ILEIA

Newsletter INFORMATIONCENTRE for LOW EXTERNAL INPUT AGRICULTURE Number 2, march 1985.

# SOIL FERTILITY

## possibilities for maintenance in low external input farming

Integration of farming systems in the world economy puts a stress on possibilities for maintenance of soil fertility under 'low external input' circumstances, as increased losses by export of farm products have to be compensated.
Some alternatives to fertilizer use may, however, be present, depending on the local situation. Several non-agricultural "developments" interfere with traditional techniques for maintaining soil fertility. If sufficient labour is available, losses from the system can be reduced and recirculation increased. Contrary to the high-input fertilizer option, no general "green-revolution" recipes are possible. A solution for each situation will have to start with an analysis of strong and weak points of the present situation.

Agriculture can be 'mining', using land for reaping a temporary profit without bo-thering about the future.
Another extreme is to use the land as a 'waste-dump', enriching the soil with potentially useful elements, but in such an excessive way, that eventually they can become toxic.
On a world scale the two types of agriculture are coupled at the moment, import of large amounts of animal feed into Western countries leading not only to soil exhaustion in exporting areas, but also to pollution of soil and groundwater in importing areas.
Obviously, a system in between these extremes, maintaining - and possibly improving - soil fertility in a form of 'sustainable' agriculture, offer us the only way to survive on this 'only one earth'.
Two options for maintaining soil ferility seem to be open: a **'high external input'** option, which uses large amounts of (fossil) energy and other limited mineral resources for the manufacture and transport of fertilizers to maintain the above-mentioned nutrient flow) and a **'low external input'** option, which often involves a high input of local labour to use a variety of practical solutions to reduce the losses from the nutrient cycle and to 'harvest' additional nutrients from the environment. Of course, mixed strategies using parts of both options are possible, but for the sake of clarity we will concentrate on these two types here.

'High external input' systems can only be economical when a high financial output is guaranteed. Therefore, it is no wonder that fertilizer use in developing countries is often restricted to cash-crops for export (coffee, cotton, tobacco, etc.), as both the farmer and the government of the country need a cash income (or hard currency) to buy fertilizers from the (world) market (see 2). Fertilizer use is linked economically to integration with cash economies, just as it is linked ecologically to irreplaceable losses from the local nutrient cycle by export of agricultural products.
In subsistence farming (local consumption in the village) or for 'self reliance' (consumption in the towns) often no money is available for expensive inputs such as fertilizers. 'Low external input' solutions may be the only choice for farmers in such circumstances, provided there is no shortage of labour.
In traditional farming systems a varie-

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# AGRICULTURE IN THE HUMID TROPICS

An interview with Ir. J. van der Heide.
Mr. van der Heide is working at the Institute of Soil Fertility (I.B.).

Since 1980, the I.B., together with I.I.T.A.(International Institute for Tropical Agriculture), is executing a research project on nitrogen cycling in shifting cultivation systems in the humid tropics. This project is situated in Onne near Port Hartcourt in south-east Nigeria.
Traditionally the local population in the tropical rainforest are shifting cultivators. On small fields up to 100 m2, they are producing their basic food, yam, cassava, corn and some small crops as peppers, bananas, papayas etc.
Their need of proteins is covered by hunting as animal husbandry is not possible on account of diseases.
Agricultural fields are prepared by "slash and burn" of the tropical forest. The burned vegetation is providing nutrients for cultivation for a period of about 3 years. Different kinds of crops are sown or planted into the ash in a mixed cropping system. Problems with decreasing soil fertility, weeds and regrowth of the forest are forcing the farmer to prepare a new field and leaving the used one to a 10 - 20 years of bush fallow.
This agricultural system was very stable and not very harmfull to the ecosystem. But by the increase of population pressure nowadays the farmers are forced to return to the same field within a period of less than 10 years which is not enough time to reestablish soil fertility.
Production per ha. decreases so seriously that there is not always enough food for the whole population. This over exploitation of the forest is very harmfull to the eco-system and sometimes even provokes severe soil erosion and irrevocable land degradation. As these subsistence farmers normally do not have enough money to buy fertilizers and are too marginal to find credit by bankers or fertilizer suppliers, an appropriate way to improve soil fertility must be found.
The local soils, oxisols and ultisols, are extremely poor and acid. Only the

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# Colophon

The ILEIA newsletter is a publication of the Informationcentre Low External Input Agriculture, established in 1982. It will be issued every three months and is distributed free of charge during the first year of existence among field workers, organisations and individuals who are concerned with the improvement of the situation of small farmers in the third world. The production of the ILEIA newsletter is made possible through financial assistance of the Government of the Netherlands for a period of three years which will end in 1985. According to its nature, ILEIA invites all sorts of articles on agricultural development and low external input practices for publication. The reader is encouraged to reproduce the articles with acknowledgement.

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# EDITORIAL

This is the second issue of the ILEIA Newsletter. We received many reactions from you on the first Newsletter. So many, that it is impossible for us to thank you all personally. But we are very pleased with these reactions and the completed request forms and want to thank on this place all the readers who send them. Others who did not yet find time to complete the request form are still invited to do so. From some reactions we concluded that it may be not yet totally clear what is meant with "low external input agriculture". What we are focussing on is agriculture:
-which is, for economic reasons, not totally dependent on imports from outside the nation or even the farm;
-which is mainly directing towards the production of food, fodder and fuel for local or regional consumption;
-which is not "mining" his own resources: the farmers family and his ecosystem, especially human health and the soil;
-but which is striving after an optimal production level for the farmer.
To farmers, we think, it is not so important how you call this all as long as it is usefull to improve their situation.

In this Newsletter you will find the following articles:
- Possibilities for maintenance of soil fertility in low external input farming. By M. van Noordwijk;
- Is there a way to a more intensive agricultural use of the humid tropical forests? An interview with J.van der Heide;
- How to reform shifting cultivation into sustainable agriculture, experiences in Ghana;
- Soil formation by termites. By W.G. Wielemaker, a book review;
- The "in-situ" rainwater harvesting technique of CPATSA/EMBRAPA;
- Book reviews;
- Short news: ADI and SIBAT.

We hope you can find something of your interest. But we also need the helping hand of the reader. Other readers are very interested to read about your experiences with e.g. agroforestry, mixed cropping systems, extention, particularly in relation with low external input agriculture. These subjects will be treated in next issues of the Newsletter.

← P. 1 (humid tropics)

organic toplayer of no more than 20 cm. contains nutrients for plant growth. A critical factor in soil fertility is nitrogen. In the region of Onne the total rainfall is more than 2500 mm. and temperatures are high causing a rapid decomposition of the organic matter and a rapid leaching resulting in heavy nitrogen losses. Phosphor and potassium are not as liable to leaching as nitrogen and only few of these nutrients are taken out of the system if all the crop residues are returned to the field.
For these reasons the I.B.-I.I.T.A. project is focussing their research specially on nitrogen cycling. Apart from the low level of soil fertility, light intensity is another critical factor. In these tropical regions there are very few hours of sunshine which makes it difficult to use multi-storey systems like mixed cropping of e.g. corn and beans or integration of trees as cover crop.
Manure is not available for the improvement of soil fertility. For this reason leguminous plants have to be introduced for nitrogen fixation and mulching. If possible these leguminous crops also should produce an edible product as the local farmers find it very hard to accept crops only for soil fertility improvement.
Within the physical possibilities of the region the project did research on four different combinations of a 100-day corn and other local crops as Cassava, in the second season followed by a leguminous crop as pigeon pea, cowpea, soja or groundnut.
Traditionally water-yam was a very important plant in the local farming system. Because of its high soil fertility requirement it used to be the first crop planted after the bush clearing. They were always planted together with a small local leguminous tree called Anthonata which gives them a hold for climbing. Weeds were thrown around these plants after shlashing, after some time leaving very characteristic hills in the fields. Now water-yam, due to lack of soil fertility, is nearly no more cultivated in this region. The project wants to try to bring the water-yam back into the farming system. They are proposing to cultivate a leguminous crop in the first season followed by water-yam in the second season.
Also alley cropping is taken into the research program. Different combinations of e.g. corn and Leuceana are tried. Other leguminous plants which are tried are e.g. cowpea, pigeonpea, Mucuna, Pueraria, Stylosanthes and others.
Different chemical nitrogen fertilizers are also experimented with.
The first phase of the project is now finished and the datas are being elaborated. In the second phase special attention will be paid to the introduction of promising crop combinations into the local farming systems. To this end various trials will be executed together with local farmers on their fields.
Also more research will be done on alley cropping. Other nitrogen fixators will be tried out.
Extension of the results of the project

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← P. 1 (soil fertility)

ty of techniques exists for managing the soil. In many cases the soil is temporarily and locally depleted in a form of 'shifting cultivation', but as no farm products leave the area, a nutrient cycle is still functioning. Nutrients are being concentrated around the homesteads, until the village is moved to a new place and natural vegetation can recover the space and use the nutrients stored. Within this period of 'village shifting' it is customary to have a 'field shifting', leaving the land fallow after a few years' cropping.

Problems in shifting cultivation systems have arisen recently, because for many reasons the decision to shift the village has become more difficult: the vicinity of roads and/or the presence of permanent services in the form of wells, schools, medical posts can all lead to local overexploitation of the land, even if sufficient land is still available at some distance.

Increasing population densities generally lead to a reduction in time available for the restorative action of a fallow (forest) vegetation. In this intensification process a critical point exists, beyond which the decrease of soil fertility becomes self-stimulating, as lower yields will lead to a higher demand and even shorter duration of the fallow, etc.

In practice, however, some possibilities exist to counter such effects.

By employing more labour, soil fertility of the cropping fields can be increased, e.g. by improving the systems of collecting organic debris from the village or by collecting mulch material from neighbouring land.

Historically, such techniques have mainly been developed in places where arable land was short in supply. An example is found in the flood plain along the river Nile in the Sudan, where much low-lying grazing land can be used for keeping cattle, concentrating manure on the limited higher grounds around the homesteads for growing crops (see (1) and (3) for further references).

The constant supply of sediments to the grazing lands by the rivers allow such a system to be stable for thousands of years. The sediment load of rivers has been used for permanent agriculture in a more direct way, for example in the famous Nile-delta agriculture which persisted for thousands of years at reasonable yield levels, and in the traditional sawah-system of S.E.-Asia. The latter system is labour-intensive to the extent that almost any amount of extra labour spend on improving the water management and dyke sytem may result in sufficient increase in yield to maintain the extra labourers, thus accomodating the large increase in population, be it on a low level of material wealth.

New and modernized techniques for 'low external input' farming will have to draw upon the traditional techniques for each specific environment and may try to avoid weak points and better exploit strong points. We will now briefly discuss three aspects of maintaining soil fertility:

A. Maintaining fertile soil layers.
B. Reducing nutrient losses.
C. Obtaining extra inputs.

**A. Maintaining fertile soil layers.**

Erosion of the topsoil can be so much faster than depletion of nutrients, that any discussion on maintenance of soil fertility has to start with prevention of erosion.

Erosion requires human activities at the field level (terracing, contour planting, windbreaks planting, etc.), but, on a more detailed level, it is also related to soil structure. Possibilities for infiltration of rainwater determine the amount of surface run-off, which is the main cause of erosion in intensive-rainfall areas. A good surface structure of the soil can be maintained by having a permanent soil cover through mixed cropping, the use of leavy green manures and/or ample mulching.

Topsoil structure can be spoiled by heavy machinery on the land, by soil tillage and by some types of fertilizer, e.g. the classical Chilesalpeter (sodium-nitrate) on clay soils. Termite activity in the soil can be important for keeping the soil porous and hence less susceptible to erosion. The use of pesticides which kill termites can in this respect be harmful (although some termite species can damage crops to such an extent that some control is needed).

**B. Reducing nutrient losses.**

Losses of nutrients from the topsoil in arable land are of various kinds. Leaching of nutrients to lower layers of the soil in (temporary) periods of excess of rain-fall over evapotranspiration can be an important loss, depending on the climate (rainfall distribution), soil type and the nutrients concerned (degree of buffering soil nutrients) and on the crop's root system.

Intense root branching in the topsoil may effect the uptake before nutrients are leached, deep root development enhances

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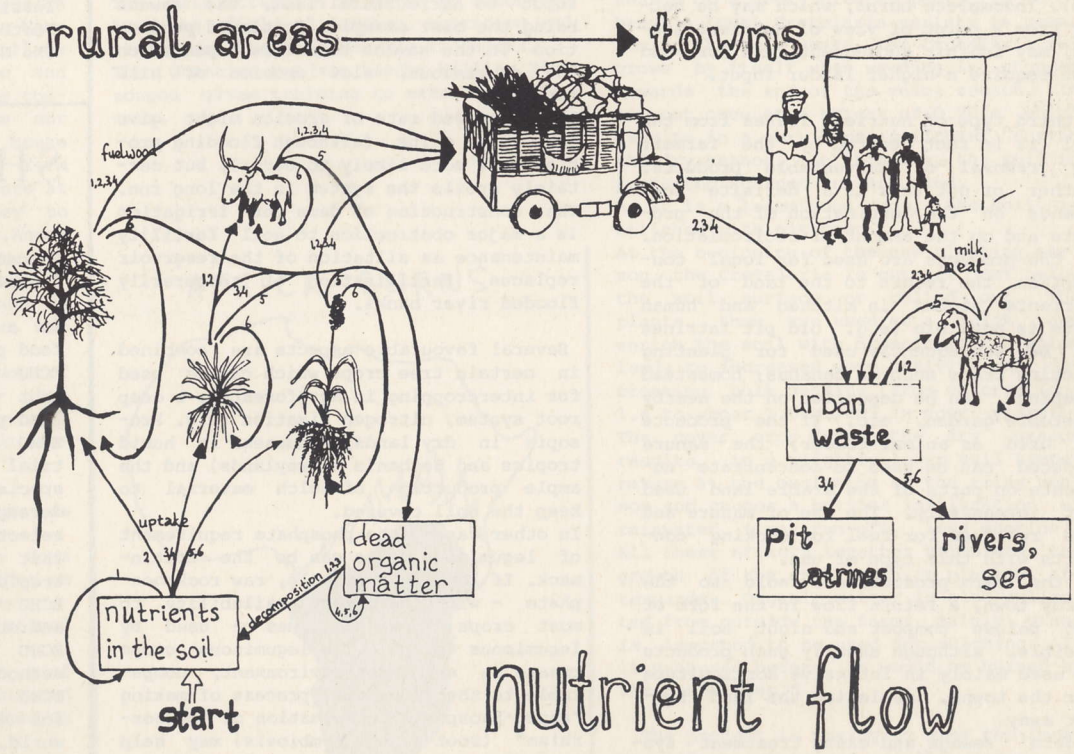
This figure shows a nutrient flow scheme, relating agricultural production to consumption in towns, without recycling.

It is also a nutrient cycle game !
It can be played by 2-10 players with 1 die. Every player acts as a mineral and starts in the soil.
Each turn, the number on the die shows your path through the cycle: you can be taken up into plants, washed out to the subsoil etc.
The game ends when nobody can continue playing.




# nutrient flow

(illustration: Meine van Noordwijk).

← P. 3 (soil fertility)

the recovery of leached elements. As in tropical climates the start of the rainy season often induces a 'flush' in the mineralisation of soil organic matter, early planting to make use of flush is an important way to reduce losses due to leaching. Usually, labour is in short supply in this period.
Having deep-rooted crops in the mixed cropping field is equally important. Deep rooting trees can take up (leached) nutrients from deeper layers and via leaf fall (mulch) concentrate them in the topsoil.
In the case of nitrogen losses, soil pH is important as a low soil pH may inhibit deep root development, but at the same time causes much of available soil nitrogen to be in the ammonium form, which is less subject to leaching than the nitrate form occurring at higher soil pH. Applying lime may increase the risk of leaching of nitrogen, as well as the chances of recovery due to a deeper root development (the cost-benefit balance cannot be predicted in general terms).

Nutrient losses to the air are potentially important as well. Nitrogen can be lost by the process of denitrification in wet soils (in the presence of nitrate and organic matter and absence of oxygen); especially in rice fields larger losses occur in this way.
Burning the remains of forest vegetation after land clearing in shifting cultivation can be useful for the farmer as it increases the short-term availability of most nutrients in the ash, but it can result in losses up to 100% of the nitrogen content of the vegetation (and even some of the soil nitrogen if the burn is too hot). Incomplete burns, which may be better from a point of view of nutrient losses, may inhibit subsequent farm work and thus require a higher labour input.

A third type of nutrient losses from the soil is in fact desired by the farmer: the removal of harvestable products. Whether or not this is a definite loss depends on the destination of the products and on the amount of recirculation. If the products are used for local consumption the return to the land of the nutrients stored in kitchen and human waste is possible (e.g. old pit latrines can be subsequently used for planting exacting crops such as bananas; homestead sweepings can be deposited on the nearby vegetable garden, etc.) If the products are used as animal fodder, the manure produced can be used to concentrate nutrients on parts of the arable land used most intensively. The use of manure and crop residues for fuel for cooking conflicts with this type of use.
If the farm products are sold to the nearby town, a return flow in the form of town refuse compost and night soil is feasible, although usually such products are used mainly in intensive horticulture near the towns, depleting the land further away.
'Modern' sewage and waste treatment systems, following the Western fashion generally preclude the possibilities for such recirculation.
If farm products are exported, no return of the nutrients is possible, and especially for 'bulky' animal feeds such exports are in fact devastating for the exporting countries (tapioca from Thailand, soybeans from South America and cottonseed-cake from Africa being well-known examples).

**C. Obtaining extra inputs.**

Inputs of nitrogen occur in the form of low amounts of nitrate in rainfall (the result of lightening, and recently increased to considerably higher amounts due to air pollution in industrialized countries).
Certain groups of micro-organisms are able to fix nitrogen from the air in plant available forms, especially when in symbiosis with green plants (which supply energy to the micro-organisms). Leguminous crops with root nodules, the floating Azolla-ferns in marshes and sawahs and free-living micro-organisms in the vicinity of plant roots can all fix substantial amounts of nitrogen, under favorable conditions.
Nitrogen fixation is often limited by external factors such as a low availability of phosphate (of which both leguminous crops and Azolla have a rather high requirement).
Mineral nutrients can be obtained from geological processes such as weathering and erosion. In young volcanic soils, weathering may yield significant amounts of nutrients, provided a deep-rooted vegetation makes efficient use of them.
In many landscapes the sediment load of rivers resulting from erosion elsewhere in the catchment area is an important input to agricultural land, the sawahs being the best example. Continued production in the sawahs therefore depends on the continuous, slow erosion of hill tops.
An increased rate of erosion might give temporary gains (although flooding problems are more likely to occur), but certainly spoils the system in the long run.
The construction of dams for irrigation is a major obstruction to soil fertility maintenance as siltation of the reservoir replaces fertilisation of temporarily flooded river banks.

Several favourable aspects are combined in certain tree crops which can be used for intercropping in agroforestry: a deep root system, nitrogen fixation (e.g. Prosopis in dry lands, Leucaena in humid tropics and Sesbania in weylands) and the ample production of mulch material to keep the soil covered.
In other cases, the phosphate requirement of leguminous crops can be the bottleneck. If locally available, raw rockphosphate - with low direct availability to most crops - can sometimes be used by leguminous crops. The leguminous crops create an acid root environment, comparable to the industrial process of making "super-phosphate". Formation of "mychorrhiza" (root-fungus symbiosis) may help in this respect.

February, 1985. Meine van Noordwijk.
Almastraat 1, Groningen, the Netherlands.

References:
1. Meine van Noordwijk, 1984, Ecology textbook for the Sudan, Khartoum University Press, Khartoum.
2. Meine van Noordwijk and Jan Nijsten, 1984, Kunstmest, uitkomst of uitbuiting ? Ekologies uitgeverij, Amsterdam.
3. H. Ruthenberg, 1980, Farming Systems in the tropics, 3rd. ed., Clarendon Press, Oxford.

← P. 2 (humid tropics)

will be executed by the national agricultural research and extension services. In october last year a symposium was held in Ibadan to give more publicity to the results of the project abd other research work on nitrogen cycling in the humid tropics.
This year an identical project will be started in Indonesia on South Sumatra with new settlers from Java. Physically this project will work in nearly the same conditions. But the cultural background of these farmers is totally different. They have experience with more intensive systems of agriculture on Java and are culturally more flexible. This will probably make it easier to design an acceptable intensive farming system.
Mr. van der Heide expects that it will be possible to come to sustainable agricultural systems for the humid tropics.
The results of the project are looking very promissing.

More information:
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# SHORT NEWS

Educational Concerns for Hunger Organization - "ECHO" -

is a Christian Information Centre for food production on subsistance level.
ECHO is answering questions of development workers in the third world about food production.
ECHO has a seed bank that sends seed for trial throughout the third world. These special kinds of seeds include both "underexploited" food plants and specially selected varieties of more common plants that will grow better under difficult tropical conditions.
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# HOW TO REFORM SHIFTING CULTIVATION INTO SUSTAINABLE AGRICULTURE

## Experiences in Ghana

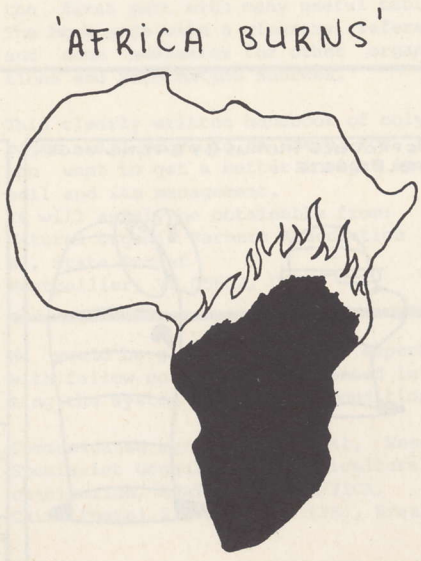
In the West African country Ghana, the ecosystem and hence the foodproduction are standing under severe pressure. Population growth and decreasing rainfall are main causes for this. To feed more mouths means that more food has to be produced. For this reason more land has to be put into production. But in an agricultural system of shifting cultivation the consequence is that there is less possibility for fallow.

Often this fallow period is already decreased from twenty to no more than three years. This is not long enough to restore the fertility of the soil by natural vegetation.
The fallow period is necessary, because the soil gets less fertile. This decrease of soil fertility results from the agricultural practices: the soil structure gets worse, the organic matter content drops, weeds become problematic and the soil does not have sufficient nutrients anymore to give a good yield.
Because there is less land available, also soils which are less suited for agricultural use are put into production, e.g. steep slopes, shallow and poor soils.
This all is leading to deforestation, soil erosion and further degradation of the soil. An indirect effect is the increasing pressure on grazing lands used by nomads. Overgrazing is the result and more frequently the vegetation is burned. This indiscriminate burning, bush fire, is used by the herdsmen to get rid of the dry grasses in order to get new sprouts. The burning however, is strongly decreasing the humus content. Besides, often agricultural crops and forests are also destructed. But there are other farmers as A.Korem describes in Ecoscript 9:
"Mr. Aneere of Via, near Bolgatanga, is one of those farmers. He is an average farmer. During the recent drought in Northern Ghana many farmers in his village were complaining of food shortage and lack of rainfall. But Mr. Aneere was complaining neither of food shortages nor lack of rainfall. Everybody in his house is well fed, and the crops on his farm are doing well and while other farmers at Via were selling animals to get money to buy grains - their staple food - Mr.Aneere bought a cow, 6 sheep and 7 goats.
Mr. Aneere does not use any inputs required by modern scientific farming such as fertilizers, pesticides, irrigation, machinery, etc.
He never received any financial loan of any kind. He is using an ordinary hoe produced by a local blacksmith. Can such a simple farmer practise scientific farming? Yes, he proved that.

The secret of Mr. Aneere's success is very simple:
a) during the last fifteen years he does not burn crop residues, but uses them as a bedding for his 8 heads of cattle;
b) he produces and uses plenty of animal manure;
c) the high amount of humus in the soil and the vigorous growth of cultivated crops give sufficient protection against water erosion;
d) besides many other good qualities, the soil rich of humus has higher water-holding capacity, than the soil poor in organic matter. That is why the crops on Mr. Aneere's farm have been doing well in spite of the prolonged period of dry weather."

In the last fifteen years, the average annual rainfall has strongly decreased.
Is it causing or is it caused by deforestation and desertification?
Anyway, it's clear that it is strongly influencing the agricultural production of the country.
Introduction of modern high input agriculture did not bring to Ghana what was expected. Therefore, farmers and the government are getting more and more interested in low external input agriculture and ecological sound agricultural systems.

In 1975, the Spee-family and their Dutch goats went to Ghana to start an organic farming project in Mimima. The Dutch goats were no success, but organic farming was.
At this moment, as a direct result the first project, two other demonstration projects are in function. One in the north in Dibuyiri and one in the south in Agomeda. In Dibuyiri an educational village was started.
Farmers and their families can live and work here for a certain period of time in order to learn organic agriculture.
The main attention is given to extension in the field of farming, nutrition and healthcare for neighbouring villagers.
The Ghanaian project leader William Yinzougou gives training to extension officers.




Van der Werf describes in Ecoscript 26:
"The Agomeda Agricultural Project was started in 1979 on request of the local Chief Nene Nagai Kassa VII. The main aim of the project is to restore the ecological balance of the country-side by way of ecofarming and re-afforestation in order to reach an ecologically sustainable agricultural production.
On the experimental extension farm organic matter is the main input for improvement of soil fertility. Organic matter is gathered by way of recycling within the farm and by specialized production and importation from outside the farm.
The extension farm was not cleared with fire, which would have been normal in the area. All organic matter on the plot (small trees, shrubs and weeds) was gathered for compost. From that time the organic matter produced on the farm was brought back into the soil as much as possible. Weeds, cover crops and green manures are used for mulching. Crop residues and kitchen waste are composted and used as fertilizer. The project farm is protected by a fire break to prevent bush fires - appearing frequently in the dry season - from destroying the farm.
Special plants are grown for multi-purpose crops. Like the wind-breaks of pigeon pea (Cajanus cajan) and the cassia trees, which are also part of the fire breaks.
Both are also used for the production of organic matter. The pigeon pea prunings can also be used as fodder for rabbits, sheep and goats, as it has a high nitrogen content. Besides, the plant also produces highly nutritious beans which can be eaten green as a vegetable or ripe and cooked as a pulse.
Towards the end of the first cropping season of a newly cleared plot, in october, a local Crotalaria variety is sown. During the next years, the Crotalaria regrows by itself when weeding is stopped towards the end of the rainy season. It is cut once at a height of 0.20 m which results in a very dense soilcover during the dry season. In this way, the soil is protected against sun and wind.
As it is a leguminous crop, the soil is enriched with nitrogen.
At the beginning of the new planting season the Crotalaria is cut-off just below the soil surface or pulled out. The plants then are used as a mulch and enrich the soil with organic matter which leads to increased worm activity and decreasing bulk density (from observation: 1.4 to about 1.0 gm/cm3 in four years).
The cover crop during the dry season results in a slightly lower soil temperature at the beginning of the rainy season and causes a bettter infiltration of rainwater (less run-off, less erosion).
All these effects together stimulate the growth of the crop which is planted afterwards. Organic matter is also collected from outside the farm: mainly grass is imported to be used for mulching. It is gathered before it would be burned by the bush fires."

The project is trying to make the local population conscious of the causes of the agricultural problems of their region by discussing these items with the

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← p. 5 (Ghana)

farmers and the leaders and by demonstration on the farm. A schoolgarden, based on the same ecological principles as the extension farm, is set up for the Agomeda Middle School.
The Agomeda Women Class has started with activities like sowing, low-energy cooking, ecological horticulture and the value of good nutrition.

These activities are executed under the responsability of the Ghanaian 'Agomeda Agricultural Foundation' and the Dutch foundation 'Ghanaian Organic Agricultural Projects Foundation' (G.O.A.P.).

Now, in 1985, the time has come that these two projects are going to bear fruits. There are two new projects being established in the North. In the Agomeda region, A.A.P. together with the Chief and the village eldest have designed a plan for ecological sound development of the region. The plan is not only aiming at the development of organic agriculture, but also at resolving the old contradiction between farmers and nomads. Then shifting cultivation can be reformed into sustainable agriculture and only then development of the region is realistic.

For further information: G.O.A.P.
Attn. E.J. van der Werf
Den Broekweg 1
6971 LT Brummen - the Netherlands.
Relevant literature:
Ecoscript 1, Desertification and Ecological Measures to Combat it, G.A. de Weille (july 1977),
Ecoscript 9, Influence of Indiscriminate Burning on Dessication and Desertification, Albim Korem (august 1979),
Ecoscript 22, Ecological Sustainable Agriculture as an Effective Means to Combat Desertification in Tropical Africa, E.J. van der Werf (1979),
Ecoscript 26, Ecological Agriculture in Africa- The Agomeda Agricultural Project, E.J. van der Werf (1979).
Ecoscripts are published by:
the Foundation for Ecological Development Alternatives, P.O.Box 168,
2040 AD Zandvoort, the Netherlands.

# more short news

News from " SIBAT ", Phillipines

Five particpants of last years course on ecological agriculture by "Agriculture, Man and Ecology" are teaming up to prepare a training curriculum on tropical organic agriculture under the leadership of ATCRD (Appropriate Technology Centre for Rural Development). They plan to form a team of trainors in the different regional secretariats.
For contact: Vickee Padilla
ATCRD, P.O.Box EA-31
Ermita Manila, Philippines.

PROJECTS WORKING WITH LOW-EXTERNAL-INPUT AGRICULTURE IN THE THIRD WORLD.

On the 22nd of February 1985, the Agrecol Development Information (see next column) organised a day for information on the above mentioned subject. More than 100 people came together to listen to lectures from Prof. Kurt Egger on "Ecofarming in East-Africa", Dr. Claude Martin on "Utility-systems for wet tropical forests" and Dr. Henri Suter on "Research on the possibility of low-external-input agriculture in the mountains of Bolivia".

Prof. Egger explained the Agro-forestry project in Nyabisindu, Rwanda with slides and some nice models showing different stages of landuse. The differences derive from good, bad or no agricultural practices. His hierarchy of methods is:
1. Trees in all plots.
2. Short intensive green manuring (for humus-formation and nitrogen-supply).
3. Mixed cropping.
4. Organic manuring of the soil.
5. Integration of animal husbandry.
6. Technical aspects (e.g. labour saving tools).
7. External fertilizers (e.g. local rock; if necessary and available, mineral fertilizers).

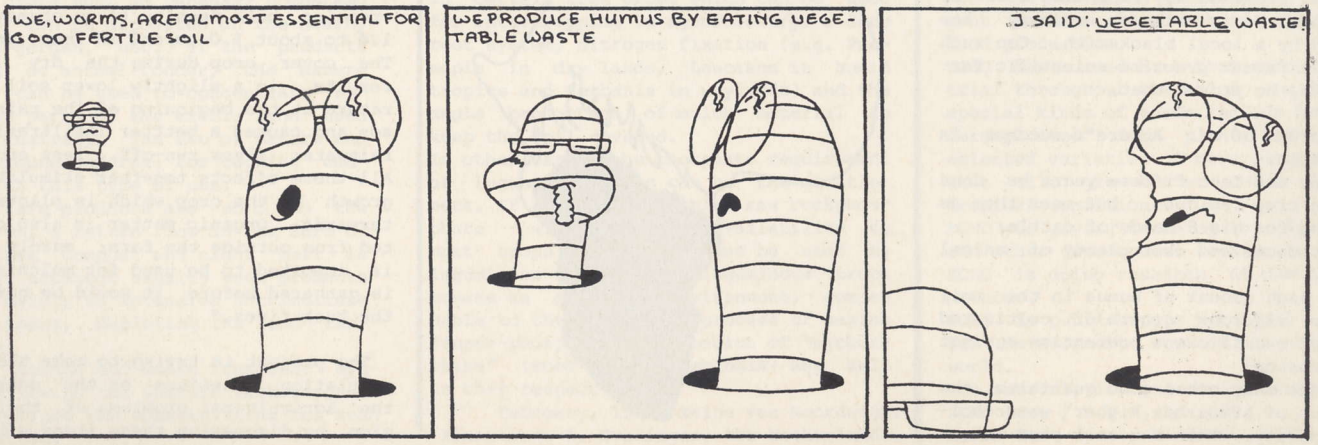
Dr. Martin showed slides and stressed the point, that in tropical forests nutrients for 80-90% are located in the vegetal area and only for 10-20% in the -thin- top layer of the soil. From Budowski he cited the "Tropical Shelterwood System": 1. Primary forests should be preserved. 2. Best soils (the deeper soils and in the valleys) should be used for food production. 3. Treeplanting on fallow lands and marginal soils for multiple use. 5. Treeplanting for fuel close to the villages. 5. Integration of agriculture and forestry (1).

Dr. Suter showed the results of the comparative research on organic and mineral fertilizers and on different mixed and cover crops, executed at the Agrobiological Project Cochabamba (which has finished and transformed into AGRUCO - Agrobiologia Universidad Cochabamba). At the end of his lecture it was shown how an ideal farm could look like in the high-lying inter Andean valleys.

(1). For more information:
Budowski, G. 1977. Agroforestry in the humid tropics. Report to the IDRC on a programme of work at CATIE, Turrialba, Costa Rica, 24 p.

Agrecol Development Information (Agrecol stands for Agriculture Écologique) is an informationcentre within the network of sustainable agriculture of the third world.
It aims at promoting, expanding and coordinating initiatives for a long-term self-reliant and integrative agricultural production in developing regions on this world. It is launching a network between similar institutions and connecting world-wide the corresponding projects, groups and initiatives, experts and consultants, training opportunities and research institutes etc.
A group of experts from projects, universities and development organisations initiated Agrecol Development Information in autumn 1982. It is a member of IFOAM, the International Federation of Organic Agricultural Movements.
A documentationcentre about relevant projects, initiatives, research and selected literature is being set up. ADI will answer requests and arrange contacts and consultants as a back-stop service.

More information:
Agrecol Development Information
c/o Oekozentrum
CH-4438 Langenbruck / Switzerland.



# BOOK REVIEWS

LOW COST FARMING IN THE HUMID TROPICS:
an illustated handbook

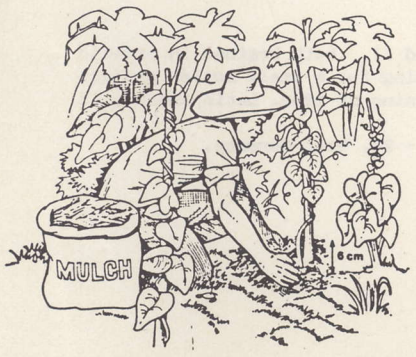
Paul Sommers

Mr. Sommers works for his own international consulting service as an advisor to the United Nations.

This handbook, published in 1983 in Manila, Philippines, describes and illustrates in no more than 38 pages: "....proven farming techniques that will minimize or eliminate dependence on costly purchased inputs. (.....) individual farmers in the humid tropics can apply the general principles outlined in this book to their particular farm environments."

The book touches clearly, schematic, basically and illustratively:
"The ten steps in low cost farming.
These are: 1. Designing the low cost farm. 2. Preparing the site. 3. Seed and seedling preparation. 4. Planting. 5. Saving and using water. 6. Managing and utilizing weeds. 7. Providing fertilizer. 8. Managing pests. 9. Harvesting and living storage. 10. Seed selection and storage".

Some remarks:
The ideal situation is described without mentioning constrainst of the different techniques, e.g. what are the conditions for the use of mulch.
It is questionable if labour requirements are really minimal in this kind of farming as it is described; when capital input is low, labour requirements mostly will rise.
It is also not clear why plant debris has to be burned when preparing the site; with a good compost-technique, weed seeds, insects and diseases can be killed. Wood-ashes are mostly available from the household to be used for pest control or other uses.
Possibilties for the integration of animals is not discussed, which makes the design more suitable for a farm homesite. Still, this book gives a nice introduction on how to produce crops around the house, a description from planting to harvesting and storage. Obtainable from:
Island Publishing House, Inc.,
Sta. Mesa, P.O. Box 406, Manila,
Philippines.
ISBN: 971-1007-02-9. (Price: Dfl. 18,-).



Mulching with dried weeds.

The Soul of the Soil
A Guide to Ecological Soil Management

Grace Gershuny

Mrs. Gershuny is active with NOFA - the Natural Organic Farmers Association in the United States of America.

The purpose of this book is described as follows: " There is a lack of information on applying scientific theories to the real world of farm production. This handbook tries to fill the need for practical guidelines to help the farmer make sound management decisions based on ecological principles. Ecological agriculture emphasizes soil management as the basis for farm productivity. Even though the handbook has been prepared for the USA, the basic principles of ecological soil management can prove to be useful for other areas as well. Little advance knowledge of soils however, is expected. It is intended as a guide for making sound personal judgement on soil management practices".

The book describes practically in three steps how to come to effective soil management:
1. to understand the soil ecosystem:
organic matter, soil structure and tilth, nutrient cycles and balances, and life in - and on - the soil are explained in such a way "that one really gets aware of how everything affects and is affected by the soil."
2. observing and evaluating your soil:"
to be a good farmer, you must be a keen observer of nature - and you must be able to use your observations to improve your management practices". This means record-keeping, looking at the soil - above the ground and beneath the surface - and soil testing.
3. soil management practices:
the physical factors of working the soil are discussed first, followed by the mechanics of organic matter and humus management and finally mineral fertilizers are dealed with, e.g. what is the necessity for specific nutrients in soil health and plant growth.
The second 30 pages of the book support the first part with many useful tables.
The book ends with a glossary, references and some addresses for other organizations and information sources.

This clearly written handbook of only 60 pages will prove to be useful for those who want to get a better insight in the soil and its management.
It will surely be obtainable from:
Natural Organic Farmers Association
43, State Street
Montpellier, VT 05602, USA.

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We would be glad to share our experience with fellow colleagues interested in testing the system under their conditions.

Communicated by: Harbans Lal, Research Specialist Consultant on Agricultural Mechanization, CPATSA/EMBRAPA/IICA,
Caixa Postal 23,Petrolina (PE), Brazil.

# *soil tillage*

The "in-situ" rainwater harvesting technique of CPATSA/EMBRAPA
(From ISTRO INFO, the information bulletin of the International Soil Tillage Research Organization, nr. 24 sept. 1984).

The major part of northeast brazil is classified as arid and semi-arid, with an annual precipitation of 400-600 mm, poorly distributed and highly unpredictable. Therefore, chances of success in crop production are slim.
The responsibility for developing suitable agricultural techniques for this region lies with the Centre of Agricultural Research for the Semi-Arid Tropics (CPATSA) of the Brazilian Enterprise for Agricultural Research (EMBRAPA), which is located at Petrolina (PA), Brazil.
To increase and stabilize dryland crop production, CPATSA has been working on alternative soil management and tillage practices, with and without supplemental irrigation. Among the various other achievements, the development of an innovative system of soil management, along with the necessary mechanization (animal-drawn and tractorized has drawn the attention of local extension workers and farmers.
The system consists in shaping the soil surface in the form af a "W", with alternating wide and narrow ridges following the contour. The wide ridges serve as a rainwater-harvesting zone, the narrow ridges as planting zone and the furrows can also serve as drainage or irrigation channels when the system is laid out on sloping terrain. To initiate and re-shape the system, 2 types of mechanization have been developed, one for animal traction and one for use with a tractor.
Initiation takes 6-8 h/ha with animal traction and 2-3 h/ha when performed with a tractor.
The advantages of the system may be listed as follows: facilitates mechanization due to symmetrical configuration; facilitates separate, selective tillage operations for water-harvesting and planting zones; is adaptable to supplemental irrigation; reduces soil compaction in the planting zone; concentrates organic matter and fertilizer in the planting zone; is easily maintained with a minimum of tillage; facilitates preparation during the dry season; provides for animals and machinery wheels.
The performance of the system in terms of higher and ensured crop production, fewer animal and tractor hours and bettter control of runoffand erosion has been very encouraging. First year's (1983) experience shows that the system can improve cowpea yield by 30% without any fertilizer and by up to 100% with a small amount of chemical fertilizer (15 kg/ha N and 45 kg/ha P205) as compared with the flat planting technique commonly used in the region. This year (1984) the system is being tested on an operational scale at the CPATSA research centre and at different locations on farmers' fields to obtain detailed information on the effects of the system in different cropping systems. On the whole the system looks quite promising for the arid and semi-arid region.

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# CALENDER

AGROMISA WEEK 1985

The Agromisa foundation is pleased to offer its 25th study week for development aid workers and partners. This week is meant for persons working directly with the rural population, as well as those expecting to begin such work.
Participants are introduced to a variety of agricultural problems in developing countries via excursions, practical excercises and discussions; they can familiarise themselves with various possibilities for small scale improvements in horticulture, animal husbandry, soil and water, small industry, nutrition and health. During the week a choice can be made from a number of topics.
Previous agricultural training is not required. For those with such training and/or experience in the tropics, ample possibilities exist to learn about other subjects useful for rural development and to discuss experiences with others. The course is given in Dutch.
The course will be offered from June 3-7 in Wageningen. Participation fees are Dfl. 150.- which covers the costs for lunch, dinner, coffee and evening programmes. odging and breakfast are provided free by host families.

More information and registration can be obtained from:
The A-week committee
Postbox 41
6700 AA Wageningen
The Netherlands.

ILEIA
Informationcentre for
Low External Input
Agriculture,
P.O. Box 64,
3830 AB Leusden.
The Netherlands.
phone: (033) - 94.30.86.
telex: 79380 NL

# SOIL FORMATION BY TERMITES

SOIL FORMATION BY TERMITES
a study in the Kisii-area, Kenya
W.G. Wielemaker.

Are termites responsible for mixing volcanic ash with soil material derived from local rocks ? And if so, how does this process work and what is its consequence for soil- and landscape-formation ?
Besides the description on soils and landscape in the studied area, the role of termites in transport and mixing of soil materials is discussed. The digging activity of termites in well drained soils is shown to be responsible for the formation of deep, homogeneous and finely textured soils. An adequately functioning macro-fauna (termites) are demonstrated to be of vital importance for the physical soil characteristics. Maintenance of this activity is not only important for agriculture, but also for the soil conservation and water household of larger areas.
New studies are necessary to get a better insight in these relationships. Therefore a sequelproject will examine the effect of agriculture on termite-activity.

From the book:
"Farming and termite activity.
Within the context of the socio-economic environment, farmers have the following options to maintain or stimulate beneficial effects of termite activity (or soil fauna in general):
- choose crops or cropping systems, which minimize rates of loss to soil structure, soil material and nutrients.
- choose crops or cropping systems, which are least susceptible to termite attack (Mielke, 1978 mentions in his paper, that indigenous African crops were hardly susceptible to termite attack, while introduced crops or varieties were quite susceptible).
- suppress harmful termite species and promote beneficial ones.
- choose crops with a low proportion of harvestable biomass (for instance a grazing system).
- increase food available for the soil fauna (a) through application of fertilizer, mulch, manure or a combination of the three, (b) pest and disease control in crops, without damaging termites.
- apply cropping and tillage systems, which minimize the stress for termites."
- alleviate stress for termites by changing land conditions as e.g. soil conservation and drainage measures."

This book is obtainable from:
The department of Soil Science and Geology, P.O. Box 37,
6700 AA WAGENINGEN (price: Dfl. 16,-)

From: Agroforestry in the West-African Sahel, National Academy Press, Washington D.C., 1983:
Constraints on Potential Agroforestry Interventions:
"..... the presence of large termite populations renders inappropriate any mulch species that provide a good habitat for these pests; and it encourages the use of mulch species that have the ability to repel or discourage termite infestation (for example, Azadirachta indica, Adhatoda vasica, Derris indica)."

Who can write us more about positive or negative influences of termites on agricultural practices ?

# CONTACTS

Horticultural Engineer with his family (28/25 and 1), both trained in organic and bio-dynamic agriculture/horticulture are looking for a small scale project in a developing country by the end of 1985/ beginning of 1986. Latin-America is prefered.
Contact: Rupert Bauer, Krauterweg 1, D-5000 Koln - 80, West-Germany.