

## World Vision Niger Agricultural Task Force Report

# Agricultural Development Recommendations



In response to the 2008 Food Price Crisis Rein Paulsen, Humanitarian Emergency Assistance Director of Strategy and Humanitarian Policy commissioned the Agricultural Task Force (ATF) to work with participating national offices in support of the agricultural component of their food security work. ATF is tasked with collaborating with national and support offices in identifying root causes of hunger; refining our approach to solving the problem and progressively main streaming our findings.

ATF acknowledges the significant contribution to improved food security WV has already made. Even so, the global food crisis has given a glimpse of the major challenges that globalized economies, population growth, climate change and land degradation add to attaining food security. ATF seeks to work with all stakeholders (regional, national and support offices, collaborating communities, government agricultural offices) to improve the impact of WV's agricultural interventions.

This report is the culmination of collaborative work between ATF and World Vision Niger; one of three pilot countries to begin work with ATF in Africa. The recommendations are put forward as a guide for both national office and support office programming staff when designing, funding and implementing agricultural programmes.

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# Acronyms

ADP	Area Development Program
ATF	Agricultural Task Force
FMAFS	Farmer Managed Agroforestry Farming System
FMNR	Farmer Managed Natural Regeneration
PICS	Purdue Improved Cowpea Storage
WV	World Vision
WVN	World Vision Niger

Once upon a time Zakara (the rooster) invited Tankarki (Bustard bird) to spend the day with him. They had such a wonderful time that at sunset, Zakara invited Tankarki for a sleepover. Tankarki wasn't so sure about that. Looking into the chicken coop he noticed there was only one way in and no other exits. Tankarki asked Zakara 'how do you escape if a man puts his hand in here?' Zakara looked down and shook his head, 'there's no escape' he said lamely. Unimpressed, Tankarki flew up into the trees crying 'it's crazy!' Hausa Proverb.

(Note: the sound the bustard bird makes is very similar to the Hausa word for crazy – 'Hauka'.)

The average Nigerien farmer is almost totally reliant on the success of the annual millet crop in an environment which conspires against it two years out of every three. In Tankarki's words, it's crazy!. In fact, under current land management methods and with reliance primarily on millet, hunger should not be seen as an unforeseen calamity, but something which can be easily predicted.

## Authors

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After gaining a Bachelor of Rural Science, Tony spent 18 years in Niger Republic as manager of Maradi Integrated Development Project from 1981 to 1999. He managed famine relief interventions and a long term agricultural development program promoting organic farming, reforestation, diversified food production systems and community based health. Tony has worked with World Vision Australia since 2000 as program officer and senior country program coordinator for various African countries and is currently the Natural Resource Management Advisor.

### **Salifou Yaou - Niger PICS National Coordinator.**

Salifou graduated with a Bachelor degree in Agronomy from Ahmadou Bello University, Nigeria in 2005. He worked as assistant research facilitator and extension agent in the 'Sowing Seeds of Change in the Sahel' project for two years before joining the World Vision Niger sponsorship team in February 2008. In July 2008, Salifou was promoted to be the PICS Assistant Coordinator and became national coordinator in December 2008. In addition, Salifou is WVN liaison person for the Agricultural Task Force.

# Executive Summary

Niger's development statistics make for a depressing reading. Niger is regularly ranked within the world's five poorest nations on the United Nations Human Development Index and is currently the poorest. Niger is a record holder for all the wrong reasons: high levels of malnutrition, low life expectancy and literacy levels, very high fertility and population growth rates and so on. In addition and contributing to the suffering, desertification and soil degradation, low soil fertility, unreliable and erratic rainfall patterns and high levels of crop and livestock disease incidence and pest attack make agricultural activities extremely risky. Most farmers and herders, who make up over 80% of Niger's population, rely on annual crops and grasses for meeting their basic food needs, and yet, all too often, annual crops fail and grass growth is inadequate. Even in good years, few farmers produce enough food to meet their family's nutritional needs for more than six months.

Despite the problems, research has shown that it is possible to produce enough to eat and or to trade, in order to meet basic needs even under Niger's harsh environmental conditions. Numerous techniques have been devised (Annex I) and a range of improved annual and perennial crops have been developed (Annex II) as well as an appropriate farming system which arranges elements (annual and perennial crops and livestock) in a cost effective way that minimizes risks and optimizes production (Annex IV).

As important as the techniques and genetic resources are to agricultural development, the real battle is for the hearts and minds of communities and for that matter of NGO and government development actors. What they believe, what their attitudes are to agricultural development and what they are willing to act on are crucial to success.

Key Observations include:

1. Peoples beliefs about farming and foods and their attitudes to adopting change are big constraints to attaining food security.
2. Reforestation and farmer managed natural regeneration (FMNR) are key to attaining wide scale, farmer led food security in Niger. FMNR is the cornerstone for increasing agricultural productivity and decreasing vulnerability and poverty in Niger.
3. Attaining agriculturally led food security in some ADPs is in-conceivable
  - while up to 50% of the productive resource base – the land -, is unusable or is limited in its productive capacity due to degradation.
  - when much of the workforce is physically absent for 65% of the year; and although present for the remaining 35%, are unavailable to address root causes of food insecurity.
4. Food security will not be attained as long as annual crops such as millet remain the mainstay of agricultural production.
5. The Farmer Managed Agroforestry Farming System is an affordable, replicable approach to agricultural production which gives farmers a framework for assembling a range of plants and animals to minimize risks and optimize production under adverse environmental conditions.
6. Without specific targeting, marginalized groups (youth, women, and ethnic minorities) unnecessarily miss out on the benefits of project interventions. The wider community also misses out on their valuable contribution.
7. If unchecked, ultimately population growth will cancel any benefits of the development and food security interventions WV Niger is currently engaged in.
8. While WV Niger ADPs are making significant gains in food security through promotion of bean storage techniques and Grain banks (post harvest technologies), its organizational structure for promoting agricultural innovation (food production technologies) is not conducive to attaining the rapid and significant revolution in agricultural practice required to meet the current and future food needs.

# Recommendations

## Short term

- Invest physical and human resources in agricultural development
- Promote Farmer Managed Natural Regeneration in all relevant WV Niger ADPs
- Mobilize communities to restore degraded land and link this activity to income generation through wood market development

In order to achieve behaviour change greater investment by WVN of time and material and human resources is required. Exchange visits to successful programs such as Dan Saga (Annex V) are recommended followed by village level discussions including all stakeholders, training, establishment of appropriate organizational structures such as development committees, community level leadership and ownership and networking with government and other NGOs. Use of technology such as radio and text messaging and regular follow up visits, encouragement and monitoring is required. Agricultural activities should include introduction and selection of improved annual crop varieties (Annex II), hard pan rehabilitation activities and aspects of conservation agriculture (Annex I).

## Medium term

- Integrate agricultural activities with access to and development of markets
- Integrate family planning activities into all ADPs

## Long term

- Diversify rainfed farming systems by promoting and integrating a range of annual and perennial crops and livestock through the Farmer Managed Agroforestry Farming System

# Methodology

1. The WV Niger national director was contacted and Salifou Yaou was nominated as liaison for ATF activities.
2. Field visits were made to WV Niger Area Development Programs in the Maradi Region where community members (men and women) were interviewed. Where visits were not possible discussions were held with World Vision staff and some community members from the Tahoua Region on food security and natural resource management issues specific to each district.
3. Seminars on agroforestry and food security were held at World Vision offices in Maradi and Niamey and were attended by World Vision and Departments of the Environment and Agriculture staff (regional and national staff respectively), a forestry research team (Mayahi), University of Niamey, CARE International, Peace Corps and representatives of the Program against the siltation of the Niger River Program.
4. Meetings were held with the Maradi heads of the Departments of Environment and Agriculture and the acting head of CARE International.
5. A field visit was made to the village of Dan Saga to meet with community members and to their organizational structure and approach to development and to see their agroforestry activities.
6. A visit was made to several Niamey wood markets.
7. ADP managers and food security staff were given the opportunity to complete a questionnaire.

Much of the detail for this report was gleaned from field visits and discussions with World Vision Niger staff, Government departmental staff and community members. Additional information was gleaned from various Food Security reports on Niger and through web searches.

# Niger Country Background



## Location

Niger is a landlocked nation in mid-West Africa that spans the boundary of the Sahara and sub-Saharan regions. It is bordered by Chad, Burkina Faso, Mali, Libya, Algeria, Nigeria and Benin. The terrain mainly comprises plains and sand dunes, with flat to rolling savannah in the south and hills in parts of the north.

## Climate

Niger's subtropical climate is mainly very hot and dry with a short rainy season of three to five months and dry season of seven to nine months. Potential evaporation is 2 to 4 meters per annum, while rainfall nowhere exceeds 800 mm and even falls to below 100mm over almost half the country. The rainfall pattern is Sudano Sahelian in the south, where up to 600mm of rain falls but many districts are only receiving around 300mm as rainfall varies widely from one region to another and its distribution is very erratic.

## Population

In 2005 Niger's population was estimated to be 14 million. The growth rate (2.87%) leaves Niger's population increasing faster than any other country in the world even after the country's extremely high child death rate is accounted for. Niger has the highest fertility rates of any other country in the world; on average, a Nigerien woman will give birth to 8 children in her lifetime. Unimpeded, projections are for Niger's population to nearly double to 26 million by 2025.

## Poverty

In 2009, Niger was again ranked the poorest country in the world with the worst health and development problems of all 182 countries included in the United Nations Human Development Index. Some 60% of the population live below the poverty line. Niger's gross per capita income is \$627.

## Nutrition and mortality

Just over half the population are children under 15 years of age and 20% of the population is under 5yrs of age with nearly 40% of this age group being malnourished even in good rainfall years. In 2007, the World Bank reported on the appalling state of nutrition in the country: infant mortality rate of 13.6% and under five mortality rate of 30%; stunting at 41.1%; moderately underweight children at 49.6% and severely underweight children at 20.2%.

Niger is no stranger to hunger. In 2004, crops experienced severe drought and locust attacks resulting in an 11% reduction of its staple cereal production as compared to the country's five-year average. By June 2005, an estimated 2.4 million

Nigeriens were affected by severe food shortages, with more than 800,000 of these classified as critically food insecure. Although the food crisis was not of the scale of the 1968-74 or 1983-84 famines, regional surveys estimated that the gross mortality rate reached 1.5 deaths/10,000 per day in some regions.

Life expectancy at birth in Niger is 50.8 years.

## Education

Only 29 percent of primary school-age children receive education.

## Agriculture

Over 80% of Niger's labour force is engaged in agriculture or livestock production. Significant constraints to rain-fed agricultural production include soil erosion, very low soil fertility, low water use efficiency, drought and erratic rainfall patterns, shortage of animal fodder, poverty and an inefficient distribution of the labour force throughout the year. The major food crop in Niger is pearl millet. Rainfed farming is restricted to a 4 to 5 month growing season. Low and irregular rainfall and outbreaks of crop pests make Niger highly vulnerable to recurring famine. Available farm land is shrinking by as much as 200,000 hectares per year because of desertification and soil degradation. Furthermore farmland has become less fertile. Each hectare of the estimated 15 million hectares of cultivatable land in Niger (4% of total) only produces 350 kg of millet compared to 430 kg in 1950, a 20% decline in productivity. In spite of low soil fertility, average annual artificial fertilizer use in Niger is only 5 kg/ha.

Livestock production contributes to 35% of the agricultural gross domestic product. Nigerien livestock production is based on extensive grazing but climatic vagaries, the extent and quality of pastures, sanitary and economic constraints set limits to its performance.

Niger's forests and woodlands dwindled to about 2% of the landmass up until the late 1980's – 1990's. Since then, Niger has experienced rapid reforestation on an estimated 5 million hectares of farmland, making it the only country in Africa experiencing net afforestation. Even so, excessive clearing for cultivation and wood-exploitation continues in some regions.

# World Vision Niger Interventions

Current World Vision Food Security Interventions include:

**Establishment of village Grain Banks.** World Vision Niger has exerted considerable effort to establish grain banks within its ADPs. Effective management strategies have been devised including transparency of committee processes, regular communication and feedback to members, independent auditing by non committee members and setting of prices and operating rules by the whole community. Grain banks are very popular and in high demand by communities as they make a significant contribution to food security. Training, establishment of functional management committees, regular follow up and persistence are seen as key elements for success.

**Cow pea storage technology (PICS – Purdue Improved Cowpea Storage).**

World Vision Niger under the coordination of the Africa Livelihoods Security team is conducting an Improved Cowpea Storage (PICS) project. Post-harvest insect pests of cowpeas degrade the nutritional quality and economic value of the grain and cause producers, in anticipation of losses during storage, to sell at harvest when the price is lowest. The Purdue University storage technology which is being promoted by WVN utilizes triple plastic bags which suffocate the insects and prevent infestation without use of chemicals. The promotion methods used have worked very well and farmers have become enthusiastic as they've seen how effective this technology is. Additionally, costs can be reduced as the storage bags can be re-used for two to three years if care is taken.

**Dry season gardening promotion** involves various activities including digging of wells, small dams if and where possible, installation of drip irrigation, provision of seed and group formation. In some areas such as Ouallam, mainly women have adopted gardening while men have shown little interest; in Tahoua, mainly men are involved. Success has varied from ADP to ADP and is dependent on a number of factors including degree of interest by the community and level of ownership of the activities, access to water, access to markets, support by authorities and level of follow up.

**Agroforestry promotion.** Through the West African Natural Resource Management Project, tree planting activities have been undertaken in various ADPs. *Acacia colei*, *Acacia torulosa* etc (for edible seed, firewood and land restoration), *Acacia senegalensis* (as a gum Arabic cash crop), *Zyzyphus* species (edible fruit) and *Moringa* species (edible leaf) have been promoted. Results appear to vary according to community interest, degree of follow up and ongoing support and market outlet for produce.

**Micro credit for women** – enables women to establish small trading enterprises such as buying and fattening small livestock. This activity appears to be well organized and is having a good impact amongst beneficiaries.

**Provision of inputs.** Inputs such as improved seed and fertilizer are provided on credit in some ADPs.

**Children's feeding programs.** Some ADPs provide nutritional supplements through village health centres in collaboration with UNICEF, PAM and local government health staff.

ADP budgetry spending on agricultural development projects ranges from 3 – 5% of total budget. WV Niger contracts outside organizations such as government technical services and other non government organizations to provide training and follow up.

# Field Observations and Discussion

## Beliefs, attitudes and practices

While effective techniques which address physical impediments to food security, such as drought, land degradation and poor soil fertility are available (Annex I), their promotion has not always resulted in adoption by communities. Certain cultural norms, attitudes towards change and attitudes towards farm work need to be challenged in order to bring about significant change. For example, there is strong resistance to changing farming methods; few farmers ever return to their fields during the entire dry season (believing that farming is only rainy season work) and few are interested in adopting new eating habits. Niger is strewn with technologically excellent development projects which failed largely because of beliefs, attitudes and entrenched practices. **The real battle for attaining food security is not primarily in the physical realm (technically, food security is possible with existing knowledge) but at the level of beliefs and attitudes to change.**

The American philosopher Henry James wrote: What you believe about something at the outset is the greatest single determinant of success. Eliaz Sanchez, a development worker in South America helped people to change their worldview, moving them from negative defeatism to victory. He convinced farmers that they were gifted people and that they could change their lot in life. "It is like a battle he says, over the hearts and minds of the people to drop 'wrong thinking' about themselves, their community, their farms and God and to adopt right thinking. "You have to grow cabbages in your head before you can see them in the ground". In other words you have to believe that it is possible for it to actually happen. Unless people can dream, can see in their mind's-eye, cabbages growing in their fields, it will be impossible for them to grow them. The authors believe this is the number one issue inhibiting attainment of food security in Niger.

## Reforestation and agroforestry

In just over two decades the age old and destructive practice of clearing all trees and bushes from farmland has been replaced by a farmer led movement called Farmer Managed Natural Regeneration (FMNR) (Annex III). Fifty percent of Niger's once treeless farmland has experienced reforestation rates unprecedented elsewhere in Africa. Acclaimed environment writer, Mark Hertsgaard calls it "one of the great success stories in the field of climate change and agriculture" and **"the single largest environmental transformation in Africa"**. This transformation has also greatly contributed to food security.

The environment is the foundation for food security, and for Niger and countries with similar climates, trees are the cornerstone. Historically, agriculture has favoured annual crops, however this is an artificial and hazardous approach to food security particularly in semi-arid environments. Trees in the Nigerien context are critical for –

- enhancing soil fertility while combating soil erosion,
- reducing damaging winds,
- provision of up to two thirds of the fodder requirements of livestock,
- income generation through sale of wood and non wood products,
- human food, medicines, honey and more.

Significantly, trees better withstand climatic variability than annual crops and in their own right, should be seen as economically valuable 'crop' species. **Reforestation and farmer managed natural regeneration are key to attaining food security in Niger.**



Agricultural production in the bare millet field (circa 1980) is completely dependent on good rains and the absence of pests and diseases. With no protection from trees, crops were regularly blasted and buried by winds of up to 70 kph. Strong winds cause extreme evaporation in an already low rainfall area. Very low soil fertility levels should be addressed, yet few farmers have sufficient organic matter to do the job and fewer can afford artificial fertilizers.

In regions where FMNR has been practiced, degraded land has been restored, crop yields lifted and resilience to environmental shocks increased.



In this reforested farm (2009) a mix of annual and perennial crops are present. This guarantees a harvest in any year, of one or more of the components in the system, including annual grains, livestock products, 'wild' vegetables, wood, honey, fodder, fruit, seeds and edible leaves. In addition, trees protect annual crops from strong winds, increase soil fertility and harbour natural predators of pests, thus contributing to increased annual grain yields.

**In regions where FMNR has been practiced, degraded land has been restored, crop yields lifted and resilience to environmental shocks increased. Financial benefits through sale of tree products and increased grain and livestock production are estimated to be up to \$250 per hectare.** In the state of Maradi alone, a very conservative estimate values total additional income attributable to FMNR at US\$17 - 23 million per year. Because of the practice of FMNR Farmers in Niger are producing an additional 500,000 tons of cereals a year; meeting the needs of 2.5 million people. Despite a near doubling of the population since 1980, Niger has been able to maintain per capita production of millet and sorghum. (International Food Policy Report, 2009, Millions Fed, Ch. 7. <http://www.ifpri.org/publication/millions-fed>)

FMNR remains the cheapest, most rapid and easily adopted means of enhancing food security. Despite adoption on an estimated 50% of farmland in the last 20 years, it is not practiced on the remaining 50%, and in some areas where it is practiced, farmers are not realizing the full potential of FMNR. There is much room for increasing the benefits farmers could gain through practicing FMNR.

Given the difficulties involved in growing annual crops compared to trees, a strong case can be made for persuading farmers to grow trees as a cash crop individually on their own farm land and/or, collaboratively on communal land. Once established, trees produce valuable products year after year and require minimal maintenance. Having reliable income from sales of wood and other tree products enables farmers to buy food from other areas where rainfall is more reliable.

Land restoration and anti desertification measures are essential components in the arsenal needed to combat food insecurity.

### Land degradation and desertification

Vast areas of once arable and grazing land have been laid waste in Niger. In some ADPs up to 50% of the landmass is totally unproductive because land degradation and erosion has resulted in hardpan formation. Ironically, when it does rain, massive water runoff and flooding occur, destroying crops and increasing erosion of productive land. What water does fall is then largely not available for food production. Other sites are still cultivated but because of very low soil fertility levels, low and erratic rainfall and strong winds, productivity is very low. It is like having \$100 in the bank but only earning interest on \$30 - \$50! **Attaining agriculturally led food security in some ADPs is in-conceivable when up to 50% of the productive resource – the land, is unusable or is limited in its productive capacity.** Land restoration and anti desertification measures are essential components in the arsenal needed to combat food insecurity. Fortunately, such measures not only help to increase food production but also increase resilience to environmental shocks and increase income levels.



Unprotected from strong winds, a bean crop struggles to take hold. Wind blasting and burial through sand deposition causes some farmers to replant crops up to eight times in one season.



Hard pan site (upon which nothing grows) occupy up to 50% of the landmass in some ADPs. Food security cannot be attained without restoring this bare ground.



1984



1990



2004

This sequence taken in the Tahoua region of Niger shows that even hard pan sites can be restored to productivity. Left: unproductive hardpan site subject to drought and water runoff and subsequent low crop establishment and yield. Centre: compost holes (locally called zai or Tassa) dug by farmers. Right: top soil has returned (largely from wind deposits). Note that trees have established from seeds passed through the droppings of livestock.

Ironically, while degraded land remains idle and there is a seasonal exodus of the labour force, this same unproductive land could produce profitable wood crops and create sustainable employment opportunities each year; and in the process, as it is restored, land could be brought back into agricultural production. Cheap, replicable restoration methods have been utilized with huge impact in Niger (Annex I). Firewood is the main source of energy for cooking and as urban populations grow demand for wood is also growing. For the firewood needs of greater Niamey, Niger's capital city, alone an estimated 364,500 tons of firewood are harvested each year. To meet the demand wood traders travel 200 kilometres each week, destroying remnant forests all the while bypassing large areas of degraded land which could be producing wood sustainably. The unsustainable methods used for harvesting wood pose a major threat to the environment and hence food security. Conversely, the high demand for wood provides an opportunity to ADPs for sustainable income generation through informed tree management, and environmental rehabilitation.



### Millet monoculture

Both the significance of millet to food security and Niger's over-reliance on it are very obvious when driving through Niger's agricultural belt. In an environment which is biased towards low yields and failure of annual plants, millet and sorghum make up 70-80% of rain fed crops! According to the director of the Maradi Regional Agriculture Department, two out of three growing seasons in Niger's agricultural zone result in poor crops. In the Keta district of Tahoua, nine out of ten years are hunger years. Even in the better districts and even in 'good' years, farmers are only growing enough food to meet six months needs. Yet, Nigerien farmers continue to invest most of their energies into a farming system which statistically is bound to fail 66% of the time.

Additionally, annual crop productivity is declining. Despite a threefold increase in land area cultivated since the 1950's, productivity of millet per hectare has declined 20-25%. Conditions for growing millet have changed and there is a need for farming practices to change also, as the Hausa proverb says: **if the drumbeat changes, the dance must also change.**



Reliance on a single annual crop under Niger's environmental conditions is extremely risky. Drought (top photo) or insect damage (bottom photo) and other factors can wipe out an entire year's efforts.

While some changes have occurred in Nigerien agriculture, (eg increasing emphasis on dry season gardening), the mindset of reliance on millet has not changed in the community's minds, or for that matter in the minds of many non government and government development actors. It is time to unseat this paradigm and make a quantum shift in our approach to farming. **Food security will not be attained as long as annual crops remain the mainstay of agricultural production.** And even more so with expected impacts from climate change which include shorter growing seasons, higher temperatures, more severe and longer duration droughts and severe weather events. These changes will make it even harder to successfully grow annual crops.

# If the drumbeat changes, the dance must also change. *Hausa proverb*

There are however a number of annual and perennial crops for farmers to choose from. Within the annual crops, in recent years plant breeders have produced a wide range of high yielding, early maturing, drought and disease resistant crops. (Annex II). A number of perennial crops which inherently resist the stresses which annual crops easily succumb to are also available. These include edible seeded Australian acacias, *moringa stenopetala*, *Ziziphus rautondifolia* and others. From a biological perspective, there is no reason to rely on a single annual crop for survival. Ways of arranging this diversity to give optimum yields of crops, tree products and livestock have been devised. The Farmer Managed Agroforestry Farming system (FMAFS) (Annex IV) developed by 'Serving In Mission' is becoming increasingly popular in the Maradi region and has wide application across Niger and beyond. The starting point for FMAFS is natural regeneration of indigenous trees in farmland. A range of improved annual crops are grown in rotation and improved exotic and indigenous tree crops are grown in rows. Of the tree species grown, Australian edible seeded acacias play a key role in reducing wind speed and hence evaporation, providing organic matter; fixing nitrogen, providing fuel wood and poles for building and nutritious seed which have become a regular and very popular part of the diet where they are grown.



Section of FMAFS farm showing *Acacia colei* trees in windbreak formation protecting millet crop.



Cooking demonstration showing a range of traditional dishes fortified with acacia.

People in the Tahoua region are migrating for 5-6 months of the year. Because of severe needs, up to 100% of the males leave the villages each year. This annual exodus leaves a heavy burden on the women and children left behind to cope. It can also increase the risk of infectious diseases such as HIV/AIDS. The resultant lack of manpower has flow on impacts: in one village, fire broke out and 40 huts burnt to the ground; when someone dies it is very difficult to find the manpower needed to bury the body; and it is nearly impossible to undertake development activities. In Oullum, even the women and girls go to urban centers and some engage in dangerous survival tactics such as commercial sex.



Loaded to the brim – Nigeriens preparing for the annual seasonal migration which brings with it its own set of social problems and severely limits development activities tackling root causes of hunger and poverty.

### Seasonal migration

Niger sees as much as a third of its rural population travel for seasonal labor during the long dry season. Because of poverty and food shortages in certain ADPs 100% of the men and in some cases many of the women leave their villages in search of work and food during the dry season. This practice severely limits a community's ability to tackle root causes of hunger. During the limited period when farmers are present (4 – 5 months during the rainy season), they are too busy tending annual crops to be able to take part in development activities. During the eight month dry season when many activities could be undertaken, farmers are often absent. In the absence of any improvement to their poverty and food security situation, communities are perpetually committed to this annual exodus. Attaining agriculturally led food security is inconceivable when much of the workforce is physically absent for 65% of the year and though present for the remaining 35%, are unavailable for working on change.

### Marginalized groups

Youth. In general, youth have no interest in taking up farming as a career and yet very few of them will realize a better life in cities or other countries where unemployment and underemployment are already serious problems. Given that the average life expectancy in Niger is 50.8 and that many of the current generation's farmers are already approaching that age, there is a looming crisis of farm labour.

Women. Aggregate data suggest that African women perform about 90 percent of the work of processing food crops, providing household water and fuel wood; 80 percent of the work of food storage and transport from farm to village, 90 percent of the work of hoeing and weeding, and 60 percent of the work of harvesting and marketing. Even so, women are not always included in project activities concerning major food crops.

Minority ethnic groups. Ethnic minorities, particularly former nomads are increasingly turning to farming. In some cases they live in clusters away from larger villages. In contrast to the general trend, a cluster of villages around Dan Saga, Aguié Department have actively encouraged youth, women and marginalized groups' involvement in agricultural innovation and in decision making and the results from this experiment have been impressive. (Annex V).

**Without specific targeting, marginalized groups unnecessarily miss out on the benefits of project interventions and their potential contribution to development, which can be disproportionately large, is lost.**

## Population growth

Promoting family planning in Niger is difficult and needs to be done in a culturally sensitive manner. However, there are successful examples such as CARE's Nutrition and Demographics project which works discreetly within communities and with Islamic religious leaders promoting spacing of children. To avoid addressing population growth is to put our head in the sand. Even our best efforts with Agroforestry and food production systems are only buying us a little more time before catastrophe hits in the Sahel. **If unchecked, ultimately population growth will cancel any benefits of the development and food security interventions we are currently engaged in.**

## Urban Agriculture

Many people in urban centres also suffer from malnutrition and food insecurity yet there are many opportunities to grow food in cities, in small areas using discarded tubs and sacs, on roof tops, along walls, in vacant lots and on roadsides (see Annex VI). WV Niamey urban program has agricultural interventions involving irrigation along the Niger River and on sites where shallow wells are possible.

## ADP Budget and organizational structure in relation to agricultural development

ADP budgets for agricultural development are small at 3 – 5% especially when judged in light of Niger's high malnutrition rates and given the fact that possibly 95% of the ADP population relies on agriculture. Also agricultural development is the precursor of economic development.

In general WV Niger staff work only part time on agricultural projects because a facilitation system is utilized through which one staff member can facilitate all activities across a number of sectors. The strength of this system is that WV staff no longer do everything themselves but they can empower community members to implement activities through the help of partner organizations. However, given Niger's critical food insecurity situation, the extreme difficulty of increasing yields, and peoples' innate resistance to change, the authors argue that in the agricultural sector at least, dedicated, full time staff, with a mandate to reduce food insecurity are required. Outside contractors alone cannot be expected to adequately fulfill this role. Even a full time agricultural facilitator could not do all the work required to bring about broad scale change quickly, so the emphasis of this position should be on facilitation and working through community development workers and training of trainers. The extra cost involved should be seen as a necessary investment for the realization of food security and be absorbed by sponsorship programs and grant projects.



Niger's rapid population growth is the 'elephant in the room' that nobody talks about, but which will in the long run determine the effectiveness of even the best designed food security programs.



Many road sides in cities have potential for conversion to agricultural use. With local community interest and collaboration, food trees such as moringa, mango, Zizyphus and acacia which would add to the beauty of the city while reducing temperatures, could be grown with little maintenance and high benefit.

**Learnings gleaned from successful WV and other NGO interventions:**

Project interventions are most successful when:

- the whole community, including youth, women and minority ethnic groups are involved in identifying their problems, in decision making, in planning on how to overcome them and in action.
- there is farmer to farmer sharing of new ideas and experiences through exposure visits and farmers become the main means of disseminating information.
- local committees with good leadership, accountability and transparency are established and sound by-laws are developed.
- there is good liaison and collaboration with other NGOs and government departments.
- there is long term commitment by the development agency to see the new innovation adopted, including a commitment to close, regular and long term (5+ years) follow up and encouragement by project staff. This requires sufficient resourcing in terms of staff with the right skill set, allocation of sufficient time in the villages and means of transport. Utilization of village level volunteers appropriately remunerated can greatly facilitate this.
- there is reinforcement of training through radio programs
- there is a market outlet for produce and infrastructure and means of getting produce to market.

# Conclusion

Niger is in a very precarious situation. The malnutrition rate is high even following 'good years'. Despite increasing acreage under cultivation, crop yields continue to decline and land degradation causes the loss of 200,000 hectares of arable land annually. All the while the population continues to rise and predicted climate change impacts make for deteriorating conditions for food production in the future. Even so, the authors believe that food security is possible in Niger.

There are basically two options, either we scale up our investment in agricultural development, or we scale up our capability to deliver more food aid. This document outlines a number of sustainable solutions based on natural resource management and mobilization of human resources. A successful result will not come easily. It will require hard work and commitment of financial and human resources, and it will take time. Of the two options, prevention is better than cure.

# Glossary

**Agroforestry:** an integrated approach of using the interactive benefits from combining trees and shrubs with crops and/or livestock. It combines agricultural and forestry technologies to create more diverse, productive, profitable, healthy and sustainable land-use systems.

**Annual Crop:** is a crop that usually germinates, flowers and dies within a year. Under Niger's climatic conditions in which drought and unreliable rainfall patterns are normal, reliance on annual crops for food security is risky.

**Farmer Managed Natural Regeneration (FMNR):** FMNR involves selecting and pruning stems regenerating from stumps of previously felled, but still living trees.

**Hardpan:** describes a soil layer that is hard, compacted and roughly horizontal. Hard pans restrict root growth and make it difficult for water, air and other gases plus soil organisms to move up and down.

**Perennial plant:** or perennial, is a plant that lives for more than two years. When used by agriculturalists, this term applies specifically to perennial herbaceous and woody plants. Under Niger's climatic conditions in which drought and unreliable rainfall patterns are normal, many perennial plant species, particularly those of desert and semi arid lands origin have survival advantages not found in annual plants.

**Reforestation:** is the restocking of existing forests and woodlands which have been depleted.

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# Annex I. Improved Farming Techniques

A number of effective farming techniques which have resulted in increased agricultural and livestock productivity even under harsh conditions have been successfully tested and applied in Niger. These include:

- components of conservation farming, which involves four principles, namely - :
  - ✓ minimal soil disturbance (ideally no tillage and direct seeding)
  - ✓ permanent soil cover by using crop residues and/ or living cover crops.
  - ✓ multi-cropping (crop rotation, intercropping etc.) and
  - ✓ integration of crop and livestock production.

The importance of permanent soil cover in the form of crop residues and cover plants for maintaining soil fertility and moisture content cannot be underestimated. When organic matter has been built up in this way crops have survived and yielded even in low (250 mm) rainfall years.

- Soil and water erosion control measures which reduce erosion, increase water infiltration and restore degraded farmland include Zai, half moons, trench bunds, check dams etc. See also: [http://www.fao.org/docrep/T0321E/t0321e-11.htm#P1357\\_136593](http://www.fao.org/docrep/T0321E/t0321e-11.htm#P1357_136593)
- Micro dosing annual crops with as little as 6 grams of granular fertilizer<sup>1</sup> per plant (i.e. a coke-cap full of fertilizer) has resulted in yield increases of about 70% for cereals (millet, sorghum, maize). This is equivalent to about 50Kgs or one bag of fertilizer per hectare, assuming 10,000 plants.
- Composting where appropriate (dependant on availability of organic matter, water and labour)
- Use of donkey-drawn animal traction equipment to ensure completion of labor-intensive operations in time, especially weeding, results in yield increases.
- The majority of livestock in Niger only have access to fibrous, low protein foods. Supplemental feeding of small ruminants for fattening can significantly lift weight gains.

<sup>1</sup> NPK or artificial fertilizer containing nitrogen, phosphorus and potassium.



Millet planted in Zai holes (background) at same time as millet planted in the conventional manner (foreground where very little germination and growth is evident) has withstood severe drought and is close to being ready for harvest.

- Where water is available irrigation takes much of the uncertainty out of rain-fed farming and also makes intensive agriculture possible in the dry season. Great care is advised when selecting the site, the target individuals or community and the actual irrigation technology. Mistakes in any of these three areas can result in failure of the irrigation project. Many factors need to be taken into account. For example in Tahoua, irrigators within the Urban perimeter have little support from authorities when nomads allow their livestock to destroy crops or when they cut down their trees. Very poor irrigators reported selling their onion crop (worth \$100/sac at harvest time), in advance for \$5.00 - \$10.00. Complex issues like these need to be worked through if irrigation promotion is going to succeed.

# Annex I I. Genetic Resources - Annual and Perennial crops

Annual Crops: Advances have been made in developing improved crop varieties. For example, pearl millet and sorghum that are resistant to diseases and insect pests and improved varieties of cowpeas and groundnut that tolerate drought and possess resistance to rosette. Seeds of improved crop varieties are a critical input for increasing agricultural productivity, reducing food insecurity, and easing the affects of poverty. Over the years donors and international development organizations have invested millions of dollars in trying to develop a sustainable seed industry in sub-Saharan Africa. These efforts have largely been unsuccessful so that today the majority of small-scale farmers still do not have access to a reliable source of good quality seeds and planting material. Neither national governments nor private industry have been able to resolve this problem alone.

USAID has partnered with the Alliance for a Green Revolution to develop a commercial seed industry in West Africa. The West Africa Seed Alliance seeks to develop an industry that will provide small-scale farmers with affordable, timely, and reliable access to high quality seeds and planting material. See also: [http://www.usaid.gov/our\\_work/global\\_partnerships/gda/resources/West\\_Africa\\_Seed\\_Alliance.pdf](http://www.usaid.gov/our_work/global_partnerships/gda/resources/West_Africa_Seed_Alliance.pdf)

Most farmers in Niger are not taking full advantage of these improved genetic resources. WVN efforts to facilitate farmer collaboration with groups like the West Africa Seed Alliance, and the continuous adoption and testing of new varieties is highly recommended.



Great increases in resilience and food security can be made by simply planting well adapted, drought tolerant and disease resistant varieties of crops already being grown. Farmer showing improved Sorghum variety which he is trialling in his home compound.

## Perennial species for agroforestry:

Traditionally perennial crops have not figured prominently in Nigerien agriculture. Yet they have enormous potential to greatly enhance resilience to environmental shocks such as drought and insect attack while providing food, fodder, environmental services such as reduced wind speeds and temperatures which in turn contribute to increased annual crop yields. A number of promising indigenous and exotic perennial species are available which are adapted to harsh Nigerien conditions:

*Faidherbia albida* (gao) is an extremely valuable indigenous species. It is widely appreciated East of Maradi and in the Zinder Region but much less utilized in other parts of Niger. Crops growing under a canopy of the nitrogen fixing *F. albida* trees produce an extra 2.5 – 3 tons of stalks per hectare and two and a half times the grain (equating to an extra 1,200 – 1,500 tons of grain) with three times the protein content compared to crops growing in the open. Twenty five trees per hectare provide a full fodder ration for one to one and a half sheep per year. This is three times the optimal stocking rate for the Sahel. The trees also host cattle egret and many other predators of insects, helping to protect crops against pests. An adult egret for example eats 30-50 locusts per day. The trees are unusual in that they shed their leaves during the rainy season when crops need maximum sunlight and bear leaves in the dry season when livestock and soils need protection from the strong sun and wind. The trees are slow growing at first but once their deep tap root hits the water table they are one of the fastest growing trees in Africa. Seeds can be direct sown in fields.

## *Moringa stenopetalla*

*Moringa* is an amazing food and medicinal plant indigenous to Ethiopia. *Moringa* can rebuild weak bones, enrich anaemic blood and enable a malnourished mother to nurse her starving baby. Ounce for ounce, it has the calcium of four glasses of milk, the Vitamin C of seven oranges and the potassium of three bananas. A dash of *Moringa* can make dirty water drinkable. Doctors use it to treat diabetes and high blood pressure. Not only can it staunch a skin infection, *Moringa* makes an efficient fuel, fertilizer and livestock feed. *Moringa* has triple the iron of spinach and more impressive attributes than olive oil. And it's not only good for you, it's delicious. *Moringa* is well known in Niger; is very drought tolerant, grows in poor soils and produces prolific amounts of edible leaves yet few farmers grow it at all, let alone in commercial quantities

### Edible seeded Australian Acacias.

Australian edible seeded acacias have great potential for combating hunger in semi-arid lands. They were first introduced into Niger in the early 1980's for wood production, windbreaks and land rehabilitation. The seeds have a long storage life and are tasty, safe to consume and nutritious: protein, carbohydrate and fat contents are 17-25%, 30-40% and 14-16 % respectively. In West Africa, the seeds ripen when labour demand is low. Being perennial plants with extensive root systems, mature acacias can take advantage of out-of-season or poorly distributed rains that would be ineffective for annual crops. Acacia seeds are easily harvested and processed into flour, using simple and existing local technologies, for incorporation into local dishes and 'non-traditional' foods such as spaghetti, bread and biscuits. The seed also has great potential as a food supplement for livestock. In the Maradi region edible seeded Australian acacias have been eagerly adopted into the regular diet in at least 25 villages and World Vision is actively exploring market opportunities and potential for nutritional food supplements based on acacia seed.

### Improved Ziziphus species

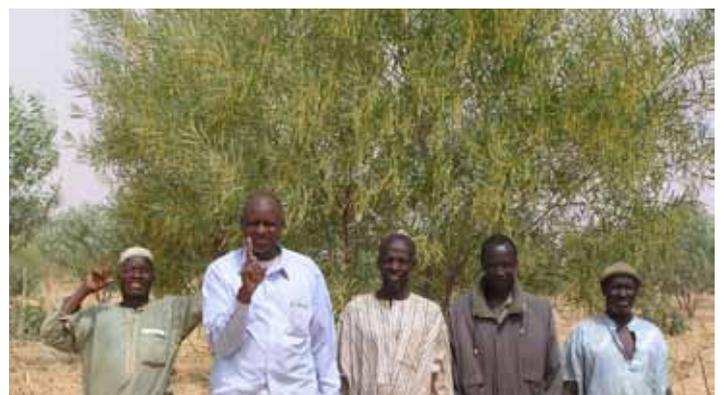
In recent years improved varieties of Ziziphus have been introduced into Niger. Earlier introductions were very susceptible to goats and insect attack. They required frequent spraying. However *Z. rautondifolia* is more resistant to insect attack, does not need to be grafted and produces large quantities of valuable fruit under Nigerien rain-fed conditions.



Large sweet fruit of ziziphus species give them market advantage over their smaller indigenous cousins.



Delicious and nutritious acacia bean cakes.



Three year old Acacia torulosa tree bearing heavy seed.

# Annex III. Farmer Managed Natural Regeneration

In Niger many tree species have the ability to sprout from stumps and roots after they are cut down. In fact, thousands of hectares of seemingly treeless land still contain living tree stumps with this ability to sprout new shoots (stems). Trees also have regenerative capacity from soil seed banks. However, continuous grazing, cutting for firewood and clearing and burning for land cultivation deny these seeds and stems the chance to become trees.

The basic method of FMNR is very simple. The farmer selects the stumps he/she will utilize and decides how many stems will be allowed to grow on each stump, based on the farmers' needs and ultimate purpose for reforestation. Excess stems are then cut. With the remaining stems, side branches are pruned off up to half way up the trunk. A good farmer will return every 2 to 6 months for a touch up pruning and thereby stimulate faster growth rates and produce straighter stems. Pruning is extremely important for stimulating rapid growth of more valuable, straighter stems.

While tree planting is important and can make a significant contribution, the advantages of FMNR include low cost, rapid growth, high establishment rate and ease of replication. As with other activities though, farmers need an incentive in order to be motivated to practice FMNR. In Niger, assurance that the farmer will benefit from her labours has been a key ingredient to successful adoption.

FMNR could make a contribution to food security through environmental restoration and towards increasing incomes. Some commentators estimate that the financial gain from practicing FMNR is around US\$ 250 per hectare through direct sale of wood, increased livestock production through increased availability of pods and leaves as fodder and through increased crop production due to benefits derived from the trees such as increased soil fertility, reduced wind speeds. One very conservative estimate for income generated from FMNR in the Maradi region alone is \$17 – 23 million annually.



Through the practice of FMNR, livestock production can be increased with the increased availability of edible leaves and pods for livestock from previously barren land.



Harvesting and sale of wood greatly increases farm income and makes good use of surplus labour in the dry season. Unlike annual crops, trees are able to produce wood even in dry years, helping build resilience to environmental shocks such as drought.



Apart from being a cash crop in their own right, trees protect and enhance environmental conditions for growing annual crops. Trees reduce wind speeds, lower temperatures, increase soil fertility and provide habitat for natural predators of crop pests.

# Annex IV. The Farmer Managed Agroforestry Farming System (FMAFS)

FMAFS represents an incremental gradation into a more complex farming system, offering more benefits than FMNR alone in terms of enhanced food security and reduced vulnerability to famine. FMAFS retains and promotes the strengths of FMNR, and also those of the Sahel Eco Farm agroforestry system. FMAFS is an alley cropping, agro-pastoral-forestry system which incorporates a wide range of annual and perennial, indigenous and exotic plant species and livestock. The diversity in its design makes it flexible enough to meet individual farmer's varying needs and priorities.

In FMAFS, farmers determine the density and layout of tree plantings and annual crops and the types of indigenous and exotic trees. The foundations laid by FMNR are complemented by the introduction of other species including a range of high seed and wood producing Australian acacias. Acacias are planted along farm borders and in rows within the farm, providing human and animal food, firewood, timber, mulch, environmental restoration and crop protection. Australian acacias have high tolerance to drought and low susceptibility to most African crop pests and diseases.

Other valuable agroforestry species are used in FMAFS such as Pomme du Sahel (*Ziziphus rotundafloria*), Tamarind (*Tamarindus indica*), Boabab (*Adansonia digitata*) and Moringa. Annual cash crops such as millet, sorghum, cowpeas, peanuts, hibiscus, sesame and cassava are planted in rotation between the tree rows, providing food and fodder and income. Crop residues are used as mulch for soil improvement and protection.

FMAFS provides significantly increased farm income compared to traditional millet farming or to FMNR alone, and more diversity in income sources. Farm labour inputs and income are also spread much more evenly across the year instead of being concentrated within a four month period. As with FMNR, the biomass produced by the trees counters the impact of low soil fertility and water stress by providing mulch and soil organic matter as well as protection from winds and fuel for firewood and income generation.

Implementation of FMAFS results in greater insurance against total crop loss during adverse events such as drought, insect attack or storms because not all species and products will be equally disadvantaged by the same event in a particular year. The biologically diverse farming system also tends to offer a range of habitats for beneficial predators of crop pests. Hence FMAFS assures a minimum income every year, even when annual crops fail.

Training in FMAFS and acacia utilization is available through Serving In Mission Maradi. It is also highly recommended that WVN builds its own capacity in this area so that it can assume responsibility for close follow up of participating farmers from WV ADPs.



# Annex V. Case Study - Dan Saga

Farmers involved in the Desert Community Initiative, located in the Aguié Department of Niger, take a central role in planning, implementing, managing, monitoring and evaluating their activities. By 1984 this once heavily forested region was nearly treeless. Sand dunes were beginning to form and crop productivity declined. Through the adoption of Farmer Managed Natural Regeneration (FMNR) and with formation of 53 village committees, some 170 villages now sustainably manage their natural resource base. 130,000 hectares of farmland are now being managed under FMNR and once treeless fields are covered with 103 to 122 trees per hectare. A number of stakeholders including farmers, herders, men and women, researchers and Aguié Departmental and government services and International Fund for Agricultural Development project staff collaborate on these activities.

Starting in three pilot villages in 2001 field work focussed on the following key activities:

- forming committees, task groups and associations
- capacity building of communities, groups and individuals to initiate and lead research and development activities
- promoting an enabling environment for open dialogue and exchange to facilitate the adoption of new ideas and to value and promote traditional knowledge and skills

Various committees, inclusive of women, men and youth, village residents and sedentary Fulani herders, were formed to deal with specific tasks:

- village committees plan new activities and supervise the work of four sub-committees
- agricultural sub-committees monitor crop experiments and seed production activities.
- environment sub-committees supervise implementation, monitoring and FMNR policing
- social sub-committees manage cultural activities
- income generation sub-committees facilitate small enterprise activities.

Committee roles were formalized publicly to ensure that all community members, most of whom are illiterate, were informed. To add legitimacy to the office, committee members were equipped with a uniform and badge as a symbolic mark of their authority. Each week sub-committees collect information in their respective spheres of influence. The various sub-committees meet together each fortnight to share information. Finally, each month there is a village level general assembly, attended by village elders and the chief, in which all information from the sub-committees is fed back to the villagers, including youth, women and Fulanis. Decisions and action plans are based on this information.

Rules for management of FMNR have been established by environment sub committees in consultation with all stakeholders. All community members are fully informed of the rules and of fines for infringements. Each committee member monitors a specified area and is responsible for reporting on infringements.

Each collaborating village has agreed to make payments to support the Desert Community Initiative. These payments, together with fines, are used for agreed purposes such as medical supplies, digging wells, or raising tree seedlings, that encourage unity and support work undertaken by the committee. While members of village committees are volunteers, villagers have typically decided they should receive a very small remuneration from this fund to encourage their participation. The fund also pays for fuel to enable the Forestry Department to help resolve conflicts between villagers and nomadic herders, and to support partnerships between extension services and villages.

The Land Tenure Commission, researchers, traditional chiefs and the new governance structures formed a partnership, supported by the International Fund for Agricultural Development, for participatory research that takes needs identified by farmers themselves into account. One outcome has been the provision of training in areas of identified need, which are diverse and include literacy, tree pruning and nursery techniques.

Increased productivity of the trees is reflected in an increase in both domestic consumption and sale of tree products. One bundle of firewood sells for around US\$ 6 and the annual per capita income to villagers from wood sales alone ranges between US\$ 46 and US\$ 92; a significant contribution to household budgets given that the average annual income in Niger is less than US\$ 200 per person. In 2005 when over one third of Niger's population suffered from famine, sale of firewood and non-timber tree products meant that farmers avoided tragedy and reliance on famine relief. With increased confidence in their committees and the dramatic increase in wood available for home use and sale, villagers established rural wood markets, aiming to increase local control and reduce exploitation by middlemen.

FMNR and agro-pastoral-forestry area management have become standard land management practices in Aguié Department as a result of the effectiveness of the new governance mechanisms. There has also been a positive change in community attitudes and behaviour towards the environment. Community members know the high cost of environmental degradation in terms of human suffering and poverty. They are now benefiting economically and socially, from their environmental restoration efforts. Illegal tree cutting, which was an enormous disincentive and threatened the success of the project initially, has practically ceased in the whole area. As knowledge and confidence have grown, community members have progressively adopted new practices.

Observations from September, 2009 field visit:

- women are benefiting through full participation in decision making and activities and manage their own income generating farms.
- Youth are involved in decision making and committee activities. Even young children are taken out of school for special farming and tree planting activities. Some youth are active committee members. Youth maintain a number of farms and school gardens. Farm income goes into an

account which they manage and they make their own decisions on how the funds will be spent. Thus, unlike other regions, even many educated youth feel positive about having a future in farming.

- Collaboration with government and NGO services is very strong.
- There is active participation of the whole community in experimentation, especially with new annual crops. Records and seed stock are maintained by educated youth. Currently 47 bean, 42 millet, 10 sesame and 12 peanut varieties are under trial. The community is convinced of the value of this work. In 2009, rains came to Dan Saga 55 days later than other parts of the district. However, because they had planted 70 day maturation millets selected from their test plots, the millet crops in Dan Saga were at the same stage of development as the crops in the rest of the district.
- Establishment of firm rules and regulations on natural resource management (particularly trees) along with collaboration with the forestry department and a community

based control system has resulted in enhanced and sustainable use of resources. Unlike other districts which are mining and destroying their natural resource base, resources in Dan Saga are well managed and will continue to provide benefits to the community indefinitely.

- Establishment of wood markets requiring membership and adherence to community endorsed regulations for wood harvesting has increased local incomes and helped reduce vulnerability to environmental shocks. Commissions from wood sales contribute to village committee and government forestry department running costs, increasing the sustainability of the work. This market helps people meet basic needs during the hunger months by providing income. During and after the millet harvest tree cutting activities are reduced, as there is less need for money.
- Each farmer has a deed to his land which indicates GPS coordinates which are also marked by bourns in the field. This has eliminated land disputes.



Top left: Many of the committee members meeting with WV delegation were in their late teens to early twenties. Top right: Test field for comparing performance of new bean and millet varieties.

The owner of this 16 hectare bio-diverse farm earns approximately \$450 each year without fail from wood sales alone.

# Annex VI. Urban Agriculture

Urban agriculture is the growing of plants and the raising of animals within and around cities.

The most striking feature of urban agriculture, which distinguishes it from rural agriculture, is that it is integrated into the urban economic and ecological system: urban agriculture is embedded in - and interacting with- the urban ecosystem. Such linkages include the use of urban residents as labourers, use of typical urban resources (like organic waste as compost and urban wastewater for irrigation), direct links with urban consumers, direct impacts on urban ecology (positive and negative), being part of the urban food system, competing for land with other urban functions, being influenced by urban policies and plans, etc. Urban agriculture is not a relic of the past that will fade away (urban agriculture increases when the city grows) nor brought to the city by rural immigrants that will lose their rural habits over time. It is an integral part of the urban system.

Urban agriculture can make a significant contribution to food security. Following adjustment to agricultural policy and practice and within just ten years, Cuba increased its caloric intake by 40% and 90% of consumed produce in Havana is produced within the city limits.



Creative ways of using 'waste' materials for growing food with minimal soil and water make gardening in confined spaces and with limited resources possible. Above: vegetables growing in discarded tyre. Left: vegetables growing without soil on cement slab.

The Resource Centres of Urban Agriculture and Food Security web site offers many practical tips and examples of what is happening in urban agriculture around the world: Case studies -<http://www.ruaf.org/node/76>, Cities farming for the future - <http://www.ruaf.org/node/96> |

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