ECHO® West Africa Notes

A Regional Supplement to *ECHO Development Notes*

Edited by Robert Sanou and Timothy Albright **July 2017 | Issue 1**

"Foundation for farming," an alternative for small-scale farmers in Sub-Saharan Africa

by Robert Sanou

ECHO West Africa Note is a framework for capitalization and sharing of best practices. For this first issue we discuss Foundations for Farming (FFF) commonly called Zai in the Sahelian countries (but FFF has more rigorous principles than Zai). We also explain how to make compost and an organic liquid fertilizer.

Join us by enriching the next issues with your experiences.

ECHO West Africa Notes (WAN) will be published every three months with four (4) issues per year.

Thank you for your suggestions and contributions (email to westafrica@echonet.org).

Facing Climate Change

One of the sectors most threatened by climate change in West Africa is agriculture. In recent years, it has suffered severe damage. Sometimes there is flooding, sometimes drought, high winds, and/or unexpected cold. Many initiatives are being undertaken to adapt agriculture to climate change.

While it is true that climate change presents itself as a scourge, a difficult challenge for people to handle, it is no less true that one of the solutions is to develop strategies of adaptation to climate change for our brave farmers. FFF presents itself as a serious option capable of helping our farmers.

Figure 1. Traditional field of millet. *Source: ECHO West Africa Impact Center Staff*

Figure 2. Traditional cotton field. *Source: ECHO West Africa Impact Center Staff*

Brief definition of concepts

Foundation for Farming (FFF) is often translated into French as "Les Fondements de l'Agriculture." In the Sahel it is mostly known as "Zaï" or "agricultural holes". In practice, FFF is much more demanding.

What is FFF?

The technique was updated by a Zimbabwean farmer by the name of Brian Oldreive who, starting from the fact that God planned everything for the earth and concluding that man is at the source of the degradation of his environment. Agriculture is possible on the condition that we do it according to God's plan, hence the name of "Farming God's Way." It consists in not plowing the soil, digging holes about 20 centimeters in diameter and 15 centimeters deep, spaced about 50 to 70 centimeters (depending on the cultivated variety) and putting organic manure there before sowing. After planting, it is advisable to cover the pockets with straw. The seedlings will be separated, leaving only two plants per hole. It is advisable to eliminate the middle or the smallest one.

To practice FFF, the farmer needs only three tools: a hoe to make the holes, a rope to establish the boundarieis, and a stick to measure the spacings.

The position of the piles of soil must take into account the slope of the field to block the passage of water (Figures 3 and 4).

Interest in FFF for small-scale farmers south of the Sahara

Several practices such as the Zaï have been carried out in the subregion for several years but FFF is quite recent. In Burkina Faso, for example, it was only after the ECHO forum in 2010 that it was implemented by some of the participants. As a result, the practice has continued to spread.

Featured in this WAN

Honoring God by empowering the undernourished with sustainable hunger solutions.

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Figure 3. Teaching FFF. *Source: ECHO West Africa Impact Center Staff*

Ecological benefits

Contrary to the widespread practice of plowing the soil, FFF discourages plowing. Plowing has some advantages, but the disadvantages should not be neglected. Among others, we must mention the leaching of the soil, its impoverishment, and its exposure to the weather. By turning it over every year, erosion carries away the vital nutrients from the soil. Other exposed nutrients are destroyed by the sun. Unfortunately, the same operation is repeated every year. FFF, on the other hand, utilizes small planting stations (holes), feeds the soil by adding organic fertilizer, and protects the soil by covering it with straw. It should be noted that the same holes can be used the next two years without the need to add other fertilizers especially if you can rotate seedlings.

The other ecological interest of FFF lies in the recovery of degraded soils. In most villages, fields are distanced from dwellings over the years because soils around the villages degrade day-by-day and small-scale farmers tend to go farther away to clear new land. This poor land around the village is almost uncultivated. With the practice of FFF, these "impracticable" soils are reusable. This is the challenge that one of ECHO's partners has encountered in his village. The soils on the outskirts of the village of Kouka have been abandoned by everyone because they are completely washed away by erosion and overgrazing. The soil had become lateritic. It is one of these terrains that Emile chose to farm three hectares of maize. In the early days, everyone called him "crazy" because they thought he would not produce anything on such bare ground. He implemented FFF and the results have been incredible. FFF could solve the issue of the availability of cultivable soils because it allows the most degraded soils to be restored and could allow small-scale farmers to reuse them. FFF enriches the soil, restores it, and could be of great ecological utility.

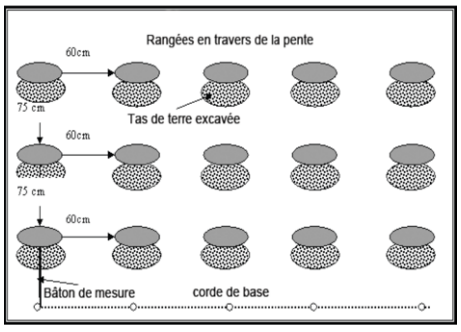

Figure 4. The FFF Method. *Source: ECHO West Africa Impact Center Staff*

Below is what the FFF can give on a completely uncultivated land (Figure 5).

Figure 5. FFF: Emile in his field. *Source: ECHO West Africa Impact Center Staff*

Economic interest

In terms of economics, the price of tillage per hectare varies between 20,000 FCFA and 25,000 FCFA in Burkina Faso. With the practice of FFF, there is no need to bring a tractor or oxen to plow the field. It is sufficient to have two people prepare one hectare per day according to the FFF method. The savings are so obvious! The other aspect of FFF's economic interest lies in the purchase of fertilizers. In Burkina Faso, technicians advise the following for a one hectare cornfield: 4 bags of NPK fertilizer and 1 bag of urea fertilizer. The average cost of a bag of NPK is 13,000 FCFA per bag against 17,500 FCFA for Urea. A quick calculation shows that for the maintenance of one hectare in fertilizer, the farmer must spend 56,000 FCFA. ECHO provides training on how to produce organic compost in less than a month using only local materials.

It must be recognized that the high cost of fertilizer is one of the causes of the impoverishment of our valiant farmers. In the case of FFF, only compost which the farmer can produce himself is used almost free of charge (see article on preparing compost, page 3).

Some of the producers we met used the organic fertilizer they spread throughout the field. They used an average of 16 donkey cart loads of organic manure per hectare. But with FFF training, since fertilizer is used only in the planting station, they only need four cartloads per hectare, or a quarter of what they used before.

Health interest

On the health front, the agricultural production of FFF is 100% organic without chemical fertilizer, whereas the traditional productions are based on chemical fertilizers which carry a lot of health risks. It is common knowledge that many diseases these days are linked to the excessive consumption of chemicals in our diet.

Interest in Farm Performance

Our study made it possible to observe the comparative evolution of an FFF field and a traditional field using chemical fertilizer. Experience shows many differences. From heading, the FFF field grows with rather strong plants while the traditional field often needs the extra input of the chemical fertilizer before recovering. Over the next three weeks, the traditional field that used chemical fertilizer grows faster than the FFF field. But after a month, the FFF field catches up and overtakes the traditional one. At flowering, the FFF field blooms more and has higher crop yield. We compared this experiment on five fields, two maize, two cotton and one sorghum. The results were approximately the same (Figures 6 and 7).

Figure 6. Comparison of a traditional field (on left) and FFF field (on right). *Source: ECHO West Africa Impact Center Staff*

A farmer who complies with the FFF standards produces practically twice as much as the farmer who uses fertilizer on the same area. In some partner fields, production of 5 to 6 tons of maize per hectare was observed, while fields using

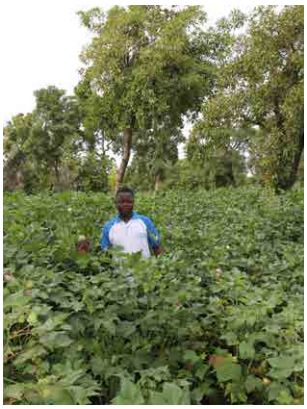

Figure 7. Traditional field (left); FFF field (right). *Source: ECHO West Africa Impact Center Staff*

chemical fertilizer very rarely exceeded 3 tons per hectare.

Advantage in combating climate change: Resistance to weather

Another FFF advantage shown by our study concerned the resistance capacity of two fields. In one case, the drought was very strongly felt by all neighboring fields whose foliage began to dry while the FFF field did not appear to be affected by the drought. On average, a well prepared field can withstand up to three weeks of drought. Another observation from the study is the particular case of farmers whose fields were in a flood zone. Over the past three years, there had virtually been no harvest due to flooding, the effects of which are more detrimental when the field is plowed. This year, these farmers experimented with FFF on the same lowland areas. The field withstood the floods and will be one of the best harvests they have had in the past three years. The practice of FFF, in fact, because it takes place in the uncultivated lowlands makes the plants firmer and more resistant in the event of flooding (Figure 7).

In cotton fields (Figures 2 and 8), the positive impact appears to be greater than in corn and sorghum fields.

On average, the comparative study shows that an FFF field produces 2 to 2.5 times more than the traditional field

Figure 8. FFF: Siméon Keita in his cotton field. *Source: ECHO West Africa Impact Center Staff*

The beauty of the FFF field

"In a field of FFF, everything is so well organized," confided to us a producer. Indeed, the FFF field is so well aligned, that it makes the job easy for the farmer.

In view of all the above, it must be recognized that FFF shows real potential, and a way forward in order to improve the working conditions of small-scale farmers. One is tempted to say after this research, that the more one seeks, the more one discovers, and the better one can adapt it to our climatic realities. In our view, this is truly an alternative for combating climate change.

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How to prepare compost in 3 weeks?

by Alain Gouba

The decline or even loss of soil fertility is the major challenge faced by more and more farmers around the world in general and especially those in sub-Saharan Africa. Many causes, mainly anthropogenic, are at the origin of this situation. Despite the massive use of chemical fertilizers through price subsidy programs, many farmers are showing that their agricultural yields are continuously decreasing despite a constant increase in the quantities of fertilizers in their fields.

Figure 9. Making compost. *Source: ECHO West Africa Impact Center Staff*

There is, however, a simple, natural, and effective way of restoring fertility to the land. It is composting which is an exceptional alternative to chemical fertilizers and which increases the level of organic nutrients of the soil while helping to restore the natural biotic balance of the soil.

Among the multiplicity of composting methods, we will present you the compost of aerobic compost piles. This ancient technique consists of a type of man-made fermentation which allows it to manage the cycles of organic matter. By promoting this composting technique, ECHO's Regional Impact Center for West Africa wanted to consider two aspects that characterize it: precocity and simplicity (accessibility). From the point of view of precocity, the composting technique promoted makes it possible to have access to compost in 21 days, perfectly mature and immediately usable. In terms of simplicity, all the elements necessary for making this compost are available and accessible in any farmer environment and require no expenditures.

How to make compost

1. Components

Ingredient	Percentage
Green matter (green leaves from any tree or grass, or any dried green leaves ie green cut and dried and preserved in shade)	45%
Dry matter: grain stalks, thatch, dry and dead leaves, straw, etc.	40%
Dry woody material: dry branches (small diameter ≤ 3 cm), dry cotton stems, dry corn cobs, peanut shells, wood shavings, cardboard leftovers, dry tree barks, etc.	5%
Manure from any animal species	10%
Water	about 800 L

Please Note: In the absence of manure, this can be replaced by legumes (peanut, cowpea, voandzou, *leucaena leucocephala, gliricidia sepium, albizia lebeck*, etc.). The required proportion is 20% of the compost pile volume.

2. Preparation

For a quantity of compost sufficient for half a hectare, it is necessary to arrange a space of 2m x 2m x 2m or a space that can contain a volume of 8 m^3. However, it is recommended to double the ground surface in order to turn the pile upside down. The place that the compost is manufactured must be shaded and protected from the sun's rays. It should be as close as possible to a water source (pond, stream, puddle, well, borehole, etc.).

After first assembling the various components, the actual work will consist in alternating layers of 20 cm thick; each of dry matter, green matter, dry woody, and manure. This sequence is repeated until all the components have been exhausted. Each layer must be pre-soaked in water before being stacked, with the exception of the manure which will be spread directly. Before any new layer is applied, the previous one must be abundantly watered. The particularity of this compost is that it must not undergo any pressure or compaction, nor be covered by any tarpaulin.

Once the compilation is completed the pile is turned over every 3 days (for a total of seven times) so that on the 21st day it is ready. In the meantime, it is necessary to control the temperature (which must be between 55°C and 68°C) and the humidity of the pile in order to avoid killing certain beneficial microorganisms and to avoid losing excess carbon. The temperature control is done by placing a metal rod in the center of the pile for 5 to 10 minutes and trying to hold it with your hand for 5 seconds after removal. If it is difficult to hold the wand, it means that the temperature is above 70°C and the heap must be turned over and watered. With regard to the humidity, control it consists in squeezing the compost in your hand, if water passes between the fingers of the hand that is a sign of high humidity.If the ball remains firm without water flow after opening the hand it means that the moisture is good. Finally if after opening your hand, the ball breaks up, the compost is too dry and requires watering. It must also be ensured at each turn that the outer parts of the pile are placed in the center and that the center of the pile (which is hot) is outside so that all parts of the pile undergo the same temperature at a given point in the cycle.

Watering during the turning only requires between 20 to 30 liters of water and is done once the pile has been completely turned over. After the 21st day the compost should have a rich smell and can now be sifted and cleared of its coarse undecomposed elements. It can then be stored for several years.

This compost can be carried out at any time of the year provided it is protected from heavy rainwater by a roof. For the optimization of the effects of the compost, the method of using fertility stations is preferred to that of direct spreading on the field.

Compost has may effects on the structure of the soil (increase in aggregates which facilitates good root penetration, better permeability to water and air, better water retention). Compost mineralization provides plant-assimilable substances. It's chemical caracteristics buffers or can even correct soil pH. And it's living components increases biological activity of the soil due to microorganism populations which are part of the compost. Compost offers farmers the best prospects for restoring soil fertility and deserves to be promoted and popularized to the level of its many advantages and quality.

Figure 10. Making copmost. *Source: ECHO West Africa Impact Center Staff*

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The preparation of organic liquid fertilizer

by Bernard Sié Kansié

Faced with the challenges of smallholders in terms of agricultural inputs and the limitations of mineral fertilizer, ECHO's West Africa Impact Center has provided farmers with practical and economic knowledge. One example of this is the technique of manufacturing organic liquid fertilizer.

Figure 11. Making liquid fertilizer. *Source: ECHO West Africa Impact Center Staff*

This technique responds to two major concerns of farmers: the production time and the efficiency of organic fertilizer.

Indeed, organic liquid fertilizer is obtained after only 14 days of aerobic biological decomposition of a mixture of organic matter, water, and other locally available elements. This fertilizer is rich in nutrients and must be diluted before application in fields or gardens. From January to June 2017, during the ECHO trainings in rural areas and during the forums, this topic of organic liquid fertilizer was presented to our trainers so that they can master this indispensable tool for the success of their agricultural activities. These were practical manufacturing sessions showing how to make organic liquid fertilizer and how to utilize it.

How to make organic liquid fertilizer

To make or prepare the organic liquid fertilizer, it takes a container, the ingredients, and a stick to mix the solution.

Regarding the container, it should not have leaks or traces of oil or petroleum products or other toxic products. Otherwise, these products can kill the good bacteria and other microorganisms responsible for the organic decomposition of organic matter into organic liquid fertilizer.

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Figure 12. Organic liquid fertilizer. *Source: ECHO West Africa Impact Center Staff*

As for the ingredients, the organic liquid fertilizer is very economical in ingredients. The ingredients used are: manure of any animal species, green matter, living earth, ash, and water. These ingredients add up according to defined proportions and objectives below:

- The manure, a source of nitrogen, occupies 1/3 of the contents of the receptacle chosen for the manufacture of the liquid fertilizer. If possible, combine different types of animal manure to achieve the best results.
- The green matter is green grass or green leaves. Green matter is a source of sugars and minerals. It occupies 1/3 of the contents of the container.
- The living earth and ash 2 to 3 shovelfuls of each. The living earth, helps to increase the varieties of useful microorganisms. For ash, it brings minerals and potassium to the fertilizer which regulates its pH.
- Water completes the last third of the contents of the container. It reaches the edge of the container so that, when stirring, the solution does not spill out.

Note that in addition to these ingredients, other ingredients can be added in order to increase the nutrient value of organic liquid fertilizer. These other ingredients can include: mud from fish ponds, remains of fish, carcasses or remains of (unpoisoned) small animals (eg. rats, chicks).

Concerning the stick, it is used to mix the different ingredients together in order to have a solution similar to a "sauce". After this first mixing, it is necessary to mix the liquid fertilizer with the stick every day for 5-10 minutes for 2 weeks: on the one hand, it allows the mixture to oxygenate and on the other hand, the more you stir, the quicker the decomposition process and the better the quality of the fertilizer will be.

Figure 13. Liquid fertilizer in jug or bottle. *Source: ECHO West Africa Impact Center Staff*

It should be emphasized that liquid fertilizer should be produced in the shade and must remain in the shade, sheltered from the direct rays of the sun. It is also necessary to cover the container after each mixture so that the rainwater does not dilute it but also for sanitation reasons.

How to use liquid fertilizer

After 14 days, the liquid fertilizer is ready to use. Liquid fertilizer can be used for nurseries, gardens, fruit trees, and other large crops.

Before using it, it is necessary to extract the liquid portion out of the mixture. This is the liquid fertilizer. Dilute a volume of this liquid in fifteen to twenty volumes of water (1 for 15 to 20) and finally to use this diluted solution by spraying the base of the plants once or twice a week. It is strongly advised to mulch the plant base before using the liquid fertilizer.

Please Note :

- When mature, undiluted liquid fertilizer can be stored in a container of any size for a long time.
- Undiluted liquid fertilizer can burn plants.
- Even if diluted, if applied directly to plant leaves, liquid fertilizer can burn plants.
- Liquid fertilizer can be applied 7 to 10 days after germination of the plants and is continued if necessary.

Figure 14. Using liquid fertilizer. *Source: ECHO West Africa Impact Center Staff*

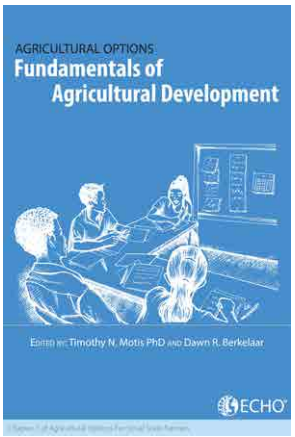
BOOKS, WEB SITES AND OTHER RESOURCES

Fundamentals of Agricultural Development epublication Release

ECHO is pleased to announce availability of the ebook ***Fundamentals of Agricultural Development.*** This electronic publication includes the content from the first chapter of *Agricultural Options for Small-Scale Farmers: A Handbook for Those Who Serve Them* (originally published in 2012 as a sequel to *Amaranth to Zai Holes*). ***Fundamentals of Agricultural Development*** shares foundational concepts to equip those working with smallholder farmers and urban gardeners in the tropics and subtropics. It features technical notes written by experienced practitioners, on development principles and how to think “outside the box." It also contains insights on research and experimentation, and shares information helpful for selecting suitable crops in the tropics and subtropics.

The ebook is available for purchase from Amazon for $4.99 in English, Spanish, and French.

We hope that this ebook will provide helpful perspective that, ultimately, will lead to improved livelihoods of smallholder farmers around the world. Please let us know how its content contributes to your efforts to serve the poor.



Also available in electronic form, Dan Fountain's Let's Restore Our Land describes how church and community leaders can come together to understand problems of the land and forests, consider how God would want them to respond, determine solutions for these problems, and put them into practice.

UPCOMING EVENTS

ECHO West Africa Events:

Training in Côte d'Ivoire in Yamoussoukro
Octobre 11-15, 2017
Location: Yamoussoukro, Côte d'Ivoire

ECHO Florida Events:

Location: Global Farm, FL, USA
Presented by: ECHO

Tropical Agricultrue Development Workshops

- Introduction to Community Development
  August 14-18, 2017

ECHO International Agriculture Conference
November 14-16, 2017

Please watch ECHOcommunity for further information. More information and registration details can be found on www.ECHOcommunity.org.

ECHO Asia Events:

Agriculture & Community Development Conference "Improving Lives"
October 3-6, 2017
Location: Chiang Mai, Thailand

PLEASE NOTE: At ECHO we are always striving to be more effective. Do you have ideas that could help others, or have you experimented with an idea you read about in *WAN*? What did or did not work for you? Please let us know the results!