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Applying Ecology to Realize Organic Farming

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Abstract

Our conventional chemical fertilizers and pesticides are effective to improve our agricultural productivity, making our crops get more nutrients and less pests; however, the usage of our chemical fertilizers will lower quality of the soils, pesticides will also eliminate beneficial organisms which can fertilize soil and control pests. Pesticides except pyrethrin are hard to decay or be cleaned from the crops, they can be ingested by our human the most through our food chain and are harmful to human, pyrethrin is still harmful to fish. Organic farming doesn't have these problems, but its productivity is still low, so we need organic methods to fertilize our crops and control harmful organisms that undermine our crops. Elements on the earth are used in cycle, so the only way to fertilize our crops is to make the elements move along the cycle, we can use methods that are same or similar to natural processes to provide fertilizers for our crops, such as producing ammonia by chemical synthesizing without adding other anions or cultivating clovers and processing them into organic nitrogen fertilizers, and import more sea foods into the inland and processing the inedible parts of them into organic fertilizers that can provide phosphorus, potassium and many other microelements that are scarce on the land. There are also many materials from some plants that can kill insects, they have small toxicity that is tolerable to human and can decompose after being used, such as matrine and nicotine. And it is also better to use natural enemies of the pest to control their population in low level, this is best to the crops since a low population of insects can stimulate the immunity of the crops by their bites, they possibly can also eat harmful microorganisms, practice shows the crops are less likely to be infected by diseases under such condition. It is perfect to use cat to eliminate mouse. By these organic methods to fertilize our crops and control harmful organisms, our organic farming possibly can have better productivity that is comparable to our conventional farming.

Keywords: Organic farming, Material cycle, Rhizobia bacteria and clover, Seafood, Natural enemy

Introduction

The development of our chemical fertilizers and pesticides effectively increases the production of our crops, this do have saved a lot of people's lives; however, there are also a lot of bad effects when we are using them. Pesticides, such as DDT, DDVP, can kill almost all insects in the ecosystem and save the crops, but they also kill or do harm to many beneficial organisms in the ecosystem, such as birds and some spiders which eat the insects as their foods, this disbalances the ecosystem and makes the crops easier to be enjoyed by harmful insects since they lost their natural enemies. What's more, such pesticides are hard to decay, there would be their residua hard to clean on our crops, and it is harmful to ingest the residua, the ingestion of foods contaminated by them may lead to many diseases, such as depression and renal failure. They can also remain in the environment or inside the animals which ate those insects killed by the pesticides, and further be spread to the environments we live in and of other food productions. As human is at the top of our food chain, human body will accumulate the most pesticides at last since the organisms we eat also had to eat foods contaminated by the pesticides. The more pesticides we use, the more dependence to them our environment would have, because the lack of natural enemies to the harmful creatures we want to eliminate will increase the dose we need to eliminate further emerged harmful creatures by using them. We have no other way to control the harmful organisms when their natural enemies were absent, and therefore we have to ingest more harmful pesticides residua from our foods. Creatures can also evolve, those who are adapted to the environment would survive, therefore when we continue using pesticides to protect our crops, stronger harmful organisms which could survive under the pesticides will continue eating our crops, and we have nothing to do with the harmful organisms that are immune to more and more pesticides.

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Chemical fertilizers are same effective as natural fertilizers such as nitrates, nitrites and ammonium synthesized by some microorganisms and blue algae that have nitrogen fixation functions, but contained too many extra contents that are harmful to ecosystem of our crops, such as SO_2^{2-},cl^- they possibly are harmful to earthworms which are important to quality of the soil,[1-3] the soil would become stiff after using ammonium compounds that contain these ions. Nitrates and nitrites are also toxic to many organisms and human body if their concentrations are not tiny. Too much nitrites, nitrates, ammonium, and phosphorus can also lead to eutrophication, they should be utilized by our crops only, but not those algae or cyano bacteria. In principle, chemical fertilizers can be harmless if they can be in same form as those natural fertilizers, but it is hard for them to exist in such forms. Chemical fertilizers possibly also can't provide enough nutrients that the crops need to grow to be heathier to combat diseases and be more nutritious as the organic crops.

The researches about organic farming had started in last century, and organic foods do have many advantages to human health,[4] and the organic farming have no harmful effects brought by chemical pesticides and fertilizers. However, the cost of organic farming is still high and the productivity is low, therefore we need better as well as cheaper methods for organic farming.

Fertilizers

In the past, we used fertilizers from decomposed feces and urine of human; however, human contain too many materials which are not hygiene, and it doesn't feel good to think what we eat are made of what was excreted by others, therefore the feces and urine excreted by human should be decomposed completely and expelled into farthest side of the nature until they were completely converted into new material in the nature which is completely not their original materials. Particle is wave, wave is particle, particle and wave are just different states of material, different materials can be converted between each other completely, human's feces and urine definitely can same be completely decomposed and converted to be new different things in nature which is absolutely not the original feces or urine of human.

All elements of nature were synthesized by nuclear reactions of stars and supernovae, it is hard to continue such processes on the earth; therefore, all elements were used in cycle on the earth. No matter organic or inorganic farming, both should promote the material cycling on the earth to provide fertilizers for the soil. Organic fertilizers essentially are still chemical but could make the ecosystem healthy which can't be made by inorganic fertilizers.

Nitrogen in the atmosphere can be fixed by lighting or some microorganisms and blue algae, nitrogen element will turn to exist in forms of nitrites, nitrates and ammonium which can be utilized by plants, then animals can also get nitrogen element by ingesting these plants. After the plants and animals died, the decomposition of their corpses can produce ammonium again, and ammonium can be oxidized into nitrites and nitrates by nitrification of some bacteria, then nitrites and nitrates can also be deoxidized into nitrogen and nitrous oxide. Nitrites and nitrates are deadly toxic to human because nitrates can be deoxidized into nitrites in human body and nitrites can occupy hemoglobin, which is essential to carry oxygen, in the blood, similar as carbon monoxide and probably can lead to human death. Nitrous oxide is easily to be oxidized by ozone and has greenhouse effect that is 200 times as that of carbon dioxide, it can also make human be addicted to it.

We can still use chemical method to produce ammonium using nitrogen or even nitrites and nitrate,[5-7] it is same as lighting or the nitrogen fixation of Rhizobia bacteria, just don't add other acid group anions like SO_2^{2-}, cl^-, NH_3OH is a natural nitrogen fertilizer, it should be organic fertilizer of nitrogen, and we can also use drip irrigation technologies to apply this fertilizer to our soil to control the dose proper and reduce waste. We can also cultivate those organisms which have nitrogen fixation functions to produce organic nitrogen fertilizers. The microorganisms and blue algae that can fix nitrogen are feasible if we have artificial method to make them grow same or better as they were in nature, we can abstract ammonia, which is organic nitrogen fertilizer, from them and the rest nitrites and nitrates may also be used to make more ammonia or nitrogen using chemical or biological methods.

It is worth mentioning that clover is a good candidate source for producing organic nitrogen fertilizer. It can same fix nitrogen from the atmosphere as legumes, being infected by Rhizobium bacteria, with which it has a symbiotic relationship, at its root, it provides the bacteria with energy and some materials the bacteria need, and the bacteria can convert the nitrogen gas from atmosphere to be ammonia which can be utilized by the plant. Moreover, clover is easily to grow in the wild and we don't need them, we can cultivate them outside the farmland and process them into organic fertilizers which can provide nitrogen.

Phosphorus is mainly only taken from the land into the sea by the river but can hardly go back to the land again. The bones of dead animals on the land contain rich phosphorus. However, we must let those of human go away and completely be decomposed to be new natural materials which are not their original materials, therefore they can only go into the sea finally, and we can only utilize this part of phosphorus at that time. To provide phosphorus for our crops, we can just transport more sea foods into inland region, supply the edible parts to the people and process the remaining parts into organic fertilizers which contain rich phosphorus, it is same as how organisms were decomposed to be fertilizers after they died. These fertilizers should be harmless to the ecosystem, and crops

probably can grow much stronger after using such fertilizers. Once the shell of a prawn was buried beside a sunflower, after a period of time, this sunflower grew much taller and stronger than the other sunflowers; this should be the effect of such fertilizers.

Potassium is same as phosphorus, is rich in the sea and possibly also has no path to go back to the inland after being taken into the sea by rivers, therefore we can same use the remaining parts other than the edible parts of sea foods to process organic fertilizers that contain rich potassium. It is hard to extract potassium from the sea artificially, but the edible creatures in the sea are good natural resources where we can extract potassium from, potassium is essential for them to survive in the sea.

Sulfur and many other microelements that is needed by the crops can be provided in same ways as those of potassium and phosphorus, we can utilize edible sea creatures to extract them and supply inland people with seafoods. It is good to let sea foods enter inland region, they contain nutrients that are essential to the development of brain, especially for children.

Carbon dioxide is essential for the photosynthesis of plants, carbohydrate must be synthesized from carbon dioxide. We can enhance ventilation of our farming land or greenhouse, burn some other plants which are not for our food or feed some livestock that eat other plants together with our crops. The concentration of carbon dioxide should be moderate and can't be too high, too much carbon dioxide would be harmful to human and animals. Its concentration in atmosphere is acceptable, there should be a dynamic equilibrium between photosynthesize of crops and carbon dioxide provision. We usually farm our crops in greenhouse now, therefore it is better to feed livestock together which eat other plants to provide carbon dioxide.

We can also use grow lights that powered by solar energy to provide enough energy for our crops, usually our greenhouse can't get enough sunlight for our crops, we can use solar cell to store solar energy that is not utilized to power the grow lights, thereby the grow lights can provide our crops with more energy. We also must use clean water to irrigate the crops, which can be together only with the organic fertilizers, there can't be material harmful to human contained in the products.

We have to let the materials on earth move in proper ways to supply our crops with enough organic fertilizers. Earthworms are important to the fertility and structure of soils, to utilize organic fertilizers probably can preserve earthworms in the soil to produce more organic matters using the organic fertilizers we provided and reduce soil compaction. The ventilation to the roots of plants are also important to their growth, and Rhizobia bacteria which live at the roots of their host plants, need nitrogen to produce ammonia.

Controlling Harmful Creatures

Pyrethrin is a pesticide that is harmless to human, but is still toxic to fishes, it is better to develop pesticides that are not only harmless to human and other beneficial organisms in ecosystem but can also decompose quickly after using. There are some materials from plants that can drive the insects always or kill them, and decompose after using, such as nicotine, matrine and some other Chinese medicines. Nicotine is consumed by a part of human, such practice shows it has low toxicity that can be tolerated by human, and it is better to make nicotine into organic pesticides rather than to let human consume them, it is not beneficial to consume such a pesticide. And it seems there is few insect that eats weed, possibly the weed contains some contents that can resist insects, we can also study about the weed, and process them into materials that can protect crops from being undermined by insects and is safe and healthy to human and environment, decomposed weed has no harm to human or the environment. Camphor tree also contains material that can drive insects away, camphor is made therefrom, it can combat insects, there is always no insect emerging around a camphor sphere, possibly a camphor can release some materials that insects can't adapt to live. Camphor smells bad, but one doesn't have discomfortable feeling when smelling it, possibly it is harmless to human and the environment, too.

Some beneficial animals can also eat insects, such as magpie, mantis, ladybird, and sparrow. Although sparrow can also eat grain, sparrow may also be our food, it doesn't matter to feed the sparrows by our grain if we can eat them. Compared with using materials to kill or drive harmful insects away, it is better to use the natural enemies of the harmful insects to control their reproduction, practice showed that a low population of insects that eat plants can help the crops to be immune to diseases caused by harmful microorganisms, their bites can stimulate the crops to combat injuries and diseases. To control the insects by using their natural enemies can restrain their reproduction not to be in exponential growth so that their population can be controlled at a low level, and crops can be healthier under such conditions.

Mouse is also same harmful creature, it can not only eat fruits of the crops, but also eat the crops from the root, and it reproduces quickly. It is not good to use poisonous materials to kill them, even the organic ones which can decompose after using, mouse has close genetic materials as human's, what can poison mouse will also poison human in large probability, and mouse can also evolve to be resistant to the poisons we used quickly because of their strong reproductive ability. Cat eats mouse according to our common sense, and this works, in practice no mouse emerged any more when there is cat, therefore the best way to combat mouse is just to

feed cats and train them to guard the crops, the mouse going to hurt the crops could be predated by the cats. Cat is also relatively safe to human, human is friend of dog and cat in convention.

Conclusion

Conventional chemical fertilizers and pesticides can make the crops grow better; however, they have too many bad effects and we have to cultivate our crops in organic way to make our products healthy to consume and good to the environment, therefore we need organic methods to replace chemical fertilizers and pesticides to fertilize our crops as well as control harmful organisms.

The materials on the earth originally were used in cycle, and it is the only way to fertilize our crops by making the materials move in cycle. Nitrogen can only be reused or converted into nitrogen gas again after being used by organisms, therefore we can fix them from nitrogen gas both in artificial method and organic method. We can synthesize ammonia artificially, it is how nitrogen was fixed in the nature, just don't add other unnatural contents such as SO_4^{2-} and Cl^-, it is these anions that has bad effects to soil, not ammonia itself, ammonia is the form that some plants fix nitrogen together with the Rhizobia bacteria infected at their roots. The plants that can fix nitrogen are mainly legumes and clover, they all have Rhizobia bacteria infection at their roots. The Rhizobia bacteria can utilize the materials provided by their host plants to grow and they can synthesize ammonia using nitrogen from the atmosphere, ammonia can be utilized by the plants to supply nitrogen for themselves, and such plants are therefore rich in nitrogen and potentially can be processed into nitrogen fertilizers. As clover doesn't provide foods we need, it is ideal to process clovers into nitrogen fertilizers we need, which are organic fertilizers. Phosphorus, potassium, and many other microelements can only flow from inland into the sea, it is ideal to use seafoods, to process the parts that we can't eat to be organic fertilizers that contain these elements that can be utilized by the crops. Carbon dioxide can be provided by livestock, grow lights powered by solar energy can be used to supply more energy to the crops. These organic fertilizers probably have good effects, can make the crops healthier, stronger, and more productive, and they are organic therefore harmless to our environment. The water we use must be clean, can only be together with our organic fertilizers.

There are many materials exist in the nature that can kill or drive away organisms, especially insects and have no bad effect, such as matrine, nicotine and some Chinese medicines, they have small toxicity to human and can decompose after being used, they are organic materials exists in the nature, are not like our conventional pesticides which can destroy the ecosystem, can't decompose and are dangerous to human. Besides striking harmful organisms, it is better to use their enemies to control them. For example, magpie, some spiders and ladybirds (not all, some can also eat our crops) can eat many insects that gnaw our crops; moreover, when the insects keep a low population, their bites plants would not damage our products, instead, according to practice, they can stimulate the immunity of the plants and prevent them from being infected by many diseases, this also shows that low population of primary pest can prevent secondary pest. It is especially good to combat against mouse by using cat to predate them, cat is human's friend and is relatively safe and healthy to human. Since mouse has genetic material similar to human, white mouse is usually used to test whether medicine is toxic to human; therefore, what is toxic to mouse could also be toxic to human in large probability, it is not safe for human to use any agent to poison mouse, only to use cat to predate mouse is safe, this is effective, the mouse did disappear when a cat was there.

With these organic fertilizers and harmless controls of harmful organisms, organic farming possibly can get better productivity that is comparable with our conventional farming.

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Conflicts of Interest

Regarding the publication of this article, the author declares that he has no conflict of interest.

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