showed that the number of termites were higher in Organic High (Org. High) in Chuka than in Thika. The overall termite damage expressed as a percentage was higher in Organic High plots Thika (6%) than in Chuka.

Conclusions

The results showed that at high input level, the number of termites was higher in organic than in conventional system while there was no difference at low input level. This could be due to the incorporation of crop residue, mulches and compost in Organic High plots which are preferred by termites. Although the number of termites in the Chuka sites were high in both Organic High and Conventional Low plots, both sites had the same termite numbers as Conventional High and Organic Low systems- a difference that could be due to woody material, crop residue and solid compost (Organic High) and raw manure used in Conventional Low.

The Chuka site had more termites yet there was little damage to the maize crop unlike in Thika which recorded moderate damage of the maize crop. This could be due to site soil characteristics and termite species and scientists recommend further research to the cause of these differences. Much of the termite damage at Thika occurred when the maize was at knee height stage for organic treatments and conventional Low. But since the high termite numbers caused no damage in Chuka, further studies were recommended to assess the potential effect of soil moisture, rate of organic matter decomposition and the weather.

The study on nematodes was meant to identify and characterize the different species of nematodes in Chuka with the aim of determining the effect of organic and conventional systems on nematode abundance and diversity on the maize and beans intercrops.

Nematode experiments

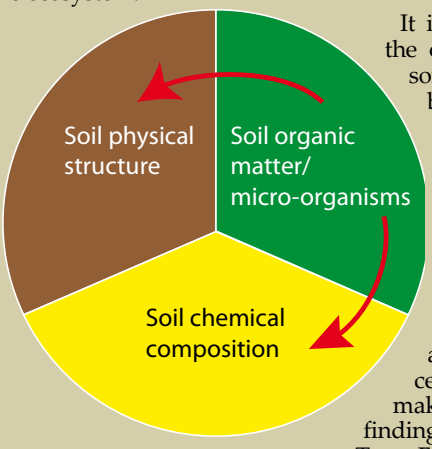
The experiment was conducted in 5 experimental plots under conventional and organic treatments and in farmers' fields in Chuka. Soil sampling was done at planting, flowering and on plant roots at harvest and the nematodes identified and put in categories such as bacterivores, fungivores omnivores, predators and Plant Parasitic Nematodes (PPN). A total of 29 nematodes were identified during the trials.

Organic farming systems better in control of destructive nematodes

The results in Chuka showed a high diversity of soil nematodes. Plant Parasitic Nematodes (PPN) were not different in both conventional and organic systems but they were fewer in organic system which may be due to their being suppressed by organic inputs or amendments used. Bacterivores nematodes were significantly higher in organic system compared to conventional systems- this is possibly due to the presence of manure and tithonia, which promote soil microbes and compost, which also increases beneficial nematodes in the soil. The absence of predatory nematodes from the conventional system may suggest that conventional inputs or chemicals kill beneficial nematodes which has a negative effect on natural control of crop damaging nematodes (PPN). The results show that organic farming systems can reduce the need and cost for expensive and poisonous chemicals to control PPN nematodes while conventional PPN control has negative effect on the soil ecosystem destroying beneficial predators. The findings also show that organic farming system is effective and it is the best way to management of both PPN and FLN nematodes.

Organic farming system improves soil health

The use of chemicals to control pests in crops has had great impact on the environment, human and animal health. Chemicals do not only affect the targeted pests but also have more disastrous effects on microorganisms in the soil, which play a very important role in creating the right conditions for all plants to grow. The soil on which we grow crops is full of living microorganisms such as viruses, bacteria, fungi, algae, protozoa mites, nematodes, worms , ants, maggot and grubs and other large animals. All these micro organisms form what is called the soil biota. Together with climate, microorganisms are responsible for the decay of organic matter and the recycling of both macro and micro nutrients back into a form that the crops and other plants can use for growth. The activities of these living microorganisms enable the soil to acquire all the right conditions for plant life building a better soil habitat and improving the soil structure, texture, productivity and while improving the overall health of the ecosystem.



Soil should not be disturbed

A well-aerated soil has a good structure which enables the uptake of oxygen for use by the microorganisms, which helps increase their population and the overall health of the soils. This helps to clean the air and water in the soil, increasing the activities of these organisms.

It is important to note that the organic matter including soil microorganisms control both the physical structure and chemical processes that take place in the soil (see diagram left).This means that to have a healthy soil, the organic matter and other life in the soil should remain undisturbed as they determine and control all other processes and structure that make up the soil. The interim findings of the ongoing Long-Term Farming System Comparison Trials (SysCom) confirm this. Organic farming is the only sustainable system of farming that restores soil fertility, maintaining soil structure and ensures a healthy ecosystem that improves farm productivity.

Chemicals destroy natural balance

However the use of synthetic chemicals has serious consequences for the soil organisms and microorganisms because they kill both the harmful and beneficial bacteria, fungi, earthworms and all other soil organisms disrupting the natural processes that sustain and feed the soil. When beneficial soil organisms are eliminated, this disrupts the natural process of replenishing and nourishing the soil resulting in an imbalance in nutrients, loss of natural predators and destruction of the soil structure.

Organic farming inputs protect soil microorganisms, allowing them to function as they should hence building soil fertility and maintaining a natural balance between predators and harmful microorganisms and restoring nutrient balance.

Peter Kamau

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Long Term Farming Systems Comparison Trials (SysCom)

Organic farming improves crop yields and income

Earnings from organic farming system start to increase from third year, reaching Ksh260,000 per acre by the sixth year.
This is a total increase of 53 per cent against that of conventional system at Ksh 192,000 per acre.


Photo: Peter Lüthi

Mr Edward Karanja (left) a senior research assitant at icipe monitors soil moisture in an experimental plot at Chuka SysCom trial site in Meru County.

Peter Kamau | Farmers practising organic agriculture can improve soil fertility, productivity and income more than those using conventional methods of crop production. They can also get higher crop yields than their conventional counterparts if they maintain proper organic crop management practices. These are findings and partial results of the first six-years of long-term experiments comparing the two farming systems at two sites in different climatic (ecological) zones in Thika and Chuka in Kenya, which were released in June 2016. The aim of the trials is to compare conventional and organic farming systems to find out which of the two is the most suitable farming system in Kenya and other tropical countries.

According to the results of the on going Long-term Farming Systems Comparison trials (SysCom) being led by the Research Institute of Organic Agriculture (FiBL) Switzerland and partners including the International Centre of Insect Physiology and Ecology (icipe), The Kenya Agricultural and Livestock Research Organisation (KALRO), Kenyatta University (KU), Tropical Soil Biology and Fertility Institute (TSBF-CIAT), The Kenya Institute of Organic Farming (KIOF) and the Kenya Organic Agriculture Network (KOAN), there were differences in soil fertility levels in experimental plots under organic treatments (where only inputs such as compost, tithonia, rock phosphate and, organic fertilizers and biopesticides were applied) and conventional plots (using chemical and organic inputs such as fertilizers, pesticides and fungicides).

Research findings

The results show that organic farming gives higher crop yields in the long term. Organic farming also protects soils and biodiversity which is key to the survival of all ecosystems and in extension life in our planet.

In the Thika site, 20 plots were put under different organic and conventional inputs. The conventional plots were divided into Conventional High (Con. High)-where the crops were provided with all chemical inputs and supplemented with limited organic fertilizers and related inputs as recommended by Kenya's Ministry of agriculture and irrigated when the rains failed to ensure consistency in data) and Conventional Low (Con. Low)-where the crop were provided with limited chemical and organic inputs as practiced in small-scale farming system in Kenya but no irrigation was provided).

The organic plots were also divided into Organic High (Orga. High)- where only organic inputs were used as recommended by the Kenya Organic Standards and crop irrigation and Organic Low (Org. Low) where limited organic inputs were used in the same way farmers practice organic farming, with no irrigation. Organic farmers in Kangari, Makuyu and Chuka had access to the experimental site to learn and replicate what they had learnt in their farms.

Maize, beans, cabbage, baby corn, French beans, potatoes and grain legumes were planted in rotation in all conventional and organic plots in three-year cycles and their performance, including yields recorded.

In Conventional High plots, 225kg of nitrogen per hectare (90kg of nitrogen per acre) and 286kg of phosphate (114kg of per acre) fertilizers were applied with pests and diseases controlled by use of chemicals. In Conventional Low plots, 45kg of nitrogen (about 1 bag of nitrogen per acre) and 60kg of phosphate (about 1 bag per acre) fertilizer were applied and pests and diseases controlled with chemicals.

A field assistant helps Martha Wairimu (right) a farmer participating in SysCom trials to test moisture levels of her beans after harvest.

In Organic High plots, organic inputs used were mainly compost, tithonia, liquid manure and rock phosphate. Nitrogen was further provided through an intercrop of *Mucuna pruriens* (for maize) and its residue ploughed back to provide nutrients to the relay crops of beans and other grain legumes (the intercrops and other organic inputs provided 225kg of nitrogen/ha and 286kg phosphate organic fertilizer; organic pesticides and fungicides were also applied and the crops put under irrigation when necessary. Well-prepared compost was regularly applied to boost soil fertility in Organic High plots. In Organic Low plots, organic inputs such as compost, pests and diseases were controlled in the same way as it is done in Low input systems or as practised by farmers.

Selected organic farmers taking part in Kangari, Chuka and Makuyu regions in Muranga and Meru Counties were allowed to visit the experimental sites to learn and to encourage them to adopt what they had learnt.

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Long Term Farming Systems Comparison Trials (SysCom)

Farmers learn the best method of composting manures

Study shows that fresh Boma (farmyard) manure composted for 63 days is of better quality than the one composted for a period of 14 days, while Masai manure is of superior quality and does not require composting.

Peter Kamau | Farmers across the country do not ordinarily compost farmyard (or Boma manure), rather, they apply it directly to fields because they know that farmyard manure increases soil fertility and improve yields which means more income from their farming efforts. However, this research in the ongoing Participatory Technology Development (PTD) on-farm trials that is verifying findings of the on-station Long Term Farming Systems Comparison Trials (SYSCOM) reveals Boma manure should be composted before applying it to crops. The on-station SYSCOM trials are comparing conventional versus organic farming systems under different ecological zones and management practices for their agronomic, economic and ecological performance in Central Kenya while the PTD trials are aimed at developing and adapting agricultural practices developed in the SYSCOM project to ensure effective technology transfer to farmers after the long term trials are over.

Preliminary results of the study titled Effects of different types of manure and composting techniques on carrot (Daucus carota) and beans (Phaseolus vulgaris) yield that was done between 2005 and 2008 in Kangari and released in June this year, shows that the method used in compost making has effects on soil fertility and crop productivity and therefore income for farmers.

The study was conducted at a Demonstration Experimental Site in Kangari (Kigumo Sub County, Murang'a County) as well as in 12 farmers' fields. While the Demonstration Experimental Site was managed by researchers and all treatments were subjected to the same conditions, the trials in farmers' fields were managed by the farmers themselves, but researchers were involved in the data collection. At the beginning of the trials, all the sites, that is, both the experimental demonstration site and farmers' fields had their soils tested to determine the levels of acidity and soil nutrients.

Farmers participating in the SysCom trials have learnt the best methods of composting farmyard manures and preparation of plant teas which they later practice in their own farms.

Farmers were exposed to six treatments in the Demonstration Experimental Site which included uncomposted Boma manure and composted Boma manure for 14 or 63 days and uncomposted Masai manure and composted Masai manure for 14 or 63 days. Plant residues were added to both Boma and Masai manure composted for 14 or 63 days but the uncomposted manures were applied in their natural state without adding residues. The differently prepared manures were then tested on climbing beans, beans and cabbages.

Composting improves quality of Farm Yard Manure (FYM)

In its natural state, Masai manure improved bean yields by 400% compared to Boma manure. When composted for 14 days, Masai manure deteriorated decreasing yields by 5%, and when composted for 63 days yields decreased by 50%. On the other hand, composting improved Boma manure, improving yields by 175% when composing was done for 14 days and by 200% when the period was extended to 63 days.

Recommendations

The results obtained from the various modes of composting showed that:

- Boma manure should be composted; the longer the manure is composted, the better.
- Boma manure should be composted for 63 days. This extended period also allows weed seeds to be eliminated, saving the farmer the extra labour they would spend in weeding the young crop.
- Masai manure should not be composted; instead, it should be applied directly to crops.

Farmers participating in this study also benefited from interactions with the researchers, who also trained them on various aspects of animal husbandry, such as farm yard manure handling; cowshed hygiene; fodder establishment, production and preservation; selection and composting techniques; and preparation of liquid manures and plant teas for foliar feed application on crops. Farmers also got an opportunity to learn various natural methods of pest and disease control.

Dr Anne Muriuki, a Kenya Agricultural & Livestock Research Organization (KALRO) Researcher and Centre Director based at KALRO Kabete (National Agricultural Research Laboratories) says that the aim of the project is to help farmers utilize cheap and easily available resources on their farms to improve crop production. 'When nutrient release is enhanced from these resources (like demonstrated in this trial for Boma manure), farmers have a reliable alternative to chemical fertilizers which may not always be available in the right amount and type for the crops they want to grow in their locality. Besides being expensive, farmers may also not know the right amount of fertilizer to apply and at what crop stage.

There is need for policy makers to embrace and support organic farming as a viable production method (among many others available) for achieving sustainable crop production. Players in the organic sector should also consider ways to subsidize certification costs so that local farmers can earn premium price from organic produce.

James Njoroge, a farmer in Kirathaini village, Makuyu central, in Muranga County is one of the 60 participating in the Long Term System Comparison trials (SysCom). Like many farmers he did not understand the value of farmyard manure. But this has now changed since he received training on how to prepare compost.

"Before I would apply raw manure on my crops and the result was not very good. But now I prepare it by mixing with various crop residue such as maize stalks, tithonia, and foliage from trees around the homestead. The results have been very good. I have seen the benefits of proper preparation of compost because I harvest more maize than I used to. I have discovered that chemical fertilizer is not good for crops because I can clearly see that the portions I have used compost have higher maize and been yields."

Long-Term Farming Systems Comparison Trials (SysCom)

continued from page 4

The findings

From the first year to third year (2007-2009) there was no difference in yield and soil condition in both Conventional High and Organic High plots. However in the third year (2009), differences in yield and soil fertility began to show in both Conventional and Organic High plots with organic showing a slight increase in yields and soil conditions.

The results showed that organic carbon content had increased by 85 per cent in Organic High plots over that of Conventional High plots (More than 4 tonnes per acre in Organic High and 2.5 tonnes per acre in Conventional High in both sites in Chuka). However there was loss of Soil organic carbon in both Organic High and Organic Low plots in the Thika experimental site, which was attributed to other factors such as the weather and the type of soil. There was also a notable difference in change in the cation exchange capacity (CEC) - a process that enables ease of movement and uptake of soil nutrients in soil by crops, with organic plots showing higher movement and uptake of nutrients such as potassium, magnessium and calcium than in conventional plots in both Thika and Chuka.

Cost of production

At the beginning of the experiments, the cost of production (input, labour, transport, irrigation and certification costs) for organic and conventional production remained more or less the same. The results show that, except for labour, organic farming requires less inputs financially but it gives higher yields in the long term.

Gross margins

When the gross margins from the two farming systems are compared in the two trial sites, earnings from organic low and high start to increase from third year, reaching 6500 US dollars per hectare (Ksh 260,000 per acre) by the sixth year, the results show a cumulative increase of 53 per cent in Organic High against Conventional High income of USD 4800 per hectare or Ksh 192,000 per acre.

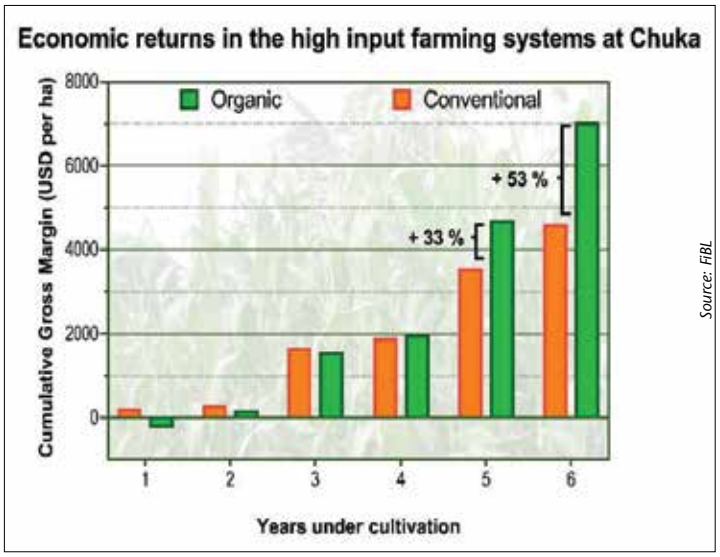
Photo: Peter Luthi

Soil samples from all project sites are tested at the Kenya Agricultural and Livestock Research Organisation (KALRO) laboratories in Muguga.

Conclusion

The results of the six-year trials show that an organic farmer can get the same yields as a conventional farmer if they maintain proper management of their soils and crops. Organic farmers should maintain intercropping and crop rotation, which is one of the key principles of maintaining soil fertility and increasing crop yields and income. However when it comes to the gross margins, organic systems become more profitable where the organic farmers are paid premium prices of between 20 per cent to 53 per cent for their produce.

Organic farming systems showed a significant improvement in soil fertility, reduction of soil acidity and the ability to ensure key plant nutrients are available to crops. Conventional farming systems increase soil acidity in the long term locking up essential nutrients that crops require for growth - a big problem now facing farmers in Kenya especially in key maize, sugarcane and rice growing areas.



Recommendations

The trials show that organic farming is an effective, productive, viable and profitable production system and should be promoted for adoption by farmers in Kenya. This is especially so for farmers who grow maize and beans in moderate to high rainfall areas as long as they practise good crop management and get premium prices for their produce.

The research team advises the Kenya Government and extension State departments of agriculture in other African countries to consider assisting farmers in their countries to adopt organic farming practices and create a separate market where they can sell their produce to get premium prices for their produce.

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The value of sweet potato vines in animal fodder

I would like to know what nutrients sweet potato vines provide to dairy cows, sheep, goats and even pigs.


Sweet potatoes Photo: IN

Sweet potato vines have many nutritional benefits for people and animals. It is easy to grow, cheap to buy and it is delicious because it is loaded with healthy vitamins that are essential for maintaining good health. Sweet potatoes are high in Vitamin B6, C and D. They contain sufficient sources of iron, magnesium and potassium. Like carrots, they are also high in beta- carotene which is essential in the processing of vitamin A within the body.

More proteins

Sweet potatoes carry nutrients in both tubers and their leaves. Animals fed on the vines get to benefit from its high nutritional value. Sweet potato forage is a main source of protein that animals require for healthy and rapid growth- they contain between 15-30 per cent crude protein when in dry matter form. However, the forage quality depends on the proportion of leaves and stems. Unlike legume forages such as calliandra, leucaena, gliricidia or mucuna, it does not contain compounds that prevent the absorption of its proteins.

Sweet potatoes contain up to 70 per cent dry matter that animals are able to digest and convert into various nutrients for growth, milk production and meat quality. Furthermore, sweet potatoes are easily broken down in the rumen (first stomach of a cow, goat or sheep). The following animals can benefit a lot from sweet potato vines:

Dairy cows

Sweet potato vines can be fed to dairy cows as a supplement to their dairy forage rations such as grasses, sorghum or maize stalks. When given in addition to these forages, sweet potato vines enable dairy cows to produce more milk because they help to increase energy thus saving the farmer the extra cost they would incur in providing more feed. Studies have found that sweet potatoes can help increase milk production in dairy cows by up to 70 per cent.

Calves

Sweet potato vines have been found to be high quality feed for calves due to their high nutrient content, palatability (calves like it) and protein content. When calves are fed consistently with sweet potato vines and Napier grass, farmers can reduce by half the milk they feed their calves - this means that sweet potato vines are a good milk replacer. Calves fed on Napier grass supplemented with sweet potatoes grow faster than those fed on Napier grass alone although calves fed on a combination of Napier grass, sweet potato vines, lucerne, desmodium, leucaena and *Sesbania sesban* do much better than those fed on Napier grass and sweet potato alone.

Sheep

Mixed sweet potato vines and roots fed to sheep have been found to increase nutrient intake (and use by sheep) - This combination also helps to cut down the cost of feeding sheep. Lambs (young sheep) have been found to increase their daily weight gain by between 50g-60g per day.

Goats

Goats love sweet potato vines. Daily weight gains of 44g-82g have been recorded in goats fed with sweet potato vines supplemented with cotton seed cake. Sweet potato vines provide sufficient crude protein and energy

to sustain goats for milk and meat production even during dry spells when there is less forage for feed. Feeding goats with sweet potato vines provides cheap nitrogen and increases feed efficiency; sweet potato vines can comfortably replace concentrates especially in bucks (male goats).

Pigs

Sweet potato vines are one of the most important feeds for pig diet mainly due to its high crude protein content, high crude protein digestibility (above 65 per cent) and amino acids content. Sweet potato vines whether they are fed fresh, dried or as silage are a good source of protein and amino acids (compounds that combine to form proteins eg lysine, glysine, tryptophan, methionine etc). Small-scale farmers can reduce the use of expensive feedstuffs such as soybean and fishmeal by feeding pigs sweet potato vines. Sweet potato vines can be fed to pigs without any negative effect on their health resulting in lower production costs and higher net income.

Fresh sweet potato vines can be used to feed growing and finishing (pigs nearing slaughter for market) as this helps in palatability of other feeds given to pigs, their digestibility and pig performance. Sweet potato vines should be fed to pigs throughout the day (*Ad libitum*). The average daily fresh sweet potato forage for a pig weighing 50kg should be 3kg. The sweet potato vines can be fed either as a sole protein supplement or combined with other forages such as mulberry or cassava leaves.

Piglets: Fresh sweet potato foliage offered to weaned piglets can reduce cereal concentrates by 10 per cent with good results in weight gain, feed conversion, mortality and herd culling. It was found to increase feed conversion by 25 per cent.

Gilt and sows: Sweet potato vines can be fed to gilts (a female pig that is less than 6 months) and sows (mother or adult female pig). Sweet potato leaves can replace 50 per cent of sow's and gilt's daily feed requirement and 20 per cent in lactating pigs. The sweet potato silage can be prepared alone or with lysine added, with cassava leaves or with sweet potato roots.

Elkanah Isaboke

Farming Tip

Do not burn crop residue, spread it again

Most farmers have already harvested their beans and even maize in some parts of the country. After harvest, much of the crop residue is burnt in preparation for planting for the short rains which start in September and October. Crop residue especially from beans is full of many essential nutrients that can be recycled either through composting or just spread on the prepared land. It can then act as mulch to prevent moisture loss. Bean crop residue also

contains nitrogen which the following crop will require in large quantities; when the residue breaks down, it releases nitrogen that is taken up by the growing crop. If not fed to livestock, maize stalk can also be spread along the rows of the growing maize and beans. If fed to livestock, the manure from the livestock can be converted into high quality compost that can further be applied as organic fertilizer for other crops such as vegetables, tomatoes or even your fruit trees.

TOF Radio answers your questions

TOFRadio is broadcast on KBC on Thursday at 8:45pm and Mbaitu FM on Friday at 8.30pm. Tune in and listen to farmer experiences and expert advice on agribusiness and eco-friendly farming methods. On this page, we respond to some of the issues raised by farmers in their correspondence to the radio program. Send your questions and comments via SMS 0715 916 136.

Control onion diseases for more yields

Dick Davey | Onions grow well under many different conditions. But when grown in the rainy season, onions have a greater chance of contracting diseases. Onions get more diseases in warm humid weather and your onions are more likely to get infected in the parts of your field where there is water logging.


Photo: IN

Different onion diseases can show different symptoms; however most diseases can be managed in the same way. The most common disease starts as a brown oval spot on the leaves. The spots then turn into yellow streaks that run along the leaf. Once the yellow streak turns brown, the leaves fold.

It is important for farmers to stay vigilant so as to be able to prevent and manage the diseases.

After harvest, the germs that cause the diseases are found in the soil. This means that after growing onions, it is important to plant other crops in rotation. You should avoid planting onions in that field for three years until the soil is free of the diseases.

There are 'improved' varieties of onions that can cope better in wet conditions than other types. You can find out from your local dealer or extension agent what varieties to grow. Then you could plant small amounts to see how they perform on your farm.

Diseases can also be passed on in the seed, especially in untreated seed from the local market. To avoid this you should buy genuine seed from a trusted seed dealer.

Diseases will often attack weak plants in poor soil. A way around this is to get healthy seedlings and try improving the quality of your soil. Adding organic compost or well-rotted manure to your seedbed is a step you can take to promote the growth of your crop.

It is important to raise your beds especially in the rainy season for this will ensure proper drainage of excess water.

Plant the seeds in lines and leave enough space between the seeds, so each seedling can become strong. Picking seedlings is important, transplant only healthy seedlings and discard the sick or weak ones.

Onions need just enough water to grow well. If you water the crop too much, the onions may get infected. Under watering is not good for the plants either. This makes it vital for you to always check how moist the soil is before you water.

Water your plants early in the morning so that they have time to dry up during the day. If plants stay wet throughout the night they easily get infections.

Weeds block air circulation, to avoid this regularly weed your field. When onions remain wet for longer this condition increases the likelihood of them contracting infections.

If you are vigilant and regularly observe your crop, you can prevent any disease from spreading. But if your field was attacked by a disease, remove or bury the remains of onion plants after harvest.

By keeping your onions healthy, you and your family will harvest more and enjoy a better income.

You can now watch a video of managing onions on http://www.accessagriculture.org/harvesting-and-storing-onions

Control devastating IYSV viral disease

One of the most destructive diseases in onions is the Irish Yellow Spot Virus (IYSV) disease. The viral disease can wipe up to 75 per cent of onion crop. The symptoms of the disease include yellow to straw coloured lesions (wounds) on the onion leaves and stalks. Dry long strips of lesions show on the leaves which may look like insects (thrip) damage. Late in the season the leaves may dry up and fall. Plant vigour (strength) is reduced and bulb size reduces affecting the overall onion yield in a farm.


IYSV infected onion leaf Photo: IN


IYSV infected onion leaf Photo: IN

Symptoms

Symptoms of Iris Yellow Spot Virus on onion include yellow to straw coloured lesions (wounds) on onion leaves and stalks. Dry, elongated lesions or flecks may resemble thrips injury. Lesions may be diamond shaped (this occurs rarely on leaves, more commonly on scapes). Late in the season, infected seed stalks and leaves may fall. Plant vigour and bulb size are also reduced including the onion yield.

Control measures

The viral disease is spread by thrips (*Thrips tabaci*). The number of thrips in an onion crop determines the severity of the disease. Volunteer onion from the previous crops transfer the disease to the new crop (this is why crop rotation with crops not prone to the disease is a good control measure). Seed transplants can also spread the disease. All crops that attract thrips act as hosts for the pest and the disease.

Studies have established that some varieties of onions are less prone to the disease. The disease- causing thrips are attracted by the colour of onions. For example Red Pinoy has been found to attract more thrips per plant while the Texas Grano and Bombay Red have least infection. The green colour of Texas Grano and Bombay Red leaves were found to be the cause of less infection. The *Thrips tabac*i is more attracted to blue colour than the green colour. Farmers are therefore advised to grow Texas Grano and Bombay Red onion varieties to reduce infection of their onion crop.

farmers forum

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Organic vegetables for sale: We have Turnips, radish, kales, spinach and amaranthus. Also selling Improved KARI indigenous day old chicks, mature chicks, eggs, cocks and meat. Located at Kinangop, contact Veronicah Kimotho - 0720664984

Potato crisps for sale: We make potato crisps for sale in shops, kiosks or any outlet contact Mr. Francis Njuguna – 0725444341

Silage tubes for sale: We sell silage tubes, improved KARI chickens, day old chicks. Farmers in Western and North Rift, call Star Rays Educational Centre, Nangili 0721 245 443.

WhatsApp

Whatsapp Farmers Group: Join farmers and agribusiness experts. To join send your full name and county to 0721 245 443.