

AgroSpecial 6

**When we take care of the land,
the land will take care of us!**

A manual for agricultural development workers on ways to start
sustainable development

Kees van Veluw

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First edition: 2007

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ISBN: 90-8573-070-8

Foreword

Agriculture plays an important role in the socio-economic development of Ghana. It contributes to insuring food security, provides raw materials for the local industries and generates foreign exchange. It is the main source of employment and livelihood for the rural and largely small-scale producers in many developing countries.

Unfortunately, the poor natural resource base of most small-scale producers limits agricultural production. Farm sizes are getting smaller with each generation; natural resources are also dwindling. Soil fertility is decreasing with the increasing rate of soil mining; bio-diversity is threatened with increased population growth.

To reverse this trend, create wealth and stimulate rural growth, designing and implementing sustainable agricultural joint actions with communities is an important step. This is important as rural communities (farmers) have developed a wealth of knowledge over the years; knowledge that has enabled them to cope with the diminishing natural resource and production base. The active involvement of farmers and the community at large will provide a forum for joint learning and promote a sense of ownership by the community. A number of NGOs have been spearheading the Participatory Technology Development (PTD) approach with other stakeholders such as farmers, researchers, the universities and the Ministry of Food & Agriculture. The Association of Church Development Projects (ACDEP) in Northern Ghana is one such NGO.

This manual on Sustainable Agricultural Development is, therefore, an invaluable source of material that can further deepen efforts at the field level and make an impact in our efforts to develop agriculture on sustainable basis.

The manual is a practical one that provides ideas and tools to guide a process that is led by the farming households themselves. It gives you a method for supporting initiatives of farming households and prepares you for the development process. We therefore highly recommend this manual for development workers who would not want to put the cart before the horse. Development is a process and must be followed step by step to achieve results on a sustainable basis.

Saa Dittoh – University for Development Studies, Tamale

Frank Adongo - Ministry of Food & Agriculture, Tamale

Malex Alebikiya – Association of Church Development Projects, Tamale



The writeshop participants

Vote of Thanks

When Rob Witte of Agromisa came up with the idea of organising a writeshop in Northern Ghana to compile a manual on the support of sustainable agricultural development, I immediately agreed. I was happy and grateful for the opportunity to write down all my views and experiences, and the possibility to check these views and experiences in a writeshop with experts that included farmers, project leaders, prominent staff of the Ministry of Food and Agriculture, ACDEP (Association of Church Development Projects) and the UDS (University for Development Studies).

I really hope that this manual will be useful, especially for agricultural development workers in the field but also for ‘desk-people’, and that it will help them to get to grips with the topic of sustainable development.

I would like to thank the following people: the farmers Mr Adam Mahama, Mr David Sandow, Mr Abdul-Rahman Abdallah, Mr Yidana Seidu and especially woman farmer Ms Kande Tindana for your thoughts, ideas and views straight from the field; Mr Joseph Wuni and Mr David Agongo, as project leaders of organic agricultural development projects for your valuable bottom-up experiences in sustainable development; Mr Yakubu Balma and Mr Paul Adraki, the young lecturers at the UDS, for your enthusiasm and support; Mr Joe Nchor, Programme Officer Agriculture of ACDEP for your comments and pre-reading and Mr Naandam Zechariah, ACDEP member of staff for your comments; Mr Frank Adongo, Senior Extensionist of the Regional Development Office of the Ministry of Agriculture in Tamale for your support, suggestion to cut the manual down into independent readable parts, pre-reading and your willingness to write a preface; Mr Malex Alibikiya, Executive Director of ACDEP for your critical remarks, your presentation on the Savanna Farmers Marketing Company and for your willingness to write the preface; Professor Saa Dittoh of the UDS for writing the preface; Professor David Millar of the UDS and CECIK (Centre of Cosmvision and Indigenous Knowledge) for your work on cosmvision and endogenous development which I used in this manual and for the pre-reading of the manual.

In addition I would like to thank Mr Jeroen Boland of Agromisa for being a very valuable sparring partner during the project and Mr Rob Witte from Agromisa for being the commissioner and, at the end, for doing the final lay-out of the manual; also Mr Acheampong, of Redeemer Artworks, Tamale for your drawings. Last but in fact first: Dr Francis Obeng of the UDS for your overall coordination, facilitation, financial reporting and your support and comments during all the activities of this project in Ghana.

The last one I want to thank is my wife Inge. She kept the fire burning in our compound when I was in Ghana working on this manual.

Thank you all ‘elephantly’ for your support, comments and friendship.

May whichever lord you believe in bless you and help you to lead people in Northern Ghana towards a more sustainable future.

Kees van Veluw
29 January 2007

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1 Introduction: What kind of manual is this?

This is a manual for development workers who want to assist or guide rural and urban communities towards sustainability. It is a manual for doers, not for talkers or workshopppers.

The main chapters in this manual, 3, 4, 5 and 6, can be read separately. You do not have to read the whole book at once.

In our view agricultural development workers are not talkers, but doers and include the following people:

- all extension officers working in governmental organisations such as MoFA and in NGOs;
- teachers living in rural communities, who are often consulted when there are problems;
- District Assembly members whose duty it is to stimulate sustainable development and poverty alleviation;
- any other person who plays a role in agricultural development.

This manual gives development workers a think- and work-tool to assist farmers living in rural and urban communities whose main activities are producing their own food and trying to raise cash through their own income generating activities. They do not produce export crops or have a job with a salary from a government institution or an NGO. The target group of this manual are the people who used to be called subsistence households.

You may be thinking that there are already so many manuals. What makes this manual different?

This one is different because it starts with the knowledge, attitude and practices of the people you are working for and with. In our view, development should start with the use of local natural and technical resources within their human and cultural contexts. Many other development processes start with the introduction of a new machine or maize variety from outside the local context. Maybe you have experienced yourself that this kind of development process, in which new items were introduced from outside the community, has failed. Have you ever wondered why these have failed?

The people who compiled this manual believe that these development processes fail, not because the new item is bad or wrong but because the new item does not really fit in the local situation, customs, culture or local ways of doing things. A seed only germinates when the soil is soft, moist and fertile. The same is true of development. Farming households need to prepare both the soil and the soul for development. This is not an easy process. It may take years, and both you, the development worker, and the community will certainly have to solve many problems. But as long as these steps in the development process are taken carefully and fit in with local knowledge, attitudes and practices, development will start. We are sure about that!

This manual does not give you clear instructions on what to do and what to say. Instead it offers you a method of how to support initiatives taken by farming households. It can help you prepare your own soil and soul for development. It gives you ideas and tools to guide a process which is led by the farming households themselves. This is what makes it a different manual.

If you think: “Yes, I want to try this new method!”, then this is a manual for you. If you say: “No, my views are different”, then please give this manual to someone else!

The chapters cover the following subjects:

- Short introduction to Northern Ghana (Chapter 2)
- What are the aims of sustainable development? (Chapter 3)
- What are the available natural and technical resources? (Chapter 4.1-4.3)
- What is the social and cultural context of the natural and technical resources? (Chapter 4.4-4.6)

- Ways to assist farmers in their development (Chapter 5)
- Case studies of successful sustainable development processes (Chapter 6)
- Sources of information and annexes with more information (Chapter 7)

After reading this manual we hope that you think: ‘Yes, this is good, I will start tomorrow!’



Figure 1: The baobab tree plays an important role in traditional societies. Ancestors may live in the tree and the leaves and the fruits are very useful sources of food.

2 Northern Ghana: The context

Northern Ghana is located in the Savannah Grassland belt. This belt is characterised by low-growing vegetation: mainly grasses, low shrubs and dispersed trees. Agriculture is rain fed. Rainfall in the region is unevenly distributed, erratic in start, duration and intensity, and ranges between 900 mm and 1000 mm. The temperature ranges from 22 to 40°C. Most farmers practise mixed cropping of trees, grain crops such as sorghum, millet and maize; legumes such as groundnuts, and root crops such as yam. They also keep livestock in the form of poultry, goats, sheep and cattle. In the dry season hardly any crops are grown, except for in small gardens along the riverbeds and dams.

In many places the biophysical environment is seriously degraded by gullies and sheet erosion due to water and wind. The major causes of this are the loss of forest as people search for fuel wood, and inappropriate methods of traditional farming, such as uncontrolled bush and farm fires and overgrazing by livestock. The population growth in some areas is leading to serious pressure on the land. Most family farm land is continuously under cultivation.

All these aspects contribute to low crop yields - the average cereal yield is estimated at 300 kg/acre. Inadequate food results in malnutrition among pregnant women and children under six. Many people are illiterate and do not have enough drinking water.

There are two main ways in which men earn cash income. The first is by selling crops and the second is by selling livestock. Livestock selling is more evenly spread over the year. Pigs, goats and poultry are the most common sources of cash; cattle are sold rarely, and only as a last resort. Decisions related to the sale of animals and use of the proceeds rest with the men. Lastly, men also generate considerable income from handicrafts (hat- and basket weaving), especially during the dry season.

Women's income sources also include crops, livestock and commercial activities. Generally, women receive only marginal income support from their husbands. Nevertheless, women provide an important income buffer to the household as they contribute to health and school expenses and procure most of the food for the family. They buy most of their own clothes, and respond to some social demands, such as funerals and outdooing, for cash.

The local people combine patrilineal and matrilineal forms of inheritance, patrilineal being predominant. Women have only limited access to land. The primary source of labour is family labour; surplus labour can be purchased directly with cash or in exchange for an animal, or food and drink. Various organised labour-sale groups exist in nearly all communities. Women groups are the most common, followed by youth groups. Reciprocal farming arrangements are common among the various groups. The traditional organisation of the household continues to be an important aspect upon which identity, authority and regulatory arrangements are based.

The traditional practice of 'worship of the ancestors' is central in the worldview of the rural people of Northern Ghana. Many people believe in an Allfather, and trace their ancestral line to the founder of the village or community. God controls our lives through our ancestors, and our spirituality depends on our faith, beliefs, righteousness and living in harmony with nature. Traditional lifestyles are continuously being challenged with calls for renewal. However, people's perceptions about the future and the way forward differ depending on their cultural background, age, sex, where they live (town or village), and economic position.

(Source: David Millar in AgroSpecial 3: Endogenous Livestock Development, Agromisa Publication)

3 Aims of sustainable development

3.1 Introduction

In this chapter we describe the aims of sustainable development. First we provide a definition of 'sustainability' and then take a closer look at the concept of 'development'.

In our opinion sustainable development should aim for the following: food security, cash security, soil security, social and cultural security. We describe these five different securities in turn, concluding that they also need to be balanced for sustainable development to take place. For example, technical development (new buildings, new machines etc.) without social development is not sustainable.

3.2 The meaning of sustainability and development

Sustainable development is a popular phrase among politicians, scientists and development workers. But what does it really mean? If we look at the word 'sustainability' we see it is made up of two words: 'sustain' and 'ability'. So we can also say 'sustainability' is the same as 'the ability to sustain'.

Now, you may wonder what 'ability' is exactly, and we can also ask 'what do we need to sustain?'

Ability has to do with skills (being able to do something), but also with knowledge, attitude, practices, the capacity to solve problems, the practice of good communication, the ability to adapt techniques to your own situation and wishes etc. An able person should have many capacities

What should we sustain? For sure we should sustain ourselves, which means having enough food!

Farmers should produce enough food to sustain their households but they also need to raise enough cash to buy their daily needs. And we also need shelter, education, health services, good transport, etc. To produce enough food we should sustain the soil and the forests and the grasslands; in short we should sustain the environment.

But we cannot farm alone: we need the support of family members and the support of the community. For that we need peace, trust, harmony and unity in the community so that it can sustain itself. And last but not least we need the support and the blessings of our ancestors. No matter what we believe, whether Christian, Muslim or traditional, we need the support of the almighty!

And what does 'development' mean? The opposite of 'develop' is 'envelop'. You put a letter in an 'envelop', meaning you enclose it, you cover up the letter. Development means 'opening up' or 'removing the cover'. Development means opening up to possibilities for growth, movement, action, exploring, listening to new ideas, procedures, views and techniques. Development means making changes for the future and keeping the good things from the past.

Development is a time-consuming process. Very often, when you start with development it is not clear where you are heading. It is difficult to start this process and it may take a year or even longer to get the whole picture clear before you can even start. It needs discussion and meetings and visits to other people who have struggled with the same problem. It needs experiments and tryouts before the real choice is made. It needs calculations and sacrifices to start a sustainable development process.

Sustainable development is needed because there is still a lot of hunger and poverty in Northern Ghana.

Story 1. A farmer's definition of sustainable development

In a village I asked a farming community: what does sustainability mean to you, what makes you 'able to sustain' life?

The groups explained easily:

- enough food
- enough cash
- rich natural environment, especially fertile soil and trees for firewood
- peace, trust, harmony and unity in the community
- a place for worship

Translating these issues into scientific terms:

Sustainability is a complex of:

- food security
- cash security
- soil security
- tree security
- social security, and last but not least
- cultural security

One cannot go without the other.

Source: Professor Saa Dittoh during a village meeting in Zuedema, Builsa district 1998

For development purposes it is a good idea to quantify these 'securities' as much as possible. For example, a farmer may ask you: please, how can I keep my soil fertile? Then you can answer: 'I suggest that you use the manure of your sheep!' So the farmer collects a head pan of sheep manure and spreads it out over his 5-acre bush farm. Do you think this will improve the fertility of the soil significantly (see Story 5 for an answer)?

By quantifying different securities we can help the farmers better to find solutions for their problems. Of course, not everything can be quantified, but when it comes to food, cash and soil fertility, these can be quantified. In the next paragraphs we quantify some of the aims of sustainable development.



Figure 2: In a village.

3.3 Food security

A household is food secure when all members of the household have enough food to eat throughout the year to sustain themselves and be healthy.

Students from the University for Development Studies in Tamale tried to estimate the annual rate of food security in two years (1998 and 1999) in some households in the Tolon Kumbungu district. They found that none of the studied households were 100% food secure. The annual food security rate ranged between 30 to 90%.

Unicef and the Ministry of Health report that at the moment about 30-40% of all children in Northern Ghana are malnourished, and a large number of these are malnourished throughout the year. Pregnant and lactating women are also often undernourished. Chronically malnourished children are more likely to die early or to develop into adults with a mental handicap. Lack of food insecurity is a very serious problem.

In our experience most heads of farming households know how much food they need to sustain their extended households. But let us calculate a bit scientifically:

- An adult farmer working every day on his farm needs 2500 kcal per day of energy. A woman needs around 2000 kcal and children around 1500 kcal per day.
- One kg of dry grains (maize, sorghum, guinea corn) contains 3600 kcal of energy. So if the farmer eats 0.7 kg of grains a day he gets enough energy to work on his farm. On yearly basis, this means that an adult man needs to consume 365 days x 0.7 kg of grains, that is roughly 250 kg of grains.
- A woman needs a bit less, around 200 kg, a child under 12 years needs around 100 kg per year, and an adolescent needs about 150 kg of grains.

With these figures you can calculate the total yearly grain requirement of a household.

Story 2. The annual grain requirement of a household

Grain requirement of individuals:

Person	kg of grains per year
adult man	250
adult women	200
youth/adolescent	150
child under 12 years	100

Take for example a household with 2 adult men, 4 adult women, 3 youths and 2 children. For a whole year, this household needs:

2 adult men x 250 kg	= 500 kg
4 adult women x 200	= 800 kg
3 youth x 150	= 450 kg
2 children x 100	= 200 kg
Total:	1950 kg grains = about 20 maxi bags of grain

On average the grain yield per acre in Northern Ghana is around 3 bags per acre. This means that a farming household consisting of 2 adult men, 4 adult women and 5 children needs around 7 acres of land for grain in addition to the plots for yam, rice, groundnuts and other crops. But if the soil is very fertile and yields 8 bags per acre, only 2.5 acres of farmland would be needed.

You see that the more fertile the soil, the smaller the farm and the less labour is needed to achieve household food security.

We assume that the smaller the farm, the easier it is to achieve food security because a smaller farm needs less labour for ploughing and weeding. But farmers can only achieve better food security on a small farm when the fertility of the soil is improved.

Source: Calculations by Kees van Veluw 2006. The farmers in the writeshop of September 2006 approved the calculations.

People also need proteins, vitamins and micronutrients for better nutrition, which is part of being food secure.

We cannot discuss all these nutrients as extensively as we did for energy (grains). If you like, though, you can do the same calculations as we did for grains. Annex 1. Nutrient composition of some common foods in Northern Ghana, provides information so that you can determine the protein, vitamin and micronutrient requirements of people, and the amount of these nutrients in different crops, fruits and vegetables. Here we provide a short summary:

- People need protein, but if their food provides enough energy, then they normally get also enough protein. Grains also contain protein. Only growing children need extra protein, which they can get by adding meat, soybeans, groundnuts, eggs to their diet.
- Vitamins are very important to prevent certain diseases. For example: Vitamin A (a mango a day keeps the doctor away!) is needed for good eyesight, skin development and resistance to diseases.
- Micronutrients are needed for full mental and physical development. For example: Iron is needed to prevent anaemia. Many pregnant women suffer from anaemia. This results in children with a low birth weight and thus in a low survival rate. Furthermore, iodine is needed to prevent goitre, a widespread disease resulting in retarded mental development.

The government of Ghana has made efforts, for example adding iodine to salt. The government has also had campaigns to promote eating a varied diet. This means growing a variety of crops, fruits and vegetables to cover all requirements

You, as development worker, should discuss these basic food needs with farming households to achieve food security as part of sustainable development.

3.4 Cash security

A household is cash secure when all basic needs are covered throughout the year for all members of the household.

On top of that, the household should have some financial reserves to be used in times of emergency. These reserves are mostly in kind, especially cattle, but they could also be in cash or a savings account at the rural bank. Farming households' basic needs that may require cash include food, water, clothing, shelter, health services, education, transport, social commitments such as outdooing, marriage and funeral ceremonies, fuel wood, on-farm inputs and off-farm activities. For some of these items or activities people can exchange goods or pay in kind.

There are different signs of wealth in a community. Rural people consider a person wealthy when, for example, the person has a large number of cattle, the thatch on the house is replaced by iron roofing sheets, the person owns a motorbike, the number of pots in a woman's hut is large, a man has married more than two women, or when a man has more than 10 smocks.

But wealth and sustainability are not always the same! In some cases, the head of the household has a motorbike or has a large herd of cattle but his children are malnourished. That is not sustainable. Wealth and cash security are not always the same.

These are difficult issues to discuss. Sometimes it takes a lot of effort to convince a rural farmer to sell a cow and buy Weanimix for his children to combat malnutrition or to pay the school fees for his children or to cover other basic needs.

Story 3: 'Our animals are our banks'

'You people talk about banks but for us we do not know banks because our animals are our banks. We keep them and sell them when we need cash.'

Livestock such as cattle are kept as an insurance, and are only sold in case of big needs such as fees for higher education, marriage, funerals, hospital bills, to obtain a chieftaincy title, to help relatives during times of need or to buy farm implements. Other livestock such as sheep, goats, rabbits and poultry are kept as means of raising cash to satisfy smaller, immediate needs such as children's school fees, or supplementing the family's annual food deficit, personal entertainment, harvest festivals and so on.

'Because I have animals, I am secure in many other ways and also make better use of my resources. The animals give me manure to 'feed' my crops and the crops, in turn, feed the animals. The animals bring in cash to purchase a donkey cart to transport compost to my farm. In that way we make sustainable use of our bank'

Madam Tindana of Bowku Village

Source: Discussion during writeshop, written down by Paul Adraki

Some students of the UDS tried to quantify cash security of some rural households in the Tolon Kumbungu district in 2000. They followed 10 households throughout a year and collected data on expenditure and income. They also listed the items and services which the households wished to purchase to have a decent life but had failed to do so due to lack of money. They collected data on 11 types of expenditure: food, clothing, shelter, health, transport, education, energy, social commitments, farm inputs, off-farm inputs and other expenditures. (See table 1)

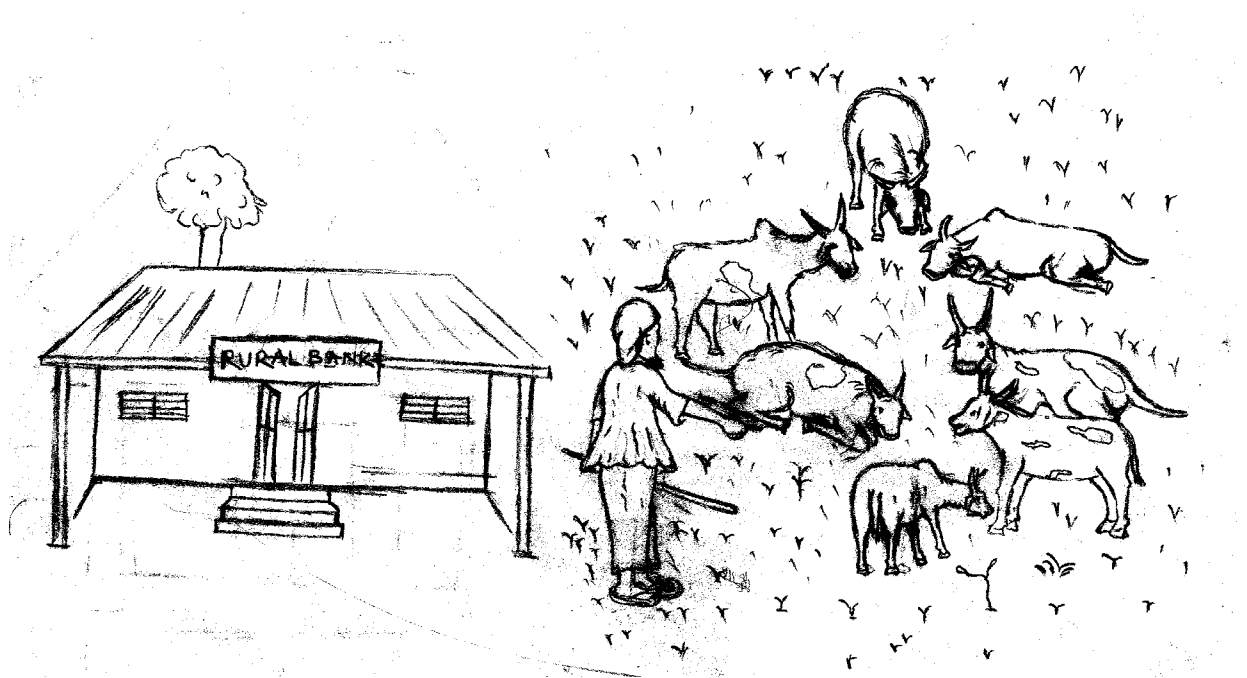


Figure 3: Savings in a bank or in animals

Although there were many uncertainties in the study, and interviewed persons could easily give the students wrong figures or forget issues, it still gives an indication on the amount of cedis running through a rural household.

Today the costs of basic needs like fuel, health services, secondary school fees etc. are increasing tremendously. Combined with the fact that almost no household is 100% food secure, we can conclude that rural households need more cash. However the opportunities to increase off-farm income are limited. The women try all kinds of income generating activities (IGA) to earn some extra in-

come. But even with these, their total income is limited. The most feasible way to raise more income is to grow more food. If a farmer grows more food than she or he needs to cover food security, the surplus can be sold to cover basic needs.

Table 1: The study revealed the following results:

Topic	number	range:
household size:	18 persons (4 men, 5 women, 9 children)	0-46 persons
farm size	8 acres	2-15 acre
annual expenditure	4 million cedis (in 2000 this was US\$ 666,-)	2,1 – 7,8 million cedis
➤ for food	34%	
➤ for transport	17%	
➤ for farm inputs	14%	
➤ for other 8 items	roughly 4,4% for each item	
annual income	4 million cedis (in 2000 this was US\$ 666,-)	2 – 10,5 million cedis
➤ from sale of crops	30%	
➤ from side jobs	27% (such as blacksmithing, rope weaving, masonry etc.)	
➤ from sale of animals	18%	
➤ from women's iga	10% (such as shea butter, small trade etc.)	
➤ from salary/pension	10%	
➤ from remittances	5%	

Converting the figures to 2006, we can state that a household of 18 members needs at least US\$ 700 per year. That is about 6 million cedis per year (500,000 cedis per month) to cover basic needs. This is not taking into account the increasing costs of transport, fees for secondary schools or training colleges, fuel, medicines, labour, etc. To have a decent life where all basic and additional needs are adequately covered, a farming household of 18 members needs, annually, somewhere up to 1000 US\$ a year (8.5 million cedis a year, or 700,000 cedis per month).

Many households are still a long way from this 'sustainable' situation. It is a great challenge for each development worker to discuss these issues with farming households and to look together for sustainable solutions. Case studies 6.4 and 6.5 in Chapter 6 show how companies and projects try to achieve these levels of income.

3.5 Soil security

A soil is 'secure' when it has the ongoing capacity to supply nutrients to plants in adequate amounts and proportions for healthy crop production.

Many farmers realise that their practices are reducing the capacity of the soil to supply nutrients to plants. In many discussions with rural households it is also clear that people know what causes the degradation of the soil. Farmers can easily list reasons such as:

- erosion
- cutting down of trees
- inadequate care for the soil
- bush fires
- stray animals
- use of chemical fertilisers
- difficulty of transporting manure to the farms
- compost making is laborious (see annex 2. The costs of making compost)

The effect of most of these activities is to reduce the organic matter content of the soil, leaving only a hard red laterite soil of poor quality. A poor soil results in a poor crop, every farmer knows that. See what Joseph Wuni is doing about this problem in Case study 2 in Chapter 6.

Story 4. Experiences of Nwodua women with compost and fertilizers

Nwodua is a small village 5 km east of Tamale in Northern Ghana. In a village meeting about the effects of compost and chemical fertilizers on the soil, women observed the following relationships:

- when we use chemical fertilizers worms disappear
- the soil becomes very hard when we use chemical fertilizers
- after two years of using fertilizers the soil is dead, nothing will grow!
- compost keeps the soil moist
- compost makes the soil soft and easier to handle
- compost works for years while chemical fertilizers are useless after 1 year

The women were very sure about their observations.

Source: Experiences of Kees van Veluw during meeting with Nwodua women, 1998

Farmers also know that the soil in the forest and under trees, for example the White Acacia tree or in sacred groves, is very fertile. Farmers know that tree leaves improve the soil organic matter content and thus also the soil fertility. Farmers also know that applying manure and compost, and reducing erosion improve the fertility of the soil.

Burning of crop residues and burning to clean the land reduces soil organic matter tremendously. Especially burning when the soil is very dry is very bad for the soil.

When a house in the village is burnt, we can repair or rebuild it in a few weeks. When a rice field is burnt we can cultivate it again one year later. When a tree gets burnt, we can replant it and in 10 years we will have a tree again that is big enough to provide shade, shelter, food, timber, medicines, etc. But when we burn just one centimetre of topsoil or when we lose one centimetre of topsoil through erosion, nature needs 25 years to replace it! What is it that farmers do that means they do not take proper care of the soil?

An African philosopher stated that 'Soil erosion is Soul erosion'. Although farmers are aware of bad farming practices and although they know what to do to improve soil fertility, farmers lack the initiative, the power or the tools and possibilities to improve soil fertility because not only the soil but also their souls are eroded. Corrupt governments, wars, poverty, malnutrition and the harsh climate are also factors that make people weak and erode their souls. Technical measures are needed to improve soil fertility, but for sure also a new attitude is needed; a new way of farming is needed.

One part of that new way of farming is to realise that we cannot take more from the soil than we give to the soil. If we do not feed the soil, the soil cannot feed the crops and cannot give good yields. It is in farmers' hands to feed the soil. If that is done then the soil can feed us.

Most of the soils in the burnt savanna of Northern Ghana have only 0.5% organic matter (see annex 3, How to measure soil organic matter content). That is why these soils have such poor yields, only 1 or 2 bags per acre. If you apply any organic matter, whether manure, compost, rice husks, cotton waste, crop residues or green manure, you will see that fertility improves immediately and therefore also your yields.

There are organic farmers in Northern Ghana who really do have yields of 10 bags of grains per acre. They provide the soil with enough nitrogen by applying compost, by using green manures, by controlling erosion and by not carrying out burning practices. They feed the soil and the soil feeds them!

In chapter 7.4 you will find a list of Organic Farming Techniques to improve soil fertility and yield.

Story 5. You first have to feed the soil and then the soil can feed you!

Suppose you want a yield of 10 bags of maize from 1 acre. How much sheep manure should you apply and how many sheep can produce that amount of manure?

Besides potassium and phosphate and other minerals, organic matter contains nitrogen. Very often it is the amount of nitrogen that determines the yield of grain. You have to supply at least the amount of nitrogen which the maize you harvest will contain. Try to follow the next calculation:

10 maxi bags of maize = 1000 kg of maize

Maize contains 9% protein, so 1000 kg of maize contains 90 kg of protein.

Protein contains 16% nitrogen (we ignore the other minerals), so 90 kg of protein contains 14.4 kg of nitrogen.

This calculation shows that you have to apply at least 14.4 kg of nitrogen to harvest 10 bags of maize.

To be sure to give enough it is better to apply 1.5 times the amount required, so we should apply around 20 kg of nitrogen.

You can say, so I apply a bag of chemical fertilizer and I am okay!

However, a good calculation depends completely on the organic matter content of the soil.

If the soil contains 5% organic matter you can apply chemical fertilizer because the 5% organic matter can absorb the chemical nitrogen and store it for later use by the crop.

But if the soil has only 0.5% organic matter it has no storage capacity: the chemical nitrogen will leach and will be washed away by the first rain shower to somewhere else.

Organic matter can store chemicals like nitrogen. That is the big advantage of using organic manures.

Dry sheep manure contains around 1% nitrogen.

So to apply 20 kg of nitrogen, we have to collect 2000 kg of dry sheep manure, that is roughly 100 to 150 head pans or 1 to 1.5 donkey carts of manure.

One adult sheep, which is confined every night, may produce 100 kg of dry farmyard manure a year.

To provide 2000 kg of manure we need to have 20 sheep.

If we continue the calculations:

20 sheep produce enough manure to keep 1 acre very fertile up to the level of 10 maxi bags.

1000 kg of maize is enough for food security of 4-5 adults during 1 year!

Source: Calculations by Kees van Veluw based on practical work of UDS students in communities, 2000

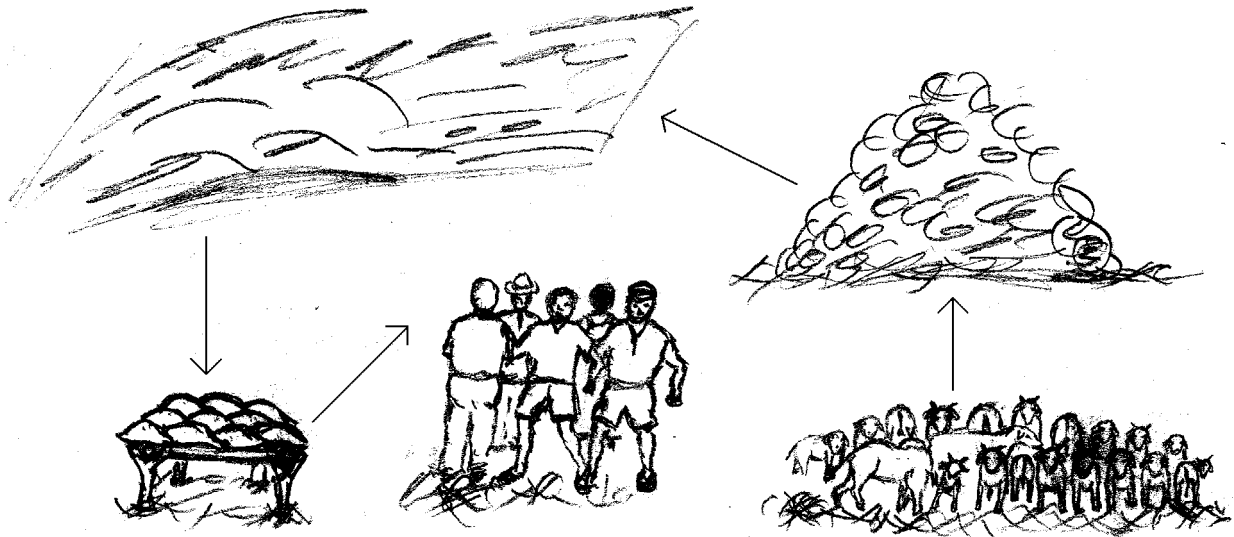


Figure 4: How 20 sheep help feeding 5 persons

3.6 Social security

Social security is difficult to define, and nearly impossible to measure or quantify. It has to do with the social structure in the household, the community, the ethnic group and the political structures, all of which have an impact on the social security of people. We suggest the following definition:

Social security is the capacity of a person or a household to fully participate in the development of the community and the capacity to develop a social network of relatives, authorities and friends to which the person/household may offer assistance or on which they themselves can fall back for assistance.

Whether a person or a household is 'socially secure' depends on many issues. Some of them are:

- The status of the household in the community. A household with a poor status has a smaller capacity to build up a secure network.
- The capacity and the attitude of the members of a household. Are they willing to participate in the development of the household and the community? Is their participation effective?
- Is the leadership of a household adequate?
- How is the community organised? Is there unity in the community?
- Is the traditional set up of the community still there? Is there a chief, a tindana, a women leader, traditional healer, etc. who are able to solve problems of community members?
- Is the leadership of the community adequate?
- Is the modern social infrastructure (government school, NGO, District assembly member, extension workers of different ministries, clinic, etc.) well developed?
- Does the traditional structure cooperate with the modern structure, and if so, how?
- How is cooperation between men and women?
- Are there still youths in the community or have they gone as kayayoo to the South?

Maybe the most important factors that determine whether a household is socially secure are unity in the household and the community. Members should agree about the most pressing problems and about the most feasible and sustainable solutions.

Story 6. Unity in the community

A village was approached by the Body Shop, a cosmetic company from Great Britain, and asked whether it could supply shea butter for the Body Shop products? The women group reorganised themselves and started to produce more and better shea butter and supplied the Body Shop with the quantities it had requested. The women group got a very good price because the Body Shop uses fair trade principles. On top of the good price they got a bonus. The size of the bonus depended on the profit the Body Shop was making, and this bonus was very good. The women group became well organised and saved a lot of capital. They decided to use the capital to build a school in the community. The school benefited the whole community. Some years later a day care centre was also constructed. In five years' time the community developed very well and the unity seemed to be very strong in the community.

The fifth year the Body Shop made such good profits that it donated a grinding mill to the women group. The community celebrated that it had become so prosperous! Then the problems started.

One elder in the community started to complain that the women were very developed and the children were all going to school, but how had the men benefited? He said: 'We are still suffering on our farms and have no benefit!' I propose that the grinding mill should be given to the chief and that the men decide what should be done with the profit from the grinding mill. The women answered: 'But the mill was given to us so we should manage the profits, and on top of that we are not sure that you can manage the grinding mill in such a way that the whole community will benefit!'

Quarrels started. The community could not come to a clear solution. After one year of discussion the chief suddenly took the grinding mill, constructed a house on his compound and placed his son in charge of the grinding activities. The women complained bitterly. They said: 'Ah, you see, the chief will use the profit of the mill for his own benefit and not for the benefit of the whole community!' Quarrels, quarrels and more quarrels.

After a while, the women group went to an NGO outside the community. They listened to the women's story, saw the papers of the Body Shop which clearly stated that the mill belonged to the women group. The NGO then decided to collect the mill from the village and gave the community the order to solve first the problem of disunity in the village before they would return the mill to the village.

Community members proposed the following:

- Maybe the women were too proud. They should accept that the men take the grinding mill!
- The Body shop should have introduced the project better and should have involved the whole community!
- The men do not see the benefit: their own children now go to school!
- The community should have discussed the issue more among themselves. Outsiders may overlook issues or may not understand the impact of development projects on the peace in the community. All members agreed that keeping unity in the community is the responsibility of all.

The problem has not yet been solved.

Source: *Experience of Kees van Veluw in a community based development project of Unicef 1999*



Figure 5: *Unity in the community?*

3.7 Cultural or spiritual security

Cultural or spiritual security is more difficult to define. Maybe the best definition is:

The capacity of all stakeholders in a community to incorporate sustainable changes and developments into the worldview and norms and values of everybody in the community

A newly developed worldview or a new set of norms and values that arises out of a process of development should give people the feeling of safety, harmony, unity, and peace, and the belief that the ancestors and gods are happy and pleased. These are very difficult and time consuming processes.

We illustrate this type of security with practical examples and stories.

Changes are always taking place. New technologies, ideas, norms and values will always enter a community. To keep the spirit and culture of a community 'secure' we should take care that the changes are peacefully integrated in the existing worldview, attitudes, knowledge and practices.

For example, extension workers sometimes talk about 'low adoption rates' of new high-yielding maize varieties. They assume that farmers do not understand the advantages of the new variety or that they are too poor or too stubborn or too ignorant to adopt the variety. And that's the end of the discussion. The reason is clear!

We regard this as a superficial analysis of the situation. There are more fundamental reasons why farmers do not adopt new techniques. Often it has to do with the fact that these new techniques do not fit in the spiritual context of traditional culture or in the social set-up of the household.

Let us look at tree planting. There is a common belief that if you plant a tree you will die. As an outsider you may think that it is superstition or that it is a stubborn old traditional custom. That may or may not be the case. Here it is not important what exactly the truth is. What is relevant for you, as a development worker, is that you have to work with this belief. You have to respect and accept this belief; otherwise you cannot work with the people. It is a challenge to find a method of tree planting which fits in the cosmivision (see Chapter 4 for an explanation of this word) of the people you work with. To do that we first have to analyse the foundations of this belief (see the two stories below) and then design an appropriate solution together.

Story 7: Views on trees

In a naive mood I once asked the Nwodua chief: What is a tree?

He gave me an answer that has changed my worldview completely:

'A tree gives us food, timber and shade to meet. A tree is also the place where our ancestors find their home! Without trees we cannot live.'

In scientific terms trees have three main functions:

- Material/technical function: a tree provides food, medicines, timber, brooms etc.
- Social function: the sun can knock you down in Northern Ghana; the shade of a large tree is as much needed as food and water. In every African village meetings take place under the crown of a large tree. Most important decisions in a village are made under a tree.
- Cultural function: trees provide homes for spirits and ancestors. The ancestors are the caretakers of the norms and values of rural people. They are consulted whenever a decision has to be taken. What society can live without norms and values?

The chief taught me a lesson: everything in life has a technical, a social and a cultural dimension, so these aspects should be taken seriously in any development process. If we outsiders do not accept the spiritual view of trees, then we cannot cooperate with village people.

As an outsider I liked this comprehensive view of trees. Ancestor worship appeals to your history, to the place where you come from. It helps you to find the right way in the future based on your history. In that sense ancestor worship is very 'sustainable'.

Source: Research of Esther Kuiler, student at Wageningen University, the Netherlands, 1998

There are examples of communities starting to plant exotic trees such as mangos, cassia, albizia and neem trees. These exotic trees are less part of the traditional cosmivision since they come from elsewhere and, as village elders say: 'they do not know the culture and customs of our area'. To plant the most liked indigenous trees, such as baobab and dawadawa trees, we need a clear and acceptable procedure that is designed by the village elders and you as outsider. One method is to ask mentally strong people to plant these trees after performing the correct traditional ceremonies. There are also examples of herbalists planting indigenous trees just outside a sacred grove in order to enlarge it, and at the same time to protect the environment and to produce herbs. There are also communities who have asked outsiders to plant indigenous tree so the indigenous people will not suffer from the consequences this action may have.

These are examples of acceptable methods of tree planting which fit within the worldview of people. This is what we mean by cultural and spiritual security.

Story 8 below provides another example of what we mean by cultural security.

To help others in a way that is sustainable, we sometimes have to forget about our own worldview and accept and respect the worldview of others. In the end you will see that by accepting and respecting the cosmivision of another, your own worldview has developed too!

Story 8. Bushfire in the community

In a certain village in the Tolon Kumbungu district there is a custom of burning all compound farms at the beginning of the farming season. The village people believed that if they do not burn the compound farms, the chief would die. To grow their food, however, they depended on the production of the bush farms.

It was only after two years of discussion that the village informed us about this custom. In these two years we had tried to convince them to stop burning by explaining the bad effect of fire on the soil.

Our conclusion was that we had made a mistake. We did not follow the right procedure to solve the problem. We immediately started to talk about soil fertility instead of first asking ourselves why they had this custom.

When we were informed about the reason of the custom we accepted it and starting to think, together with the village people, about a possible and feasible solution. After some discussions we arrived together at the following solution: we proposed carrying out an experiment: instead of burning the whole community we would only burn a two-acre plot as a symbolic act and see if that was enough to please the ancestors. The village leaders thought about it, they consulted their ancestors by performing sacrifices and the experiment was accepted.

Since then they have performed a symbolic spiritual fire every year to keep the custom alive and cultivated many crops on the compound farms.

We had accepted their worldview and at the same time we boosted food security!

Source: Experience of Kees van Veluw in a community based development project of Unicef 1997



Figure 6: Bushfire threatening a compound

3.8 Balanced sustainable development

Starting the process of sustainable development is not easy. Have you ever seen a sheep with five legs? They certainly do not exist, but sustainable development does have five legs: food security, cash security, soil security, social security and cultural/spiritual security. It could even be a sheep with seven legs, if you include health security and personal safety as additional parts of sustainable development. However, as we said at the beginning of this chapter in 3.2, development is not only a

technical issue. It is also a social and a cultural issue. Maybe it is even more of a social or a cultural issue than a technical issue. For sure: No one security goes far without the other securities; they should all go together!

Most development projects consist only of a technical approach, especially in agricultural development, and we can see that not much has changed in the past seventy years. Already in 1937 Mr Lynn made almost the same recommendations to improve agriculture as the government of Ghana is doing in 2006, see story 9.

Story 9. Recommendation by C.W. Lynn, 1937

Mr Lynn was a British agricultural superintendent studying 'indigenous agriculture in Northern Ghana'. In his publication 'Agriculture in North Mamprusi' he mentioned the following suggestions to improve farming systems:

- grow a greater diversity of crops
- introduce crop rotation
- use cow manure to fertilise the soil
- cultivate green manures
- use crop residues as litter instead of burning them
- plant crops in ridges made on the contour
- grow more rice in waterlogged areas
- improve varieties of seeds

Yield levels of maize, sorghum, millet and rice at that time were around 600 kg/ha. Source: Lynn 1937

So 69 years ago he suggested almost the same recommendations as we see now in all kinds of policy documents to boost agriculture. You may wonder why agriculture has not yet improved!

We think that an important reason that little development has taken place is that development is mostly seen as an introduction of a new technique or new machine or seed without taking care of the social and the cultural sides of the technical approach.

Source: C.W Lynn, Agriculture in North Mamprusi, 1937 and policy documents of Ministry of Food and Agriculture, Ghana.

We would like to warn you of the pitfalls. Do not fall in the trap of striving only for technical development. Before introducing a technique or a new machine, discuss first the following questions and issues:

- Is the requested technique the real answer to the problems in the community?
- How does it fit into the household structure and how does it fit into the community set-up. What implications does it have for the different household members and what effects is it likely to have on the unity in the community?
- How does it fit into the culture or the spirit of the community? Are the right procedures for introduction or decision-making being followed? Is it clear to all community members what will be done? Is it clear to all community members what is expected from him or her and who will benefit from the development?

Only after clear answers and agreement of all stakeholders can a sustainable development process start.



Figure 7: Outsider lecturing community on technical solutions

4 The resources available in Northern Ghana to achieve sustainable farming systems

4.1 Introduction

Development starts with gaining an overview of the existing situation. This chapter will help you to create that overview. We explain about natural and technical resources, and the social and cultural context of these resources.

To simplify things we have divided 'reality' into two types of resources and in two sets of contexts. In principle every development activity has to do with these resources and contexts. In other words: any development process involves natural resources, technical resources, and a social or human context and a cultural or spiritual context. There are also links between these resources, which have been developed over time by the people live in a particular area. Often there are conflicts about resources or between people holding traditional or modern views on life and development. Therefore this chapter ends with a list of possible tensions in communities.

4.2 Natural resources

Natural resources consist of everything we find in the natural environment (water, soil, air, climate, plants, animals) in which a community has to live, survive and develop.

The natural resources available can vary tremendously between one community and another.

Here is a list of the most important natural resources and brief remarks on each.

Rainfall

As a farmer said once, 'Rain is the chief farmer'. Rain is very important. But over the last 50 years rainfall seems to have become very erratic. The total amount of rainfall has not changed much, but the dry spell in July and August has become more pronounced and longer. This means that the farming season is now split in two: one season from April/May to July and one from August to October. Only a few crops can survive the long dry spell. Therefore farming practices should be adapted to two seasons instead of one season.

Story 10. Hand hoes, bullocks or tractors?

Old farmers mentioned that in the old days rain was very reliable. After the first rains you knew that the second rains would come in a week's time, and the third rain was also regular. The soil did not dry up. There was enough time to prepare the land by the hoe. As young boys we were proud when we could make 100 yam mounds in a day!

Nowadays it is different. Nobody can predict when the first rains will fall. And the second rain may not come until two or three weeks later. This is a big problem for us hand-hoe farmers. The first two or three rains make the soil soft. Only when the soil is soft can we make new ridges, and yam mounds and beds for vegetables. When the next rains do not come shortly after the previous rain, the soil will dry up and become hard. This means that we are short of time to prepare the land. We cannot prepare two acres in one day! Besides that, even if we are able to make ridges after some rains, if it doesn't rain regularly, we cannot sow. The soil has to be soft and moist for sowing. And when we can sow, we also need rain soon after sowing, otherwise the seeds will not germinate. And after germination we need rain for crop growth. Very often we see that the germinated seeds dry up because of no rain!

Possible solutions for this problem are bullocks or tractors. We know farmers who have organised themselves and who have purchased bullocks, and use them for ploughing. Bullocks can plough one or two acres a day. The next day we can sow and, if the gods are helpful and the rains come regularly, the seeds will germinate and grow through their most vulnerable stage. But very often we have to sow two or three times before the crop gets a hold. But then we face the problem that the growing season has become shorter, so the crop might fail completely or the harvest might be small.

Another solution we are trying out is the use of early-maturing varieties. Some farmers are now also focussing on crops like tomatoes and pepper. They raise them in nursery beds first and when the rains are stable, they transplant them. It's best to use compost, because compost increases the capacity of the soil to retain water.

Source: Experiences of Mr. Joseph Wuni, director of Chera Bisii Fari Project

Every farmer will agree with the statement: Rain-fed agriculture is becoming more risky than it was 50 years ago.

Irrigation possibilities

Communities close to rivers or lakes have a valuable resource nearby. Although irrigation is not easy, the communities who have access to water may be able to farm throughout the year, and that may lead to a sustainable future.

Soil

Northern Ghana still has land that is fertile and suitable for farming although rain-fed agriculture is become more and more difficult. Rather than clearing new lands, it is important to make more sustainable use of the existing farmlands, by using organic farming methods. However it is clear that there is pressure on farmlands: towns and villages are growing, and need more land; roads are being constructed, etc. The resource 'fertile soil' has become more scarce, and therefore it is all the more important to use this resource in a sustainable way.

Climate

We know that the climate is changing due to global warming. For Ghana the forecasts are that the rain will become more erratic and that temperatures will increase, as the Sahara desert creeps further south. Throughout history, people have always adapted their way of living and farming practices in response to changes in climate, and the same is happening today.

Crops, trees and livestock

People have always tried out different types of plants, trees and animals to see whether they might contribute towards their own food-, cash- and soil security. And people do not confine their interest to local varieties: exotic varieties are tried out for their potential benefits. Groundnut, cassava and mangos were originally introduced by the Portuguese and the British, and can now be called indigenous varieties. Twenty years ago soybean was been introduced, and sunflowers are a more recent introduction. Soybeans have now found their place in the local social and cultural context; in the Dagomba language they are called the 'golden bean'. They contribute towards more fertile soil and to cash security.

Other natural resources.

There are many other natural resources, too many to list them all here. Inquiring and curious people are always looking for 'new' natural resources in their surroundings. For example, see Story 11 about the excellent microclimate along the riverbank which the people of Janga are using. There is also a special kind of clay around Tamale, that a local artist is using to make miniature models of Dagomba compounds, which he sells to tourists. Many local plant parts are used for medicine and, accompanied by the right spiritual acts like prayers or sacrifices to the black ants, the medicine is effective.

Natural resources are everywhere. It is very useful to look around and see if you can find a resource in your immediate surroundings that can be used to solve a problem. Neem oil extracted from seeds can be used to control insects, sand can be used to control beetles in pigeon pea seeds, more use could be made of the acacia tree which drops its leaves in the rainy season and therefore makes the soil fertile. If you use this tree you will not need expensive chemical fertilizers. There are so many forgotten and unused indigenous resources that could be used to start and support sustainable development – look for them!

Story 11: Vegetables on the riverbanks

The Janga community on the banks of the Volta river is blessed with the natural resource of a flat riverbank along the river. When the water in the river goes down after the rainy season, the people plant vegetables on the riverbank. Another natural resource is that every morning, even at the height of the dry season, dew and moist air bring water to the vegetables. The farmers do not have to water their crops. The people in Janga have been able to use this natural resource for their development. They produce and sell large amounts of tomatoes in Kumasi and Accra. Because the community is well organised and the development is embedded in their social and cultural structure, we consider it to be sustainable development.

Source: Notes from a field visit to Janga by M. Kees van Veluw, 2003

Indigenous resources very often have the advantages that they are cheap, culturally acceptable and directly available.

4.3 Technical resources

Technical resources consist of tools, utensils, machines and transport facilities which people need or use to make life easier.

Throughout their existence, people have used technology to help them in daily life. The invention of some technologies such as the wheel and control of fire enabled people to make a 'jump' in their development. Sustainable development challenges us to find technologies that really help people to make a 'jump'.

Maybe an even more important challenge is to find a sustainable way of applying new technologies. Technologies influence worldviews and customs; this is unavoidable. But we should ask the following important questions about new technologies:

- Do they contribute towards sustainable development?
- Do we really want them? Are they the best solution to the problem?

It is extremely important to see if and how new technologies from outside, such as electricity and genetically modified seeds, are likely to fit within the social and spiritual context of rural households.

Story 12. Electricity in a sustainable way

A community came to the Unicef office in Tamale. They argued that the largest bottleneck in their (sustainable) development was the lack of electricity. If the community was connected to the national grid, their problems would be solved and development would be able to start. Could Unicef help them to get connected? 'What problems would be solved by being connected, and who will pay for the connection and the electricity consumption? It is very expensive these days,' the Unicef officer replied.

'Well, to answer your first question I would say, you see, our women have to walk long distances to grind their grains in the neighbouring village. If we had electricity we could get an electric grinding mill and then our women would spend less time walking and would have more time to take care of the children. To answer your second question: we are poor, so for us the most sustainable way would be for Unicef to pay for connection and for consumption'. The second answer was accompanied by lots of laughter!

The Unicef officer replied: 'But your women can also save time by organising themselves and instead of all women going every day to the mill in the neighbouring village, some women can take the grains of all the women. You can develop a rotating scheme in which all women take turns to go, let's say, once a week instead of every day!' The community delegation replied: 'But you know, women like to talk and besides that they are afraid that the women chosen will misuse the situation and put some extra flour from other's in their own calabash!' 'Aha,' the Unicef officer discovered, 'Your problem is not the lack of electricity but the lack of trust! And, as regards the second question: that is not the meaning of sustainability; the community should also contribute significantly!' The delegation went away and returned three months later.

They stated: 'The women are now organised and they are using a rotation scheme. To be honest; it has created some trust among the women and they are happy about it. But we'd still like electricity in the community. You see, our children need to read books and do their homework in the evening when it is dark. We need electricity! And about the costs: the community will pay for the teak poles and for the consumption, and we humbly request Unicef to pay for the connection.' The Unicef officer answered: 'Well, you have a good reason for your request, but you also have to consider that when there is electricity people will start selling cool beer and alcohol from a fridge and that will bring drunkenness, crime and maybe even prostitutes to your village. How will you avoid that? And about the costs: are you sure you have enough cash to pay for electricity consumption? It may cost you one cow a month! Are you really willing to pay these costs?'

The delegation went home again and came back six months later. The delegation leader spoke: 'We thought about all the points you raised. We have discussed it in the community and have come to the next proposal. We will start with electricity in the school, so children can read their books in the evenings. Besides that we want to start some vocational training courses in the school and we can use small electric machines like grinders, tomato-crushers, a radio-set and may be even a computer to prepare our children for the future. In this way we will avoid all the bad effects of electricity and benefit from the good use of electricity! The consumption of electricity will be minimal and we can pay for that.'

Unicef and the delegation were happy and everybody agreed with this 'sustainable' proposal. They celebrated the agreement in a community meeting with dances and greetings.

Source: Experience of Kees van Veluw in a community-based development project of Unicef, 1997

Technology should serve human beings

The challenge is to look for technical resources that really contribute to development and which are affordable. Technology should be made for people and not the other way around. The technology should be adapted to the people who are going to use that technology. We should avoid that we have 'to adopt people to the technology'. In a modern jet airplane the weakest part is the pilot. The speed of the plane in curves is so high that the blood in the pilot is all going to one side of the body resulting in dizziness of the pilot and in possible accidents. But we cannot create pilots without blood. We need appropriate technology, technology that fits to the human body and the human understanding and which is affordable to people. A threshing machine is costly; a manual operated maize sheller is more affordable. A diesel engine to pump water from the river to the vegetable crops may be feasible although fuel and maintenance of the engine are costly. A peddle-operated Soka-pump is maybe more appropriate. It depends on the people and the purpose; every situation needs again a discussion on what is sustainable and what is affordable.

4.4 The social and human context of the natural and technical resources

People living in rural and suburban communities often live under difficult conditions. Although the traditional social system is breaking down due to the influence of modern development, it is still the most important framework within which their livelihoods take place. In this section we describe the traditional and modern institutions that form the social or human context in rural communities in Northern Ghana.

The traditional institutions

We take the excellent overview Professor David Millar compiled in his article entitled 'Traditional institutions: entry point for endogenous development'. Professor Millar describes a Community Mapping exercise that was done in a village in Northern Ghana. The aim of the exercise was to show to community members the institutions that exist in their own community, and give them a picture of how they function. Only when you know about the existing situation can you design a sustainable development process and understand what the traditional institutions are likely to be able to do and for what activities you might need assistance from outside. Figure 1 gives an overview of the traditional human and social resource base in a Northern Ghanaian village. Indigenous institutions are indicated by ellipses, structural institutions by rectangles.

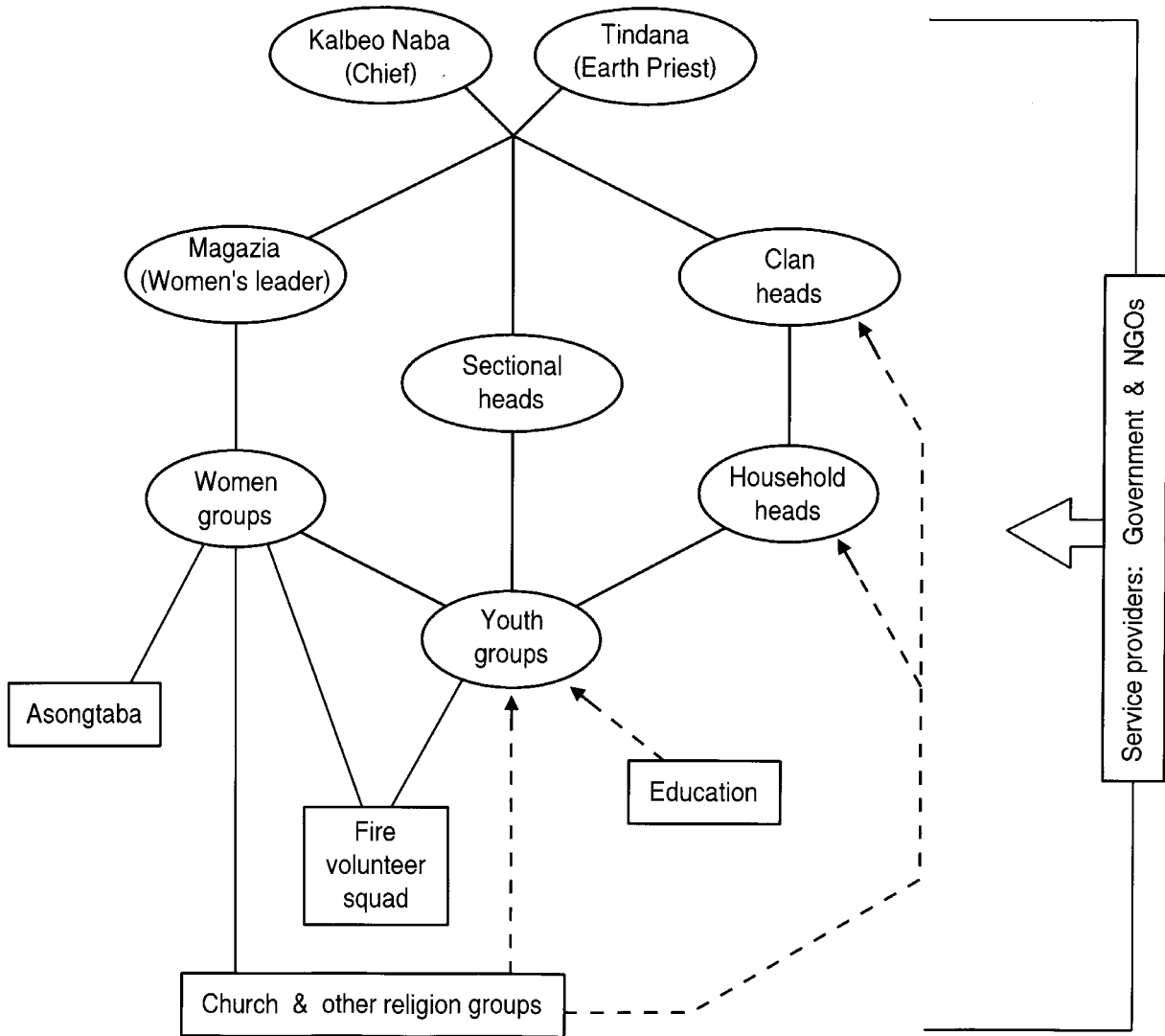


Figure 8: Outcome of community-institutional mapping for the Kalbeo community.

The chief or Naba and the earth priest or Tindana, are placed at the highest level of authority. The section heads (representatives of geographical sections of the community) and clan heads (family representatives) were ranked at the second level of authority. The women's leader or Magazia stands at the same level as the section and clan heads. Household heads, various women groups and youth groups with their leadership follow. Other institutions in this particular village are the village support groups or Asongtaba, the squad of fire volunteers and Christian or Muslim groups. Especially women are active in groups. Service providers from government and NGOs can work with any of these groups but stand outside the community organisation. There may be other functional institutions like the hunter groups or the musical groups. These groups are active when the occasion arises. Finally there are ritual institutions, for example the 'puberty rites' for girls between 16 and 18 years of age that they must undergo in order to be able to marry. Similarly, the 'adulthood rites' are rituals for young adult men that enable them to live separately from their family. See Annex 5 for an extensive description of the traditional institutions.

Story 13. Cotton, culture and identity

Cotton is an indigenous crop in Ghana. It was not cultivated as a crop on a plot but some specific households had a few cotton shrubs on an old termite hill on the farm. The shrub can grow up to 5 metres. Old women harvested the cotton wool and spun it to yarn and wove it into a special cloth. Not every woman could do that; you had to come from a special family, just as the soothsayers, the blacksmiths and the fiddle players also all come from special families. These families were the traditional artisans of the rural areas, important in maintaining the tradition but also in giving people and tribes their own identity. One of the special cloths these 'cotton women' in the Upper East Region make is the vaninga. This is a T-shaped cloth especially made for girls and given to them after the initiation ceremonies. These ceremonies mark the end of puberty and receiving the vaninga is a sign of womanhood. All rural women of around 50 years and older still have their vaninga. It is a piece of cloth that gives them identity; it is proof of being accepted as a woman in the community. When women die and are buried, they wear the vaninga.

Men also have a special cloth, which they receive after entering manhood. Chiefs also have special smocks made of traditional cotton. These customs are slowly dying, and modern cotton is now used in the production. The old cotton variety is difficult to find.

These days Dutch Wax is highly valued. It is a status symbol in West Africa. If a bride receives two or three pieces of Dutch Wax for her wedding, she gains social status. Dutch Wax is a product owned by women. Ownership of Dutch Wax contributes to the identity of being a woman. You could say that Dutch Wax is taking over the traditional role of the vaninga. In this way, we see the old custom is migrating slowly from the vaninga cloth linked to traditional initiation, towards Dutch Wax linked to modern marriage. But the sign materialised in cloth remains.

Source: Discussions with the manager of Censudi, Bolgatanga, September 2003

The modern institutions

Modernity has reached all corners of rural Ghana. Modern structures have been introduced in every rural village and play a role in the development of the community. Here we mention a few:

The teacher. The Ministry of Education has around 5000 primary schools in Northern Ghana. Traditionally the fathers educated their sons and the mothers educated their daughters. Koran schools also exist. Often they are already fully integrated in rural life. Rural people often see that the Koran schools are strengthening traditional norms and values while the government schools and their teachers bring modern norms and values.

The people in a certain area elect the District Assembly member. The DA-member represents the people from that particular area in the District Assembly. In Ghana there are now around 130 District Assemblies. Their role in development activities concerning national and international 'millennium goals' is growing.

The District Assembly consists of a political head, appointed by the national government, who is in charge of leading the development in the district. Other members are all heads of decentralised ministries such as Food and Agriculture, Education and Health. These members are appointed by the national government. The last group of the assembly are the elected members coming from the district. They form 50% of the assembly. The development of the district proceeds very often according to political affiliations: only members of the ruling political party get assistance.

Extension workers of ministries (agriculture, health, community development, etc.) and local NGOs and international NGOs (Unicef, Sida World Vision etc.) are bringing in all new kinds of technologies and views.

Hospital and clinics run by academically trained doctors and nurses have introduced a western type of health system. Representatives of the traditional health system and the western health system do not work together.



Figure 9: Women group. Besides the chief and the Tindana, the women group is an important traditional institution in a community. Often the women group takes the lead in a community in development.

4.5 The cultural and spiritual context of natural and technical resources

In many projects, the question whether or not the intended development activities fit into the cultural or spiritual context of the beneficiaries is not asked. Nevertheless this question is perhaps the most important one in any development project. Do the people fully agree in the deepest of their heart, mind and soul with the activities? Do all the stakeholders in the community or household understand clearly and agree on the consequences that the development activity are likely to have? If the answer is yes, do they express their agreement openly? And if the answer is no, do they express their complaints openly and in such a way that these are clear for all (see Story 6, Unity in the Community)?

Getting a clear answer to these questions is the most important and challenging part of a sustainable development process. They are not easy questions; it takes a lot of time, discussions, frustrations, quarrels, money, energy and creativity to get an answer. You need to be a sheep with five legs: a priest, a farmer, a scientist, a banker, a politician all in one to get this question answered. But it is not impossible.

In fact it is also a happy and inspiring process, it makes you feel alive and kicking, and you might even be able to laugh about the beauty of people as creatures of god. The best ingredient to guide everybody through these questions is a donkey cart full of humour and patience. If you have that you will surely succeed in finding an answer to this question!

The traditional worldview: Cosmovision

To explain more about the spiritual context of people, or their worldview, we return again to the experiences of CECIK, the Centre for Cosmovisions and Indigenous Knowledge in Ghana led by Dr David Millar.

Dr Millar studies traditional African culture and how development can be based on traditional culture. He states that: 'Although western influence by 300 years of colonialism and by so-called modern ways of agricultural extension methods like the Training & Visit method and all the ideas of the green revolution and nowadays the introduction of genetically modified crop varieties is for sure influencing the traditional worldview, still the decisions about agriculture, health and nature management are based on the traditional worldview'. Story 7 'Views on trees' and Story 8 'Bushfire in the community', are clear examples of the importance of the traditional worldview. At village level, the spiritual leaders, although often not clearly observed by outsiders, are quite influential.

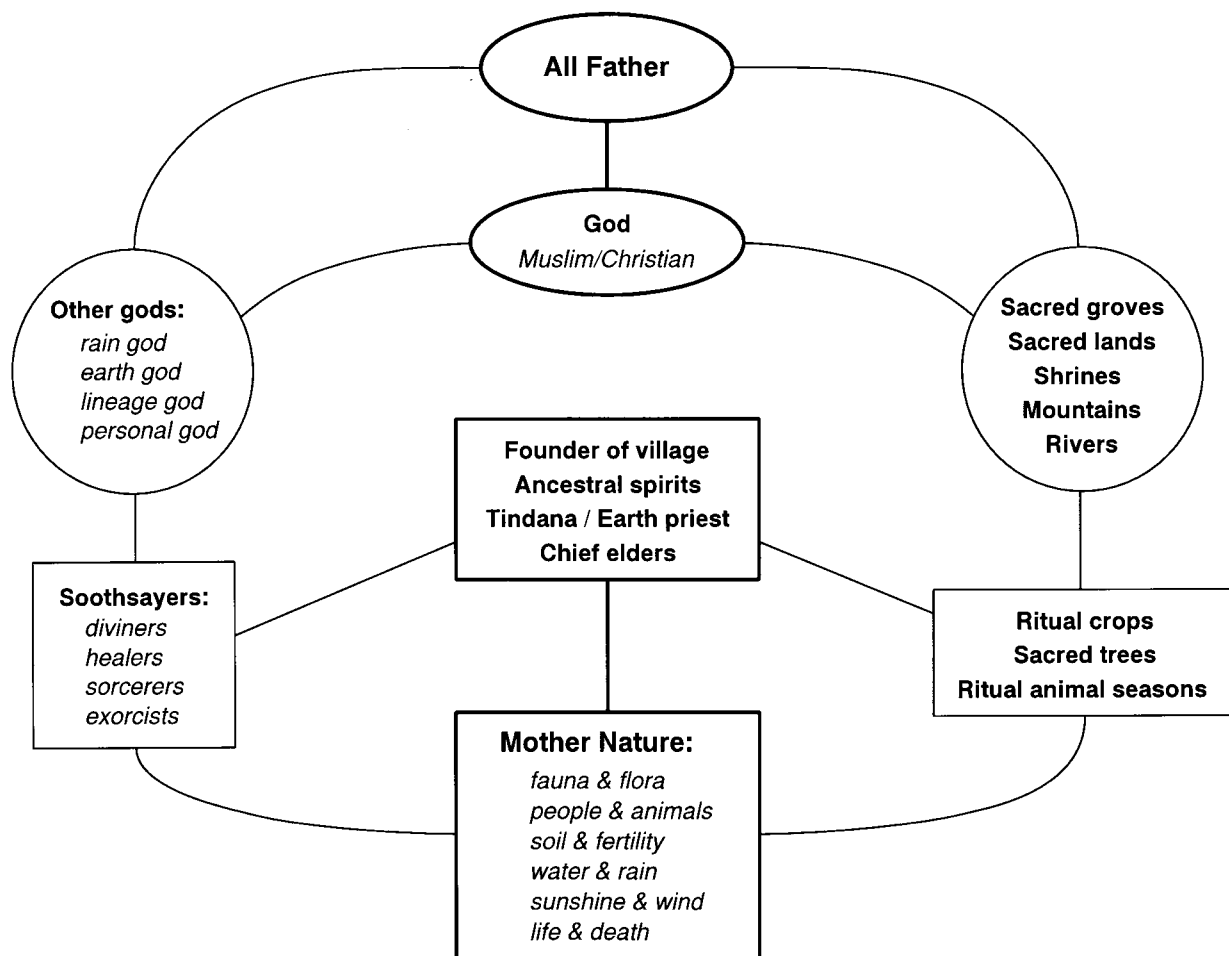


Figure 10: The cultural and spiritual context of natural and technical resources

Dr Millar explains the traditional set-up in the diagram above. It illustrates a hierarchy that is often found between divine beings, spiritual beings, especially the ancestors, men and women and natural forces such as climate, disease, floods, soil, vegetation, animals. This worldview or cosmovision gives rise to several rituals in which elders, the priest, soothsayers and spiritual leaders play a prominent role. Cosmovision dictates the way land, water, plants and animals are to be used, how decisions are taken, problems are solved, experiments are carried out and how rural people organise themselves. In the diagram you see that the founder of the village and the ancestral spirits play an intermediate role in life. They are the door towards the use of the natural environment such as shea nut picking, land preparation and sowing. For example, when the farming season starts the men in the

village consult the chief and the earth priest to find out if the time is right to start with land preparation. The earth priest performs a number of rituals and comes back with an answer. Another example is that when women want to go into the bush they ask permission from the traditional leaders. The leaders again consult the gods through the ancestors and ask permission. At the same time, they also ask protection from snake bites and for a safe return to the village.

In principle the ancestors are always approached when an important decision has to be taken. The permission from the gods has to be asked through the ancestors before an important activity such as ploughing, harvesting, travelling, selling grain etc. can start. Any new activity or farming technique, new seed variety, new machine or tool first needs the blessing of the gods through consulting the ancestors. If this is not done, the introduction of the new development will not go smoothly and many problems will arise.

In modern terms you could say that the ancestors are the caretakers of norms and values in the community. And who can live without good and sustainable norms and values? All societies on earth have institutions whose role it is to keep norms and values alive! In the traditional cosmivision in Northern Ghana, the ancestors act as the custodians of norms and values. As a service to the living, the ancestors safeguard the sustainable use of the natural and the technical resources through their consultations with the gods. They act as a store, as a collective memory, of good and bad practices and they know what is good or bad for the soil, for the people and for the cosmos. Ultimately, it is the Allfather, the Supreme Being, who decides.

The soil or land is perceived as being a mother or as a womb. The land is often considered to be a deity, the property of the gods and the founders of a clan or tribe. The traditional priest, the Tindana, as the custodian, exercises spiritual and not personal control over the land. A person can never own land; it is owned by the dead and the coming generation. The existing generation may use it but not own it. It doesn't take much imagination to compare this with the Christian concept of stewardship, another traditional concept concerning land from a different culture.

As a development worker you will face many problems such as lack of rain, malnourished children, failing crops, sick animals, sick people, devastating bushfires etc. For sure, there are scientific reasons for these problems but, equally, the people will also indicate spiritual causes of these problems. There are certainly scientific solutions for these problems, but there are also spiritual solutions. The challenge is to find the right mix of solutions. And to find that mix requires trust, participation, engagement and patience.

We realise that a convinced Christian or Muslim might find this way of looking at things personally confronting. Some people even see traditional belief systems as backward and hampering development; or that Christianity or the Muslim religions are higher in power or truth or hierarchy than traditional belief systems. On the other side, however, we have seen pictures of Catholic priests who bless the seeds, which farmers bring to church at the beginning of the farming season. We have also experienced pastors blessing the harvest and praying for health and development in church services.

The most important attitude if we are to get the sustainable development process going is not to ignore the traditional culture. We think that it is far better to start with the understanding that the traditional set-up exists and is relevant, rather than ignoring it or dismissing it as irrelevant or outdated. It is worthwhile, and also very interesting, to study very specific customs in communities, and even to take part in them, if we are to find the best way for development to take place. Life and life views are diverse, and we should acknowledge and rejoice in this.

We add, however a last cautionary remark. We want to make it clear that romanticising traditional cosmivision is not a good basis for development. Dr Millar gives a good overview of the shortcomings of the traditional cosmivision in Northern Ghana :

- Most of the traditional authorities are males. The Magazia, the traditional women leader in a Northern Ghanaian community, does not have the same level of power as the chief.
- The chieftaincy system reaches right up to the national level, but the Tindana-system does not. This creates an imbalance between the power structure and the spiritual structure.
- Open and full participation in decision making is very restricted in the traditional culture.
- Traditional structures have a limited capacity, capability and scope. They cannot solve problems alone and need the support of other structures. There are traditional authorities, just like other authorities, which misuse their position to enhance their own unsustainable status.
- Loyalties within the indigenous system are very clear, but as in other systems, can be clouded by hidden agendas, selfish motives and various unsustainable privileges.
- There are traditional production practices, such as uncontrolled bush fires that do not favour food and soil security.
- Some socio-cultural practices like funerals, outdoor activities and festivals have high levels of food wastage that result in food shortfalls.
- Gender inequality, inherent in the traditional cosmovision, militates against food security and social security.
- Witchcraft and superstition may lead to injustice. Old women are often accused of being a witch and are cast out of the community. This leads sometimes to inhumane situations.

These shortcomings of the traditional systems should be mentioned and brought into discussion and dialogue. These shortcomings should never be the reason to forget or ignore the traditional cosmovision completely. In many rural communities the traditional cosmovision, in spite of 300 years of colonialism or Christian or Muslim evangelisation, is still the basis of life and development.

Story 14: Can the Bugum festival be modernised?

The Dagombas celebrate their Bugum festival, the fire festival, with great energy, especially in the rural areas. Although it has been forbidden the last few years because of the tension in the area, this festival will never die. I have often been in the village when the procession of people with burning torches passed by. The singing and drumming entered my body and I felt the power such a festival has over the people.

I often found myself thinking about how the Bugum festival might be used for development purposes.

The festival has already gained some features that could stimulate development. The festival creates unity among the people, for example communities take measures like cleaning the festival grounds to prevent bushfires caused by the throwing of torches at a special tree. Tindanas and chiefs also set good examples by throwing their torches in another direction than the scheduled tree. There are also serious punishments; culprits are not only fined; they also have to compensate for the damage by working, and cannot do so by just paying their fine.

This prohibition of freely setting fire during the Bugum festival could be extended to a wider moral obligation: its adoption could lead to prevention of bushfire in general. It would be a challenge for development workers, traditional leaders and community members to study the possibility of using the Bugum festival to control bush fires throughout the year. Although the fire during Bugum is a spiritual fire and bushfires are material fires, it could be studied how the measures taken and rules implemented in the Bugum season could be applied during the rest of the year.

What small changes in the festival procedures might be acceptable for the ancestors and the gods and at the same time stimulate sustainable development? It is very useful to think about modernisation of traditional festivals, because the festival really belongs to the people and they have enormous power, which could be used to improve life.

Who is prepared to take up the challenge?

Source: Kees van Veluw, after visits to the Bugum festival (1995 to 2001); commented on by farmers in 2006.

The modern worldview

Many books have been written on the scientific causes of and solutions to sustainable development. We do not intend to summarise them in this manual. Here we present just one example of a scientific worldview: the Unicef framework to combat malnutrition. In this worldview, child malnutrition is seen as the key-problem of underdevelopment. If you solve malnutrition of children you solve many problems and development can start.

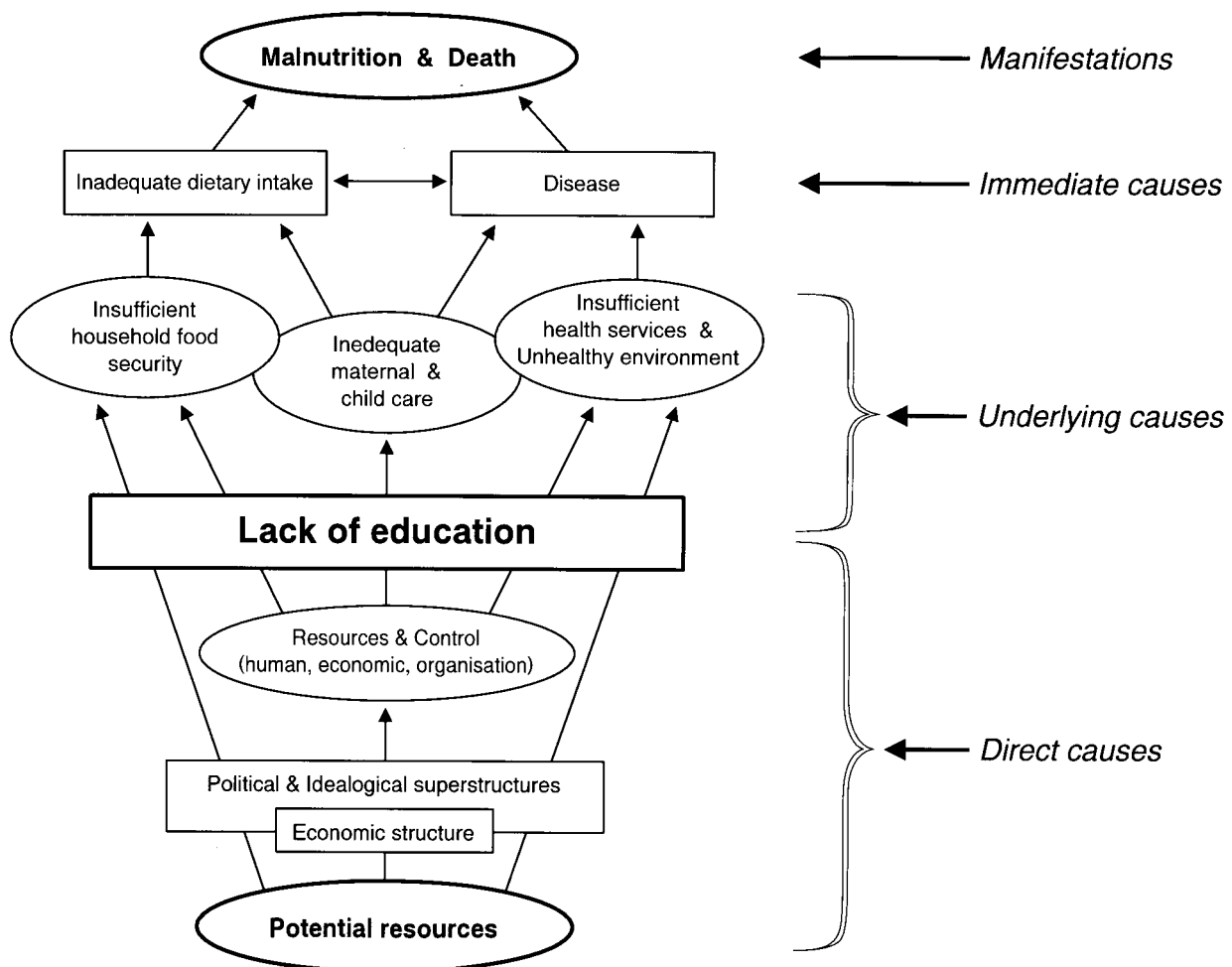


Figure 11: Unicef framework on malnutrition

Figure 11 shows three levels of causes of the manifestation 'Malnutrition and Death'. There are immediate, underlying and basic causes. The framework focuses on 'lack of education', 'insufficient household food security', 'inadequate maternal and childcare' and 'insufficient health services & unhealthy environment' as the main causes of malnutrition. Unicef (and many other development organisations) works hard to improve 'dietary intake' and reduce 'diseases' through mass vaccination programmes, and by organising iodised salt. But Unicef also provides support through community-based development projects in schools and day care centres and supports women groups by donating grinding mills. The main aim of this worldview is: if children consume good-quality diets (see 3.3 Food security) and are not sick they will grow and develop into adults who are physically and mentally ready for the future!

This is an example of a scientific worldview. It is a completely different worldview from the one shown in Figure 10, where in the traditional worldview the aim is 'To please the Allfather'.

Traditional versus modern

Many NGOs work with a scientific or modern worldview similar to the Unicef Framework on Malnutrition. There is not much room for traditional worldviews or cosmovisions. And the other way around too: is there room for scientific causes in the traditional worldview?

Let's take a practical example. What do rural households see as causes of malnutrition? If you ask people, they will often give spiritual reasons, like the child is bewitched or the mother has 'bad thoughts' about the child or another non-scientific reason. You will get similar answers if you ask the reasons for a guinea worm infection, extended dry spells or the sudden death of a person.

We are not saying that one view is better than the other view. The reality is that people who have a traditional worldview are not necessarily impressed by scientific reasoning. The other way around also applies: if you have a scientific worldview you probably tend to see traditional reasoning as something backwards. Many development workers have a scientific worldview and therefore do not find it easy to work together with people who have a traditional worldview. This contradiction is not helpful and does not stimulate development. Both views have something to say and should be respected. The challenge for development workers should be how to combine these two worldviews. Story 8. Bushfire in the community in Chapter 3.7 is a good example.

We hope that reading this manual is a first step to integrated the two worldviews and that both the development worker and the rural people work hard to use these worldviews to develop life and support a sustainable way of living.

4.6 Tensions in the community

There are many changes going on in rural communities. Modern facilities like electricity, mobile phones, television and radio and modern education affect rural people. Traditional views still exist and are challenged by modern views. These changes cause problems but also opportunities. When starting with a development process it is necessary to know which institutions and which changes are going on in the community.

Story 15. What is in the child's mind?

I live close to a rural community. In front of my house the municipality has built a concrete gutter to guide rain-water away from the housing area. After rain showers a nice layer of clay remains in the gutter. Children in the neighbouring community have discovered this clay and after every shower they are busy modelling all kinds of things. One day I stopped and asked them what they were making with the clay. 'I am making a Pajero' (small 4-wheel drive car given to all District Chief Executives), one answered. 'A mobile phone, a TV-set, a nice hotel, an automatic gun,' were other answers. 'Where have you seen these things,' I asked. 'On television!' they replied. 'Do you want to have a Pajero, a TV and a gun?' I questioned further. 'For sure,' they answered, 'but we will always be too poor to get them', they concluded.

TV has changed the minds of these rural children. I was wondering how large the tension is between the rich and violent world they see on television and their own rural situation. Now they are playing and dreaming but I am also wondering what kind of adults these children will grow up to be? What influences will these tensions have on their norms and values? Will they become frustrated? How do their parents deal with this tension? How can we guide children and parents so that they come 'unscathed' through these large processes of change? How do we deal with dreams and reality?

My conclusion to the above is, that we cannot ignore or get rid of the influence of TVs and other elements of modernity, but we have to see how we can link these items to sustainable development.

Source: Discussion with children near my house in Norrip village, Tamale, 2000. Written by Kees van Veluw

We list the following tensions:

- The traditional structures are breaking down. The tindana is losing status. The chief and the governmental leaders like the District Assembly man may be opponents but could also support each other. Youth, who have done secondary education but who do not find a job, return to the community and live more according to the new norms and values they have learned at secondary schools. They start to challenge the traditional authorities.
- The traditional customs, modern customs spread by governmental institutions, and customs spread by Christian and Muslim groups also conflict with each other. Christians no longer accept traditional sacrifices and regard these practices as pagan. On the other hand in time of real emergencies they fall back on some traditional practices.
- Many NGOs but also governmental organisations focus their work on women and try to develop them. For sure this has a positive impact on the women, but it could have negative effects on the

unity in the community or in the household. Gender issues are on the agenda and that is a good development. On the other side it creates tensions.

- Youth is no longer staying in the village. The main reason for that is that there is no employment for them, rain fed agriculture is becoming more risky, farming is losing its status and the ones who have followed secondary schooling have problems with traditional belief systems. The result is that the youth is disappearing from the countryside. Kayayoo girls in Accra, young boys go to Tamale, Kumasi or other places in the south to find a job in the informal sector. These changes are draining the rural areas of their future inhabitants. But adults are also leaving the rural areas more often. In the dry season they go to the south to find employment to come back in the farming season. In all these changes and new situations, the chance of coming into contact with crime and prostitution is higher. Work often involves inhumane conditions. These new experiences change the minds of the people. And the villages are losing their future generation. Kayayoo and the exodus of the youth create a lot of tensions in the community but also in the urban areas.
- Services of the government like schooling, transport, health care, fuel, user goods like bicycles and agricultural tools and food are becoming more and more expensive. It is becoming increasingly difficult to meet basic needs. On the other hand, the prices of agricultural products are not increasing at the same rate as the prices of basic needs. For rural people it is becoming more and more difficult to live a decent life. That creates tension, for sure!

All these changes create tension and uncertainty. Which rules, norms and values are 'valid' in our community? In many places there is a search going on for a new community identity. However, not all traditional structures are breaking down. Many youth groups, farmer groups and women groups are active and vibrant, and could be entry points for development.

To conclude this section: the social structure and the norms and values in the community are changing. Any development activity should be situated within these changing human and social and cultural contexts.

5 How to assist farmers in their development?

5.1 Introduction

In this chapter we present three ways or processes of development: Participatory Technology Development (PTD), Endogenous Development (ED) as promoted by CECIK, the Centre for Cosmovision and Indigenous Knowledge, and Farmer to Farmer Extension. The first two, PTD and ED, are methods for sowing the seeds of sustainable development. But we can never reach all rural households in Northern Ghana using these two extension techniques. Therefore scaling up to the larger level should be done from farmer to farmer. That is why we also mention some basic principles of Farmer to Farmer Extension.

5.2 What is participation?

Other words for participation are: sharing, contribution, involvement, cooperation, co-partnership, membership, and attendance.

But participation can take place on very different levels. Look carefully at the next table and study the increasing levels of participation. In the last column we have tried to find examples of the particular level of participation that you will find in Ghana.

When you study the different levels of participation you will see that in level 1, manipulative participation, farmers or the target group are totally out of the decision making process. The same in level 2 and 3 although you see that in level 3 consults are taken. If there is an excellent consultant you may have some influence on the decisions, which are made. In level 4, the Food for Work participation farmers may decide about minor issues but not about the main issues. In level 5 the project owners just see it as functional to give people the power to decide but not about the main issues. The project owners are not really interested in the people but just in the aim of the project. If the project succeeds, they will get the status, not the people.

Levels 6 and especially 7 we see as levels of participation that belong to sustainable development. We realise that it is not an easy development process for both the target group as well as for the development worker to slowly or radically change from level 1 to level 7. It is a big change in attitude but we see it as a prerequisite to give the farmers the full power to decide about their own situation. All these ways of development are participatory processes. We start by offering some thoughts about participation since proper participation is a prerequisite of sustainable development.

5.3 Participatory technology development

In this paragraph we give you a method to guide farmer groups or communities through a participatory technology development process.

Introduction

In some agricultural disciplines such as crop breeding or irrigation, technology development is a well-known tool.

- The crop breeder studies the local varieties and decides that the yield capacity is too low. Based on farmers' experience and his own agronomic knowledge, he breeds a new sorghum or maize variety and gives it to the extension worker to be introduced to farmers.
- The agricultural mechanisation expert sees how farmers are suffering when they try to eradicate weeds in their crops. Since the traditional hoe has a short handle, you have to bend to remove the weeds. The mechanisation expert thinks that a long handle will reduce the back pain. He makes some drawings, goes to a blacksmith who makes the hoe with a long handle. Remember also Story 8, Bushfire in the community!

Table 2: Levels of increasing participation

	Level	Characteristics	Examples from Northern Ghana
1.	Manipulative participation	Participation is simply a pretence, with 'people's' representatives on official boards but who are unelected and have no power.	- any organisation with a dictator as director - an old type of extension worker
2.	Passive participation	People participate by being told what has been decided or has already happened. It involves unilateral announcements by an administration or project management without listening to people's responses. The information being shared belongs only to external professionals.	- NGOs who put farmers in the board just to get funds - in some cooperatives the manager decide about prices, the members are not involved - CRS school feeding programme
3.	Participation by consultation	People participate by being consulted or by answering questions. External agents define problems and information processes and so control analysis. Such a consultative process does not concede any share in decision making and professionals are under no obligation to take on board people's views.	- NGO that just builds a grain store or a KVIP without taking the people serious; white elephants! - some target groups agree just to please the leader or to avoid problems
4.	Participation for material incentives	People participate by contributing resources; for example, labour, in return for food, cash or other material incentives. Farmers may provide the fields and labour, but are involved in neither experimentation nor the process of learning. It is very common to see this called participation, yet people have no stake in prolonging techniques or practices when the incentives end.	- all food-for-work projects - attending a workshop just to become DSA - a normal boss-employer relationship
5.	Functional participation	Participation seen by external agencies as a means to achieve project goals, especially reduced costs. People may participate by forming groups to meet predetermined objectives related to the project. Such involvement may be interactive and involve shared decision making but tends to arise only after major decisions have already been made by external agents. At worst, local people may still only be cooperating to serve external goals.	- youth employment fund - many government projects such as livestock development project - most NGOs work along these lines
6.	Interactive participation	People participate in joint analysis, development of action plans and formation of strengthening of local institutions. Participation is seen as a right, not just the means to achieve goals. The process involves interdisciplinary methods that seek multiple perspectives and make use of systematic and structured learning processes. As groups take control over local decisions and determine how available resources are used, so they have a stake in maintaining structures or practices.	- a well functioning District Assembly - an old traditional village - Parent Teachers Association
7.	Self-mobilisation	People participate by taking decisions independently of external institutions to change systems. They develop contacts with external institutions for resources and technical advice they need, but retain control over how resources are used. Self-mobilisation can spread if governments and NGOs provide an enabling framework of support. Such self-initiated mobilisation may or may not challenge existing distribution of wealth and power.	- susu group credit schemes - construction of school buildings with thatch roofs by communities - youth groups who work rotationally on all farms of the members - some well functioning anti-bushfire squadrons installed by the community

Source: Pretty 1995

In both examples new technologies are an important step in agricultural development activities. In both examples it is also clear that the new technologies are the skills of an 'expert'. Farmers start to use the new weeding tool and variety, and maybe as a result of discussions with the expert, the tool will be adapted, improved or rejected.

These examples show how technical agricultural development, up to now, has been done.

That is the past. After reading this manual, we ask you to experiment with a participatory development process, taking into consideration the sustainable development aims of Chapter 3, all resources described in Chapter 4 and the social and cultural contexts, also described in Chapter 4. Try it!

What is participatory technology development?

It is strange that agricultural experts consider only parts of a farming system (a tool, a de-husker, a new maize variety, use of compost etc.) and never consider consciously a whole farming system. Farming households and especially landlords, when designing their farming system, take into account the household size, and the natural-, social- and spiritual resources. Developing a farming system is an indigenous skill applied by farmers to achieve certain aims. In Northern Ghana these aims do not include only food security. There are many other aims: households also farm to achieve cash

security, they try to save the environment for future generations and they farm to achieve cultural or spiritual aims. Agricultural development experts overlook especially the cultural or spiritual aims.

Participatory Technology Development (PTD) tries to enhance the development skills of farmers and of agricultural experts like extension workers and researchers. It is a mutual process between insiders (farmers) and outsiders, but the farmers play the key role. It is their farming system and they have to guide their own development process. Participatory Technology Development tries to design a farm consciously to achieve aims which are set by the farming households.

Participatory Technology Development is an approach that:

- takes the traditional setting (nature, techniques, social set-up and the traditional cosmovision) as starting point of development;
- combines the traditional knowledge, attitudes and practices with scientific knowledge, attitudes and practices;
- integrates several sustainable farming techniques to a self-supporting farming system;
- changes the attitude of farmers from 'package-receivers' to 'independent farm developers' and
- changes experts and fieldworkers from 'message-deliverers to development-partners'.

The six steps of Participatory Technology Development

- Step 1: Getting Started and Building Trust
- Step 2: Problem Identification and Looking for Things to Try
- Step 3: Organising for Development Action
- Step 4: Trying out
- Step 5: Sharing Results (including Monitoring and Evaluation)
- Step 6: Sustaining the Results

Is the problem solved?

If yes -> select the next key-problem and continue with Step 2.

If no -> go back to Step 2 and select another possible solution for the problem and continue with Step 3

In Chapter 7 you will find some participatory training techniques (paragraph 7.5) that will help you in problem identification (Step 2) and some organic farming techniques (paragraph 7.4), also as part of Step 2: 'Things to Try'.

The six steps are a cyclic process. Once the first problem is solved, the next one can be solved. Start with small feasible problems first and then try to tackle larger problems. This will build confidence in the farmer and in you as outsider. Working with these steps, hopefully you can solve more and larger problems and turn the downward vicious cycle of food-insecurity leading to weak and poor households leading to lower food production leading to larger food insecurity into positive development cycle of improving food security, more cash and more unity in the community.

Remember always that you are the facilitator and that you have to respect rural farmers' worldview and way of life. They should decide on all six steps. They also determine the speed of the process. Annex 6 provides a detailed description of all six steps.

5.4 Endogenous Development

CECIK is a partner organisation in the Compas network: COMPAring and Supporting endogenous development. CECIK has carried out field experiments with endogenous development in the area of Bongo, Northern Ghana. This is a rural area caught up in a vicious cycle of poverty. It is a socio-culturally rich environment, with strong value systems, traditional leadership structures and systems, spiritual values. The communities are poor, but 'proud in their poverty'.

The methodologies developed by CECIK take into account the worldview of the people in these communities, as well as the way they want to combine traditional with modern practices in agricul-

ture, natural resource management and several income-generating activities. CECIK has established partnerships with local universities (University for Development Studies in Bolgatanga).

Methodology of CECIK for supporting endogenous development (ED)

First community entry:

- We go only on invitation.
- Project members alone, not with government. It is more a social occasion.
- Preparation of the 'self' of project staff, through reflection, prayer and intuition: what do I have to offer at personal level, to the community and to my country?
- At the same time preparation by the 'community', through consultation of the ancestors, reflection, intuition.
- When community members and project staff agree that energies are positive, the programme can start.

Community planning and envisioning:

- Together with government officials & universities:
- Start with whole community;
- Joint analysis of six local resources to see how much potential is available:
 1. Natural resources (for example: natural environment, crops, animals)
 2. Human resources (for example: local knowledge, the learning methods)
 3. Economic/financial resources (for example: credit, market, saving methods)
 4. Produced resources (for example: roads, schools)
 5. Social resources (family structures, solidarity structures, leadership)
 6. Cultural resources: all elements related to the local culture, including spiritual resources (which cannot be identified separately, as they underlie all resources mentioned before)
- Select and start working in thematic activities: group formation within the community according to
 - thematic interests;
- Community Institutional Mapping (CIM) of traditional leadership structures and community expert structures related to each of the thematic areas;
- Baseline data collection for each thematic activity.

Action research within thematic areas:

- Planning of each thematic area using the participatory methodologies, and including role of local institutions in these plans and responsibilities;
- Topical research input from university on specific themes;
- Joint management of plans (between community traditional leaders and field staff);
- Validation sessions (between community experts and NGO, participation of university);
- During community festivals the outcome of action research are presented and discussed.

Evaluation and (re)planning:

- Discussions of evaluation findings;
- Walks, visits, cross-visits;
- Sacrifices and other ritual performances for some of the activities.

Some questions about CECIK put to the director, Dr. David Millar:

- 1 What do you mean by 'pride in their poverty'? The local perception of poverty does not primarily look at the dress or the number of meals per day. The main criteria for well-being include: how many women you have, how many children, and how many people look up to you within the community.
- 2 What about discriminatory issues within the groups, such as against women? Participation does not mean that it is only the community that knows. One of our responsibilities is to provide information about a controversial aspect – not tell them that, for example, 'the way you treat your women is not right'. So provide them with information through posters, or a radio programme about other ways of doing these things, so reflection can start. It takes time, this way. But now the practices can be discussed. If they remain hidden, they cannot be challenged.
- 3 What themes do you focus on? This includes livestock, tree planting, rehabilitation of sacred lands, experiments with controlling striga in crops, etc.
- 4 Remark by David: If you perceive that spirituality does not exist in your area, you have to look closer; also look for the traditional leadership structure.
- 5 Do you suggest we have to perform rituals ourselves? We do not perform them. Only if it is important in the area that you are included in a ritual, can you participate.

- 6 You only focus on the whole system? We start with the whole community and the whole system. Then according to interest in a specific theme, groups are formed to work on that. In our area, for example, livestock work is limited due to the belief in the 'evil eye'. Therefore we can only work through family groups with livestock, instead of community groups. But that is ok.
- 7 Do you have superstition in your area? Yes, and this is part of our reality. We have to respect it and be empathetic; we have to develop tolerance of other realities.
- 8 Is religion the same as spirituality? Religion is different from spirituality. Spirituality is the innermost expression of ourselves – while religion is just one of those expressions, but does not include all the others.

5.5 Farmer to Farmer Extension

Sowing the seeds of sustainable development through PTD or the CECIK ED method is in fact not the most difficult part of starting sustainable development. A more challenging question is: How do we reach all rural households? How do we reach all souls and soils in Northern Ghana? As development workers, we can never reach all farming households in a development project. It is clear: the scaling up should be done from farmer to farmer; or from woman to woman; from community to community. The case study about David Sandow in Chapter 6 describes how Farmer to Farmer (FtF) extension takes place.

Only when sustainable development becomes a movement, a grassroots development, a development in which the seeds of the few PTD and ED-trainings can germinate, flower and multiply, will Northern Ghana be able to develop and achieve reach all five forms of security.

In Latin America there has been a lot of experience with FtF extension. FtF is more than a wide-flung, loosely related collection of NGO projects. It is not simply a horizontal methodology for learning or technology transfer from one to the other. It is a social movement based on the belief that farmers are capable of developing their own agriculture (see Leisa Magazine, October 2001). The FtF movement 'walks' on the legs of 'innovation and solidarity' by experimenting on small, local scales and by widely sharing knowledge, creativity, experience and wisdom, from farmer to farmer.

The movement 'works' with the two hands of 'production and protection'. By focusing on overcoming limiting factors to production and on strengthening the environmental capacity (more organic matter in the soil, more trees, less erosion, stop bush burning etc.), farmers first reduce external inputs and then substitute internal for external inputs. To the extent possible, they gradually eliminate inputs altogether by redesigning the farm system to rely primarily on sustainable and renewable techniques. When the environment is protected, the production capacity of the farms will increase automatically.

Basic principles of Farmer to Farmer extension

The basic principles of FtF are:

- Start small, go slowly;
- Small-scale experimentation to overcome limiting factors and stabilise ecological functions;
- Multiplier effect; one farmer should inform his household, his relatives, his friends. When all farmers who have participated in a project do this, there will be a large multiplier effect;
- Limit introduction of technology; only simple techniques to start with, like composting, later on more difficult techniques like contour ploughing;
- Train others in FtF extension;
- Reduction, substitution, redesign: 3-phase conversion to sustainability: first replace part of your chemical fertilizer use by compost, secondly replace all chemicals by compost, thirdly re-organise your whole farming system.

The movement 'sees' with the shared visions of farmer-led sustainable agriculture. In its 'heart', members of the movement are motivated by deeply-held beliefs in their divine worldview, in family-structures, in nature and community.

Experience over the years in Latin America has resulted in a number of activities and methodological/ organisational lessons. First is the centrality of rural culture. Farmers learn from each other by sharing wisdom, creativity and knowledge, not just information and techniques. Rather than simply transferring technologies, farmers first and foremost ‘make culture’ - sharing that leads to action builds a culture of sustainable agriculture. Technology transfer is actually just one (and not always the primary) component of this cultural matrix.

Part of farmers’ enthusiasm for developing agriculture comes from the sense that they are actually contributing to and shaping society. This subjective, but very powerful motivational force has been nurtured through cross visits, meetings like Farmer Days and full participation of farmers in all kinds of training and workshops.

Some suggestions on how to stimulate Farmer to Farmer extension in Northern Ghana:

- 1 Farmer Field Schools: this involves locating sites which are considered poor and degraded, and strategically located along a busy roadside or close to a market, and practising different (soil) improvement practices. This approach works with farmer groups, which are expected to rehabilitate collectively a piece of degraded land. This way, ideas gained about the improved practices and their resultant effects (for instance as expressed in yields obtained) help to spread information about these practices. This is also an example of how participatory innovations can be developed.
- 2 Farmer Days as are organised by MoFA. Besides being an occasion when prizes are given to the best farmers, these days could also be used to stimulate farmers to show the public innovations they have made themselves.
- 3 NGOs should stimulate successful farmers who are participating in projects on sustainable agriculture to distribute their knowledge and experience to members of their own social network (like Mr Sandow, in Case 1, Chapter 6).
- 4 Lead an exemplary life. Traditionally Ghanaian adults and children learn by copying their parents



Figure 12: Stone bunding: Stone bunding is an endogenous technique in some parts of Northern Ghana. In other parts is not indigenous. Farmers who are familiar with the technique can easily motivate other farmers to apply this technique in their fields.

6 Case studies

6.1 Introduction

The four case studies in this chapter give you some examples of sustainable developments. They all show different aspects of sustainable development

The first case study describes the farm of David Sandow, an organic farmer in Zangum, near Walewale. In Northern Ghana there are many farms like that of David Sandow. There are only two big differences compared to other farms in Northern Ghana. David farms consciously in an organic way and he spreads his knowledge to everybody who passes his farm. David Sandow puts Farmer to Farmer extension into practice!

The second case study is about the farm of Joseph Wuni. Joseph has developed a farming system that is sustainable and produces food, firewood, fertility, wild vegetables and honey in a very integrated way. His farm is a shining example of ecological sustainability and should be copied far more!

The third case study is the ITFC project on organic mangos. Planting a tree is planting sustainability. Organic Mango plantations will sustain the environment and at the same time can raise cash security.

The fourth case study is about the Savanna Farmers Production and Marketing Company. They are trying to create more unity within a large group of Savanna farmers, especially so that they can market their produce more sustainably and for a more stable price than on the free market.

All four case studies show how sustainable development can start. Do contact them if you want more information!

6.2 Case study 1: Mr David Sandow, organic farmer in Zangum, West Mamprusi district

Zangum is located about 8 km Northwest of Walewale. David Sandow's household consists of 12 people. For the last 10 years he has been linked with Zasilari Ecological Farms project, which is managed by David Agongo. Mr Sandow heard about David Agongo and decided to visit him and learn sustainable farming. He has been farming organically for five years now. The techniques he and his family uses are:

- Collecting organic residues and farmyard manure at the compound for making compost. His wife and his young men mainly do this.
- Carrying the compost to the farm.
- Not burning crop residues but putting the residues in the furrows to be incorporated in the soil, together with some compost.
- Preventing gully erosion by filling the gullies with crop residues.
- Making ridges parallel to contour lines to prevent erosion
- Planting grass bunds along the roadside to check erosion

David Sandow is no longer using artificial fertilizer, except for some experimental plots. Before, his harvests were very low because the soil was really bad. Thanks to his organic farming practices, David has improved soil fertility.

What are the benefits of composting?

Mr. Sandow: 'As regards composting, I notice that it improves the soil condition: when a drought stays on for a long time, and other farmers' fields get dry, I still have a good moisture in the soil. Other maize fields that were planted at the same time as mine, but without compost, cannot make it

anymore. I am aware that composting has more virtues than only improving soil fertility and thus giving taller plants.'

Maize is the main food crop for David Sandow's family. In the 2005 season, he cultivated 1.5 acres of maize and harvested 3 donkey carts of 2.5 bags each. In 2006 he intercropped all maize with groundnuts, which thus gives a bonus harvest. This year he cultivated 2.5 acres, harvesting 5 carts of 2.5 bags each. This translates into 5 bags per acre for both last year and this year. The increased yields over last year's harvest are the bonus harvest from the intercropped sorghum and groundnuts.

Mr. Sandow: 'I can now also sell food. I used to go to other Mamprusi villages to buy food. Now people are coming from other places to get food from my harvest.' At a second location he plants 1.5 acres with mainly soybean as a cash crop, and some Bambara beans and cowpea. Dispersed on his plots are shea nut trees. They provide shea nuts, shade and leaves, which fertilise the soil.

In addition to the crops, he has 1.5 acres of tree plantation next to a community tree plantation.

What are your thoughts about sustainable development?

Mr Sandow replies: 'We need enough food throughout the year. If we don't have enough food, we are not happy. But not only my household, other households in our community also should have enough food. If all farmers agree on this way of farming, we would all be happy and even be able to sell food to get money. Thus nobody will starve and there is happiness in the community'. Mr Sandow stated very clearly: 'Food security in the context of sustainable development must go beyond the individual to the community level. Sustainability in farming includes the whole thing; if everybody is educated in organic farming, the next generation will live in a sustainable way. In the old days we practised a shifting cultivation but now it's not like that. I realise that in a couple of years my children will take over. If I do not practice organic farming now, how will they be able to grow their own food in a sustainable way? For example, by collecting rubbish and farmyard manure, I stimulate my children to do so as well, and thus I teach them my composting practice. Yes, I may, at best, be able to pass on money to them to buy fertilizer. But yet I prefer passing on knowledge, because this leads to more experience and sustainability!'

How can unity be defined, how do villagers experience it, what are its main features?

Mr Sandow: 'I regard unity among community members as the most important condition for improvement of farming and livelihood. One finger cannot lift a stone, but two or even three can. Unity leads others farmers to become interested in learning organic farming. Without unity they would not have come to look at my practice and I would not have been willing to tell them about it. Another virtue of unity is that, we were able to come together and express our need to grow trees together. If you are interested, I can readily show some of the wood harvested from the woodland at my homestead. I therefore plead for further extension of organic farming methods. Some who don't know come to learn. We need also patience: it takes time for those who do not know and want to be taught.

How do you teach others about sustainability?

Mr Sandow: 'People pass my farm along the road and start questioning. Then I explain that I can farm without adding fertilizer, and they want to know more and come along more often, and also others that I do not know before, start to come along, throughout the growing season. Some people even come from four kilometres distance to learn from me!'



Figure 13: David Sundow talks about his experiences of organic farming to people who pass his farm. This is also farmer-to-farmer extension

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6.3 Case study 2: The farm of Joseph Wuni in Chera-Bisii, West Mamprusi District

Joseph Wuni's farm is located on the outskirts of the small community of Chera-Bisii, 30 km west of Walewale. The first thing Joseph did was to plant a fence of cassia trees. The fence surrounds half of his farm and is about 500 metres long. The tree-fence now is established and has about 1 tree every metre. Cassia is a leguminous tree. It has mainly taproots, meaning that the roots do not compete so much with the roots of the crops. Cassia is not an indigenous tree and has therefore the advantage that planting it is not accompanied by all kinds of spiritual customs. It took around 5 years before the fence could really be pruned but now the trees are producing many valuable resources:

- Leaves which contain a high level of protein. Joseph collects these leaves and spreads them over his farm land;
- Shade for relaxing and resting;
- Firewood: there is now abundant firewood in the household;
- Timber: he uses poles and sticks for all kinds of construction;
- A microclimate: people coming from the south say: 'Hey, it looks as if I am in a forest!' The trees temper the heat and increase air humidity.



Figure 14: Joseph and his mother. Joseph's mother collects wild vegetables which grow spontaneously on Joseph's farm since he has been farming organically.

In the middle of Joseph's farm is a small forest of 3 acres. When he started farming here, Joseph did not cut down the indigenous trees in those 3 acres. He even planted more trees in his small forest. He also protected his forest and his crop land from bushfires. After some years, his forest developed into a fertilizer factory. Every dry season he collects the leaves from his forest and applies them on his crop land. There is 2.5 acres of crop land on both sides of his forest. The leaves of the forest and of the tree fence are making his 5 acres of crop land very fertile.

A fire belt surrounds his 8 acre farm (5 acres of crops and 3 acres of forest). He uses mainly *Crotalaria* shrubs as a fire resisting belt. This legume shrub stays green in the dry season and is therefore wet. Fire cannot destroy it and when the fire is not too intense and the wind is not blowing too much, the fire usually dies in the green wet shrubs.

In addition to the leaves, Joseph is also using green manures, especially *Crotalaria*. He sometimes grows it together with the maize crop. The maize grows over the *Crotalaria* to start with, but after harvesting the maize the *Crotalaria* stops suffering and develops on the remaining water into green shrubs. In the next farming season the shrubs develop further on the first rains. Even the seeds ger-

minate after the first rains and develop a lush green layer. At the time of land preparation Joseph cuts the green manure down and incorporates the organic matter into the soil.

Joseph estimates that for 10 persons he needs around 30 bags of food, and that he can produce that easily on 5 acres of land (6 bags/acre). Mostly, the farm produces more than 6 bags an acre. In the forests he has put some beehives, and they produce plenty of honey. Since he is not burning anymore and due to the protected environment, wild vegetables now have a chance again to grow. The older women in the community come to collect these vegetables. The fence is producing a lot of firewood for sale. In all it is a very sustainable farm design and an example for other farmers.



Figure 15: Beebox: The forest on Joseph Wuni's farm is an excellent place for beehives. The bees help to pollinate crops and, especially in beans, this results in higher yields

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6.4 Case study 3: The Integrated Tamale Fruit Company project on organic mango plantations

The Integrated Tamale Fruit Company is a Ghanaian based company in the agro-forestry industry. ITFC has its head offices in Tamale, the capital city of the Northern Region. Incorporated in 1999, the main activities of ITFC are the cultivation of organic grafted mango, the nursing of seedlings and

the promotion of indigenous species of trees. The climate of the region is ideal for mango. ITFC's nucleus farm and nursery is in the village of Dipale in Savelugu Nanton district. The outgrowers are all situated in the Savelugu Nanton District.

Acquiring the land proved to be time consuming for ITFC, but with patience and determination for the project, the land was officially handed over to ITFC in 2000. This initial hurdle notwithstanding, ITFC has a strong foundation in its operational area and a notable reputation throughout the country.

The nucleus farm cultivates 140 hectares of certified organic mango and will be extended by 15 more hectares. In order to meet the international organic regulations, the farm uses a system of integrated pest management and an organic disease control scheme. An internal control system has also been put in place to monitor all activities on the farm and insure the best quality of mangos.

ITFC uses a micro-irrigation system, meaning there is one sprinkler per plant. This system allows every plant to receive the required amount of water. The water is pumped directly from the White Volta River, and passes through a filtration system before reaching the sprinklers.

ITFC has employed qualified personnel with requisite experience to manage the plantation as well as sourced workers from the surrounding communities. It is expected that the organic agricultural methods used by the nucleus plantation will be transferred to the surrounding communities through the outgrowers scheme, which is also certified organic.

ITFC has a modern nursery at the same location as the nucleus farm. The nursery works according to organic standards. The nursery produces grafted mango seedlings which are used on the plantations of the outgrowers.

At the moment ITFC is assisting 700 farmers with funds from Cordaid a Dutch NGO and Wienco Ghana Ltd. ITFC has a target of assisting 2000 outgrowers by the end of 2006. ITFC supports the farmers or outgrowers with a long-term loan in the form of inputs that are used only for farming one acre with 100 mango trees. Women and families also participate in the project beside men. The mango plantations of each outgrowers are clustered into 25-50 acres in each community. This makes logistics (watering, fencing, transport etc) easier and cheaper. The chief has to give a written document in which he states that the outgrowers can use the land for at least 99 years. ITFC has a contractual agreement with the farmers, the cost of the inputs are debited to individual accounts and will be paid back at the time of harvest (approximately 5 years). The farmer will pay a maximum of 30% of his income towards the total expenses owed.

The harvesting season of mangos is in April and May. This doesn't interfere with other farming activities. The income from the mangos can be used to buy inputs for farming or to buy food to get through the hunger-season.

The farmers work in groups and each farmer must provide one bag of maize as a registration fee and a sign of commitment. ITFC provides one technical officer with a motorcycle for every 200 farmers and one field assistant with a bicycle for every forty farmers. These technical officers and field assistants provide the farmer with the necessary advice and record keeping to successfully farm organic mango.

It is the responsibility of the farmers to provide labour for their farms such as digging, fencing, weeding and bucket watering. ITFC provides the technical aspects of farming organic mango, such as disease and pest control, pruning or shaping of the trees, and water provision twice a week during the dry season. During the rainy season ITFC strongly encourages the farmers to intercrop with groundnuts, not only as a cover crop to promote farm hygiene and for its nitrogen fixing benefits, but also as an intermediate income benefit to the farmer.

The individual farming groups have unified themselves under the umbrella of the Organic Mango Outgrowers Association (OMOA), a registered organisation that was formed as a means of internal control and to collectively negotiate for the benefit of all. The association has an executive body, which participates in decision-making on behalf of the farmers and represents the farmers when holding discussions with ITFC and other donor organisations.

Once the trees have reached maturity and they begin to fruit, ITFC will provide the farmers with the technical assistance to harvest and transport the fruits to be packed in the company's packing station. ITFC will also market the mangos for the farmers, and give a clear statement of the number of kilograms harvested, the amount exported and sold within Ghana, the fees for packing and shipping, the loan payment, balance of their loan and the profit for the farmer. While the outgrowers and their families will benefit for many generations to come, with a more profitable agricultural crop, ITFC stands to benefit by gaining a bulk marketing advantage. The outgrowers put a percentage of their profit in a community development fund.

The benefits for the outgrowers can be far better than the profits from 1 acre of maize. But a lot depends on the prices for mangos in Accra and the willingness of market women to buy and sell mangos. Also exporting the mangos is expected to provide an attractive market. However, up to now not many mangos have been exported, but plans are under way.

But the benefits of an organic mango plantation are more than only raising cash. If the existing institutions in the community are supportive of the project and help solve problems like stray animals, land disputes, theft of mangos etc. the project will be of tremendous assistance to communities. The environment is not degraded since trees protect the environment; all members of the community can benefit, as part of the profit is put into a community development fund and the labour peak doesn't conflict with the other existing farming activities. Although they are individually managed, the mango plantations are clustered together and can therefore create a feeling of unity and common progress in the community.

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6.5 Case study 4: The Savanna Farmers Production and Marketing Company

The Savanna Farmers Production and Marketing Company is a project of the Association of Church Development Projects (ACDEP), aimed at providing market access for rural farmers to improve household incomes, stimulate agricultural development and household food security.

The core objective of the project is to establish a transparent and independent production and marketing chain, which will be beneficial to Northern rural households and other actors involved.

To realise this objective, the project intends to:

- 1 Provide a secure market for small-scale farmers to sell their crops;
- 2 Organise farmers into strong farmer-based organisations (FBOs) that will improve their bargaining power;
- 3 Build the capacity of individual farmers and farmers' groups.

These elements of the project are explained below.

Securing the market

The project has established a private limited liability company called Savanna Farmers Marketing Company Ltd (SFMC). The shares in the company are currently held in trust by ACDEP, but will be transferred to FBOs in the near future.

In terms of securing the market, SFMC is building supply chains to companies such as Guinness Breweries Ghana Ltd and others in and outside Ghana. The starting point is contracts in which these companies have guaranteed to buy agreed quantities of the contracted farmers' produce at a fixed fair price. SFMC subsequently contracts FBOs for production of these volumes. At harvest time, SFMC buys the produce from the farmers and organises logistics and cleaning and grading of the produce, based on customer specifications. The company thereby solves the problem of farmers that have difficulties with marketing their produce as well as that of companies which do not have a reliable supply of raw materials.

For the 2006 season, SFMC has contracted over 300 farmer groups for the cultivation of nearly 4,000 acres of sorghum, groundnuts and soybean. In the contracts with the farmer groups, SFMC guarantees to buy all produce generated from these acres at a predetermined fixed fair price. SFMC only buys from farmers that are organised into groups. In the near future, SFMC plans to increase the number of farmers and to extend the product range to other crops.

Building strong Farmer-Based Organisations (FBOs)

The building of strong FBOs is crucial for improving the living conditions of rural farmers. It is in this respect that the project through the ACDEP member agriculture stations has started organising farmers into groups of between 10 and 20 farmers.

For the 2006 season, over 300 groups, numbering 4,000 farmers, (45% women) were organised. In subsequent years the project will be opened to farmers that are organised through other NGOs or government institutions. The total number of farmers is projected to grow to 10,000 in the coming years. Once the FBOs are well developed, ACDEP will transfer the shares in SFMC to these groups.

Building the capacity of farmers and farmer groups

Increase in yields is essential to both farmers and SFMC. Therefore, farmer groups receive extension services from the ACDEP stations and the Ministry of Food and Agriculture (MoFA) extension officers.

In collaboration with MoFA, scientists from SARI and other NGOs, extension officers under the project are supported to improve their knowledge and skills in providing extension support to farmers for the selected crops.

Farmer groups will also be taken through a series of community based capacity building programmes that will enhance group cohesion, management and their business skills.

Sustainability is central to the project. Food security could increase since the farming household receives extension on sustainable farming methods such as low-external input sustainable agriculture (LEISA), integrated pest management (IPM) and organic farming. If the company and the FBO really work together and trust each other, the cash security of the households will increase. The focus of farming is on sustainability; the soil and the environment should not degrade. The social and cultural security could also grow if the FBOs get more and more say in the management of the company and the FBOs themselves. If managed well, these are excellent opportunities for raising the standard of living and unity in the communities.

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7 Technical background information

7.1 Food composition table

Each 100 gram edible portion contains:	Water (gram)	Energy (kcal)	Fat (gram)	Protein (gram)	Iron (milligram)	Vitamin A (microgram)
Maize:						
- Whole grain	11	359	4	9	8	0
- TZ	47	210	1	5	10	0
- Banku	73	94	0	7	5	0
- Weanimix (dry powder)	6	392	8	14	0	0
Rice:						
- Whole grain	12	331	0	7	3	0
- Cooked	69	116	0	2	1	0
Sorghum & Millet:						
- Whole grain	11	343	3	10	5	3
- TZ	56	170	2	4	4	0
Cassava & Sweet Potato:						
- Cooked Cassava	62	147	0	1	1	0
- Gari	12	350	0	1	2	130
- Cooked Sweet Potato (yellow)	64	140	0	1	1	300
Yam:						
- Fried Yam	43	237	4	3	0	0
- Fufu	71	195	0	3	1	0
Dawadawa:						
- Dawadawa	28	339	27	29	5	0
- Yellow pulp	14	297	4	4	17	0
Cowpeas:						
- Cooked	74	90	1	7	2	0
Groundnut:						
- Roasted	2	588	51	22	4	0
Vegetables:						
- Garden eggs cooked	91	31	1	1	1	0
- Baobab leaves dry	9	299	4	12	15	0
- Alefu fresh	94	17	0	1	2	75
- Carrots, fresh	90	30	0	1	2	150
Fruits:						
- Mango	85	55	0	1	1	40
- Pawpaw	90	35	0	1	1	20
Fish & Meat:						
- Tilapia dried	74	123	6	17	3	0
- Meat	70	173	10	19	4	25
- Liver	73	127	4	20	9	1500
- Egg	75	140	10	12	2	200

Source: Nutrition Facts for Ghanaian Families, Nutrition Unit MOH-Ghana (1995).

Daily requirements:	Child/Youth	Woman	Man
- Energy (kcal)	1000	2000	2500
- Vitamine A (mcg RE)	300	700	900

7.2 The costs of making compost compared to chemical fertilizers

A bag of urea (50kg) contains about 46% nitrogen, which is 23 kg N.

6m³ of compost also contains around 23 kg N.

6m³ of compost can be made in a compost box measuring 3 x 2 x 1 metres (length, width, height). You will need to fill the box twice to make 6m³ of compost since the volume of fresh compost material reduces by about half after decomposing.

The costs of making a pit are:

- cost of digging soil for bricks: 1 day labour	12,000
- water for construction of bricks	10,000
- building of compost box: 2 days labour	24,000

Total	46,000 cedis

This pit can be used for at least 1 year, after which it will need repairing.

The costs of making 3 m³ of compost are:

- cost of water used during composting period	10,000
- gathering materials: 2 days labour	32,000
- hiring tools:	10,000
- carting compost to farm: 2 days labour	32,000
- cost of application: 1 day labour	16,000

Total costs:	100,000

Cost per kg nitrogen in compost: 8,700 (100,000 cedis divided by 11.5 kg N)

A 50 kg bag of urea costs 207,000 cedis (see www.wienco.com)

Therefore, the cost of 1 kg nitrogen in urea is: 9,000

If you calculate all the labour costs at 16,000 cedis per day, making and applying compost is almost as expensive as buying urea. But there are many advantages of compost compared to urea:

- See Story 4, Experiences of Nwodua women with compost and fertilizers.
- Compost works for 2-3 years, urea-nitrogen works only 1 year.
- Compost contains also other nutrients, urea contains only nitrogen.
- Labour, especially if it is your own labour, is often not calculated.

If we subtract the labour costs from the total amount of making 6 m³ of compost, then the total costs are just 20,000 cedis (for tools and water). For this amount of money you will have 11.5 kg of nitrogen, costing you about 1,700 cedis per kg. That is far less than urea nitrogen, which costs 9,000 cedis per kg.

7.3 What is a simple way to measure soil organic matter content?

There are many simple methods for measuring soil organic matter content. Here are a few:

- If you see many worms in the soil, if the soil is soft after some rain, if the colour of the soil is dark, the soil is fertile.
- Farmers know exactly which plants or trees are indicators of a good and fertile soil. The false yam is such a plant. It indicates that the soil is deep and fertile.
- There are also indicator plants for poor soil fertility. The best known indicator is striga. The plant does not feed on the soil alone. The roots also enter the root system of crop plants and tap water and mineral from these crops. Scientists are searching for ways to control striga, but the simplest method is: apply organic matter, striga will disappear and crops will grow well!
- Take one cup of topsoil and put it in a bottle. Add two cups of water to the soil, cover and shake the bottle with soil and water firmly. Leave the bottle overnight and next morning study the different layers of soil components. The heavy, sandy and not fertile particles will settle first at the bottom of the bottle. After that the more fertile smaller particles will settle on top of the sandy particles. The organic matter content will settle at the top. The thicker the top layer is, the more fertile the soil. You can use this method to compare the soil fertility of different plots. You can also use this method to see whether a specific measure, such as composting, has improved soil fertility after a number of years. Write down the thickness of the layers as percentages of the total column of soil. Do the same 1 or 2 years later, and you will be able to see whether or not the organic matter layer is thicker than it was before you started applying compost.
- You can also take a soil sample to a laboratory. In the laboratory they can measure the percentage of organic matter in the soil. They take a sample and take the moisture out of it by air-drying the soil. Then they weigh the soil. After that they burn the soil in a stove. The burning removes all the organic matter (as does a hot bushfire). They then weigh the sample again. By calculating the difference they can determine the organic matter percentage of the soil. A content of 2% is very low, but okay. Soil with 5% organic matter is fertile soil. The soils in sacred groves and forests sometimes have an organic matter content of up to 10 or 15%.

7.4 Organic farming and training techniques

Introduction

This annex provides a comprehensive but compact list of many organic farming and training techniques. The list acts as an introduction to these techniques. If you want to know more, go to experts, research stations and agricultural stations and ask for more detailed information about these techniques (see also Chapter 7 for sources of information). All these places have libraries with books and journals in which you will find more information. This chapter is mainly the work of Paul Adraki, Lecturer at the UDS.

Organic farming techniques

The table below lists about 20 organic farming techniques. All techniques can be applied locally. You do not need any sophisticated tools or unusual species. All the crops, plants or trees mentioned are locally available. That is the power of organic techniques: they are locally available, cheap and renewable.

When you are discussing these techniques, it is useful to analyse the impact or the effect of each technique on sustainable development. Try to discuss the techniques from different aspects, such as the impact on the five securities described in Chapter 3, or how the technique might be used to lower the tensions in the community described in Chapter 4.6.

To help you, here is a short list of questions to be used in assessing a new organic farming technique:

- What is the impact on the environment, on water, trees, and land?
- What is the impact on women, i.e. the workload, the time she spends on childcare, on status of the woman, on women's income?
- What is the impact on men, i.e. on the farm production, on income?
- What is the effect on children?
- What is the impact on the community organisation? On the unity in the community?
- How should the technique be introduced? How should the ancestors and the district assembly be involved?
- How can it be used to support sustainable development?

Table 3: Organic farming techniques

No	Technique	Description
1	Mulching	Using a shallow top layer of organic material to protect the soil from overheating, erosion and to feed the soil with nutrient
2	Composting	The deliberate decomposition and conversion of animal manure and plant or crop residues for the purpose of producing humus. It recycles organic matter. For a cost benefit analysis, see Chapter 6, Case study 1. And for costs of compost compared with fertilizer, see appendix 2.
3	Basket composting	Same as composting, but on a very small scale. You can plant e.g. 5 maize plants around the basket-compost heap. The small compost heap will feed the maize plants.
4	Dynamic kraaling	Penning livestock on a piece of farm land for a given length of time and moving the kraal after a few days, so that the animals' manure is spread over many fields, while they have access to feed at various locations
5	Zero-grazing unit	Forage is cut and fed to confined animals without allowing the animals access to natural grazing. Often simple roofed stables are built. The animals do not waste energy in collecting fodder. The floor should be covered with any dry plant material. This dry material mixed with urine and manure makes very good manure for crops.
6	Trees as a windbreak	Windbreaks are strips of trees and/or shrubs planted to protect farms and houses from wind to reduce soil erosion, to improve the microclimate for growing crops and to shelter people and livestock.
7	Agroforestry	Land use systems in which trees are grown in association with agricultural crops, pastures or livestock. Often, trees are grown in rows between the crops (alley cropping) or as fences on the borders of the plot.
8	Green manure	Growing mostly legumes for the purpose of incorporating them into the soil. Green manures are a replacement for chemical fertilizers
9	Crop Rotation	A carefully considered cropping sequence with or without a fallow period and a green manure. Crop rotation is applied to restore the soil's fertility, to prevent the build up of pests, weeds and soil-borne diseases.
10	Bunds	Bunds are ridges of stones, trees or crop residues made along the contour lines. The best bund is made from a combination of these materials. Bunds are used to slow down run-off water and to catch soil that is being washed away.
11	Ploughing along contour lines	Contour ploughing is ploughing at right angles to the natural slope of the land. Contour tillage successfully controls erosion on fields with moderate slopes of 2 – 8%. The purpose is to prevent run-off down the slope and encourage infiltration of water into the soil.
12	Manure protection	Nutrient loss occurs if manure is left in the sun or rain and if the bedding material does not absorb the urine and manure very well. Collect and protect manure under a simple roof and use litter that can absorb urine.
13	Neem as a bio-pesticide	Using plant-derived pesticides is an age-old control method. Neem leaf extract or neem oil kills many harmful insects.
14	Ridge boxing	This involves growing crops on ridges made along the contour line, adjacent ridges being joined at regular intervals of 1.5 to 3.5 metres by barriers on ties slightly lower than the ridges made with soil scraped from the furrow. This ensures better water penetration and prevents run-off.
15	White acacia trees	This legume tree sheds its fertile leaves at the beginning of the rains and first begins to bud when the growing period for crops is almost over. For this reason, it provides virtually no competition for water, light and nutrients.
16	Tree fallow	Planting a previously cropped farmland with legume tree and cover crops, to produce a dense plant cover that enhances the fertility of the soil. This is done instead of leaving land naturally fallow.
17	Animal traction	The use of bullocks and donkeys as draught animals is now an important farming technique in the face of dwindling availability and affordability of tractors.
18	Nursing and transplanting	To gain 2 or 3 weeks growing time, farmers sometimes nurse millet seedlings in a seedbed for 3 months. After the early crop has been harvested, the nursed millet is transplanted to the field.
19	Liquid Manures	Liquid manure is made by extracting the nutrients from legume leaves and animal manure in water. It is then used to fertilise vegetable crops.

7.5 Participatory training techniques

We provide a short description here of just three participatory training techniques. Of course, there are many more. See Chapter 7 for more sources of information.

Impact diagram or problem tree

An impact diagram or problem tree shows how factors influence facilities (e.g. schools, credits) or developments (e.g. poverty, hunger etc.). A problem tree makes clear the relation (using arrows) between cause and effect. Figure 4 shows a problem tree. A problem tree can be used to analyse problems and to list possible solutions.

Community mapping

A community map is a map of a community on which are drawn all resources, institutions and other aspects that are characteristic of the community. Making a community map is a way to build up a good relationship between community members and outsiders. A community map can also be used in finding the best location for new facilities. See Figure 5.

Ranking methods

Ranking methods help you to come to a decision. Stone voting is a simple ranking method. Each member in a group has e.g. 10 stones to divide over the most pressing causes, trends or facilities shown in a problem tree. The issue that collects the most stones is probably the most important issue. The result of the voting should be confirmed or rejected by further discussion.

There are many more participatory training techniques. See Appendix 6 for books and manuals on these participatory rural appraisal techniques. All these techniques are tools which can be helpful for analysing problems, listing solutions, ranking problems and solutions, building trust, listing resources, etc.

Participatory training techniques should never replace discussion or decision-making. The outcome of a participatory training technique should always be discussed in the group so that it can be confirmed or rejected. If it is rejected, new discussions and analysis are needed.

7.6 Sources of information

Sources for sustainable farming

Bush fires and the domestication of the wild in Northern Ghana. TICSS, Occasional papers, Culture and development series no.1, 1987, p14-29.

Available at: TICCS, P.O. Box 42, Tamale

Appropriate Technology:

Department of Agricultural Mechanization and Irrigation Technology

Faculty of Agriculture, Mr A. Abukari, P.O. Box 1350, Tamale, Tel: +233 (0)71- 23620

Agrodok series: over 40 manuals on a wide variety of topics concerning small-scale sustainable farming. All can be downloaded. See www.agromisa.org

Farming for the Future, by Coen Reijntjes, Bertus Haverkort and Ann Waters Bayer. 1992. ISBN 0333570111. 250 pages. Available at the library of UDS, Nyankpala and most NGOs in Northern Ghana

Bush fire and agricultural development in Ghana, by Albin Korem.1985. 220 pages. ISBN 996410295. Available at library of UDS, Nyankpala

Sources for sustainable extension techniques

Guide for mobilising communities for community-based self-development: The role of participatory technology development and participatory rural appraisal techniques. 2004, 69 pages.

Available at: Farmer project, MOFA, P.O. Box 522, Tamale, Tel. +233 (0)71-22475

Participatory training techniques using participatory rural appraisal tools: a manual for trainers and for the training of trainers. 2004, 61 pages.

Available at: Farmer project, MOFA, P.O. Box 522, Tamale, Tel. +233 (0)71-22475

Two ears of corn; a guide to people centred agricultural improvement, by Roland Bunch. 1985. ISBN 0 942716 03 05. 250 pages. Available at library of UDS, Nyankpala and most NGOs in Northern Ghana.

Campesino a Campesino: Voices from Latin America's Farmer to Farmer Movement for Sustainable Agriculture, by Eric Holt-Giminez. 2006. ISBN 0935028277. Contact: eholtgim@cats.udsc.edu

Journals and magazines

The Savanna Farmer, Newsletter of the Northern Ghana Leisa Working Group.

Available from: ACDEP, P.O. Box 1411, Tamale.

Compas, Magazine for endogenous development.

Available from: Compas, P.O. Box 64, 3830 AB, Leusden, The Netherlands. See www.compasnet.org

LEISA, Magazine on Low External Input and Sustainable Agriculture

Available from: Leisa, P.O. Box 2067, 3800 CB, Amersfoort, The Netherlands. See www.ileia.org or www.leisa.info

Development organisations

ACDEP, Association of Church Development Projects

Gumani Rd

P.O. Box 1311

Tamale

Tel: +233 (0)71-23807/26449

E-mail: acdep@africaonline.com.gh

FARMER Project

Ministry of Food and Agriculture

P.O. Box 522, Tamale

tel: 233-(0)71-22475 information

Zasilari Ecological Farming Project

Mr David Agongo

P.O. Box 10 Walewale

Tel: +233 (0)20-8294697

E-mail: agongodavid@yahoo.com

Website: www.zefpatghana.com

Chera-Bisii Fari Project

Manager: Joseph Wuni

P.O. Box 32 Walewale

E-mail: wungh2001@yahoo.com

Office is in Chera Bissi, 30 km west of Walewale

CECIK, Centre for Cosmvision and Indigenous Knowledge

P.O. Box 607

Bolgatanga

E-mail: cecik@africaonline.com.gh

7.7 Evaluation form

When we take care of the land, the land will take care of us!

Dear agricultural development worker,

We hope that you enjoy this manual and that you are going to work with it. In two years time, September 2008, we like to evaluate this manual. When you are interested to help us in the evaluation, please fill in the form and send it to:

University for Development Studies;
Faculty of Agriculture
Department of Agricultural Economics and Extension;
Dr. Francis Obeng
P.O. Box 1350
Tamale, Ghana

Name

Address

Town

Tel. Nr.

E-mail

Position

Age

Education

Remarks on the manual:

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When we start with the evaluation we will contact you.

Thank you for the cooperation!

(empty back of the form)