

# **Institutional Context of Soil Information in Burkina Faso**

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## Executive summary

The Government of Burkina Faso has adopted a *National Strategy for Integrated Soil Fertility Management* (SNGIFS, *Stratégie Nationale de Gestion Intégrée de la Fertilité des Sols*) in 1999, accompanied by an *Action Plan for Integrated Soil Fertility Management* (PAGIFS, *Plan d'Action pour la Gestion Intégrée de la Fertilité des Sols*), defining the main directions and action plans for improvement and maintenance of soil fertility in Burkina Faso. Since 2000 Burkina Faso managed to execute many tasks appointed by the PAGIFS. The biggest progress was made in the area of extension and scientific research. Several important projects were carried out addressing soil degradation, financed predominantly by IFAD. The National Strategy (SNGIFS) arrived to the point where it should be re-evaluated.

Key educational structures dealing with soil fertility management in Burkina Faso are: CAP-M, *Centre Agricole Polyvalent de Matourkou* (Multipurpose Agricultural Centre of Matourkou); UPBD-IDR, *Université Polytechnique de Bobo-Dioulasso, Institut du Développement Rural* (Polytechnic University of Bobo Dioulasso, Rural Development Institute); UO-UFR-SVT, *Université de Ouagadougou, Unité de Formation et de Recherche: Sciences de la Vie et de la Terre* (University of Ouagadougou, Training and Research Unit Life and Earth Sciences); and 2iE, *Institut International d'Ingénierie de l'Eau et de l'Environnement* (International Institute for Water and Environmental Engineering). These training institutes include sustainable soil management in their curriculums.

The key training institutes for rural extension personnel in Burkina Faso are CAP-M and UPBD-IDR. Both institutions work in close collaboration with Ministry of Agriculture (MARHASA) and associate their teaching curriculums with its soil fertility management programmes.

Burkinabe researchers intensively study management strategies implemented by the farmers. Traditional techniques of soil conservation such as *zaï* and half-moons were improved by research and fed back to farmers through implementation actions of the National Strategy (SNGIFS) and were also included in the educational curriculum of Burkinabe training institutions.

Fertilizer is a very costly production input once it arrives in Burkina Faso, a landlocked country far from seaports. Most of the fertilizer used in Burkina Faso (up to 80%) goes to the cotton sector. The rest of the imported fertilizer, approximately 20%, is either purchased by government as part of the subsidized input scheme or brought in by private dealers. In 2011,

fertilizers were subsidized up to 28% of the cost of urea and 23% of the cost of NPK, although the subsidy is officially 50%.

Access and high cost of credit present binding constraints to agribusiness development. A generalized lack of credit for investment is due to a banking sector that is fundamentally not interested in agricultural development. The practice of inventory credit, or *warrantage*, has become increasingly common. The Government of Burkina Faso is keen to promote and expand *warrantage* (AGRA 2014, 9).

There is almost no private sector for fertilizers in Burkina Faso, it is poorly organized and lacks qualified personnel. The private sector is involved in distribution of fertilizer. Private service providers of fertilizers distribute NPK, DAP and urea (N). The majority of fertilizers used are imported and most fertilizers that enter Burkina Faso come from non-ECOWAS suppliers. Burkina Faso has phosphate reserves (Kodjiari) that could compensate the phosphate deficiencies in Burkinabe soils, however the use of Burkina phosphate remains low.

Burkina Faso faces numerous problems that prevent improvement of agriculture and related soil fertility management issues. The major obstacle is the lack of funding. Government budgets depend heavily on donor support (71% of public funding for agriculture from 2006 through 2010) and there are insufficient funds for investment and operations, particularly field extension. The capacity of public sector institutions to support agricultural sector development is limited, as government agencies face infrastructural, management, organizational and human capacity shortfalls. There are problems with dissemination of knowledge and soil information, distribution of fertilizers and other supplies, as well as with unregulated land ownership. The purchasing power of poor farmers is weak. The unavailability of fertilizers through local suppliers presents a serious constraint in use of fertilizers. Another problem is a poor quality of fertilizers purchased on market places, where there is no quality control. An important obstacle on the road to improved soil fertility management is the lack of crops appropriate formulas. Another serious issue is low production and use of organic fertilizers by the farmers and the lack of knowledge on the part of the farmers. Poor transport networks only add to the problem. A rural access to transport is low, marked by an index of 24–25%. The road access is better in more populated central region of Burkina Faso and it is limited in drier Sahelian regions with a low population density.

## List of abbreviations

AGRA	Alliance for a Green Revolution in Africa
AGRODIA	<i>Association des Grossistes et Détaillant des Intrants Agricoles</i>
ANSD	<i>Association Nourrir Sans Détruire</i>
AZN	<i>Association Zoramb Naagtaaba</i>
BUMIGB	<i>Bureau des Mines et la Géologie du Burkina</i>
BUNASOL	<i>Bureau National de Sols</i>
CAP-M	<i>Centre Agricole Polyvalent de Matourkou</i>
CEAS	<i>Centre Ecologique Albert Schweitzer</i>
CIPAM	<i>Compagnie Industrielle de Production Agricole et Marchande</i>
CIRAD	La Recherche Agronomique pour le Développement
CNDI	<i>Caisse Nationale de Dépôts et Investissement agricoles</i>
CNRST	<i>Centre National de la Recherche Scientifique et Technologique</i>
CONACER	<i>Comité National de Control des Engrais</i>
CORAF/WECARD	<i>Conseil Ouest et Centre Africain pour la Recherche et le Développement Agricoles</i> /West and Central African Council for Agricultural Research and Development
CPF	<i>Confédération Paysanne du Faso</i>
CRREA	<i>Centre Régional de Recherches Environnementales et Agricoles</i>
DGADI	<i>Direction Générale des Aménagements et du Développement de l'Irrigation</i>
DGPV	<i>Direction Générales des Productions Végétales</i>
DIDPV	<i>Direction d'Intrants et du Développement de la Production Végétale</i>
DVRD	<i>Direction de la Vulgarisation et de la Recherche Développement</i>
FMNR	farmer managed natural regeneration
FNGN	<i>Fédération Nationale des Groupements NAAM</i>
IFAD	International Fund for Agricultural Development
IFDC	International Fertilizer Development Center
INERA	<i>Institut de l'Environnement et des Recherches Agricoles</i>
IRD	<i>L'Institut de Recherche pour le Développement</i>
ISFM	integrated soil fertility management
MAHRH	<i>Ministère de l'Agriculture, de L'Hydraulique et des Ressources Halieutiques</i>
MARHASA	<i>Ministère de l'Agriculture des Ressources Hydrauliques de l'Assainissement et de la Sécurité Alimentaire</i>
MCPEA	Ministère du Commerce, de la Promotion de l'Entreprise et de l'Artisanat
MECV	<i>Ministère de l'Environnement et du Cadre de Vie</i>
MEDD	<i>Ministère de l'Environnement et du Développement Durable</i>
MESSRS	<i>Ministère des Enseignements Secondaire, Supérieur et de la Recherche Scientifique</i>

MFPTSS	<i>Ministère de la Fonction Publique du Travail et de la Sécurité Sociale</i>
PAGIFS	<i>Plan d'Action pour la Gestion Intégrée de la Fertilité des Sols</i>
PANA	<i>Program d'Action National d'Adaptation à la Variabilité et aux Changements Climatiques</i>
PDRD	<i>Programme de développement rural durable</i>
PICOFA	<i>Programme d'Investissement Communautaire pour la Fertilité Agricole</i>
PNDD	<i>Politique National de Développement Durable au Burkina Faso</i>
PNSR	<i>Programme National du Secteur Rural</i>
PROFIL	<i>Projet d'Appui aux Filières Agricoles</i>
RCPB	<i>Réseau de Caisses Populaires du Burkina</i>
SCADD	<i>Stratégie de Croissance Accélérée et de Développement Durable</i>
SDR	soil defence and restoration
SFI	Soil Fertility Initiative
SFMU	Soil Fertility Management Unit
SHP	Soil Health Program (AGRA)
SNGIFS	<i>Stratégie Nationale de Gestion Intégrée de la Fertilité des Sols</i>
SNVACA	<i>Le Système National de Vulgarisation et d'appui Conseil Agricoles</i>
SPCONEDD	<i>Secrétariat Permanent du Conseil National pour l'Environnement et le développement Durable</i>
SWC	soil and water conservation
t	tonnes
UO-UFR-SVT	<i>Université de Ouagadougou, Unité de Formation et de Recherche: Sciences de la Vie et de la Terre</i>
UPBD-IDR	<i>Université Polytechnique de Bobo-Dioulasso, Institut du Développement Rural</i>
USD	United States Dollar
XOF	CFA Franc
2iE	<i>Institut International d'Ingénierie de l'Eau et de l'Environnement</i>

## Introduction

This study examines the institutional context of soil information in Burkina Faso. Data was collected using informant interviews conducted over a 1-month period in Burkina Faso between May and June 2015. Interviewees were drawn from the consultant's Internet survey and recommendations from the representatives of interviewed entities (a snowball method). Given the objectives of the study, the interviews were conducted with representatives of 11 entities in Ouagadougou, Kamboinse and Bobo-Dioulasso. Interviewees spanned the spectrum of those concerned with soil fertility management issues including researchers, university lecturers and government officials. A semi-structured interview questionnaire prepared according to *Terms of Reference for a Consultant* guided the discussion between the interviewer and respondent to explore specific topics in an open, conversational manner. The questions concerned integration of soils into agricultural planning and implementation, perceived constraints of improving access to fertilizers and other soil management options, the level of technical knowledge in key training institutes for extension personnel and incorporation of farmer soil management strategies into curriculums of national training institutes. Specific information on civil society sector, policy and strategy documents on soil fertility management, access to fertilizers and the agribusiness private sector was complemented through an additional Internet and professional literature survey.



## **Integration of soils into agricultural planning and implementation at the national, regional, district and local levels**

Agriculture in Burkina Faso is characterized by low productivity due to a continuous decline in soil fertility. Naturally poor soils in mineral elements (nitrogen, potassium and phosphorus) are exacerbated by the practice of extensive farming, using very little organic and mineral fertilizers and other inputs, needed for production. According to estimations from 1999 (*Ministère de l'agriculture* 1999c, 65) soil contains less than 1% of organic matter, less than 0.06% of nitrogen and less than 0.06% of phosphorus. Cultivated land does not receive enough compensation for exported nutrients, resulting in a continuous decline in fertility. This situation makes the restoration and improvement of soil fertility a major priority for sustainable agricultural production.

### ***Key national institutions responsible for soil fertility management***

#### **The Government of Burkina Faso**

The following two ministries are the main government structures involved in soil management in Burkina Faso:

- MARHASA, *Ministère de l'Agriculture des Ressources Hydrauliques de l'Assainissement et de la Sécurité Alimentaire* (Ministry of Agriculture, Water Resources, Sanitation and Food Security)
- MEDD, *Ministère de l'Environnement et du Développement Durable* (Ministry of Environment and Sustainable Development).

While MARHASA concentrates on actions associated with production, MEDD tackles the situation from a global perspective of sustainable management of environment, i.e. soil and water conservation issues related to climatic changes, increased desertification and environmental pollution.

The principle structures within MARHASA dealing with soil management issues are:

- BUNASOL, *Bureau National de Sols* (National Office for Soils)
- DGADI, *Direction Générale des Aménagements et du Développement de l'Irrigation* (General Directorate for Facilities and Development of Irrigation)
- DGPV, *Direction General de la Production Vegetable* (General Directorate for Vegetable Production) with two departments:

- DVRD, *Direction de la Vulgarisation et de la Recherche Développement* (Directorate for Extension and Developmental Research)
- DIDPV, *Direction d’Intrants et du Développement de la Production Végétale* (Directorate for Inputs and Development of Vegetable Production).

The office dealing with soil management issues at MEDD is BUNEE, *Bureau National des Evaluations Environnementales* (National Office for Environmental Evaluations). Another relevant MEDD body is SPCONEDD, *Secretariat Permanent du Conseil National pour l’Environnement et le Développement Durable* (Permanent Secretariat of National Counsel for Environment and Sustainable Development).

DGADI/MARHASA is a technical directorate specialized in restoration, conservation and recovery of soils, which provides farmers with technical support. It was established 2 years ago by MARHASA in order to tackle the increasing problem of soil degradation.

DVRD/DGPV/MARHASA is a directorate of the General Directorate for Vegetable Production specializing in agricultural extension and developmental research. Its principal mission is to transfer agricultural production techniques and technologies, conduct capacity building for extension agents, offer agricultural advice to farmers and follow up on the so-called “evolution of agricultural campaign”.

DIDPV/DGPV/MARHASA is another directorate of the General Directorate for Vegetable Production, which is in charge of inputs and development of vegetable production. The principal role of DIDPV is to facilitate access to inputs (e.g. fertilizers, seeds, amendments).

BUNASOL/MARHASA’s principal role is soil evaluation. BUNASOL has the best-equipped laboratory in Burkina Faso and performs soil analysis on a large scale. It has information on soil characteristics across the country and is in charge of soil analysis, inventories and cartography. One of the office’s mandates was the evaluation and classification of soils across the country. To date, BUNASOL has managed to cover 42 out of 45 provinces and completed an inventory that shows condition of soils and degradation trends across the country. The office works in close collaboration with researchers, various research studies, applied projects and programmes that intervene in the field of agriculture. BUNASOL also carries out fertilizers quality control, i.e. soil analysis and granting of certificates.

BUNEE/MEDD is a monitoring agency that validates and follows projects in the field of agriculture. Its main role is environmental protection. Project proposals of various kinds, for farms as well as for large fields or agribusinesses, are evaluated at the BUNEE level, which

evaluates projects' activities, their use of fertilizers and crops, as well as advice on projects' implementation in order to prevent mistakes which could contribute to pollution of soil and water. BUNEE also intervenes in case of pollution and executes soil sampling and analyses. BUNEE does not have its own laboratory, but it cooperates with the BUNASOL laboratory, as well as with the National Laboratory for Public Health (*Laboratoire National de Santé Publique*) and the National Office for Mines and Geology (BUMIGB, *Bureau des Mines et la Géologie du Burkina*).

## **Research**

The dominant institute for agricultural and environmental research in Burkina Faso is INERA, *Institut de l'Environnement et des Recherches Agricoles* (Institute for Environmental and Agricultural Research), which is one of four institutes of CNRST, *Centre National de la Recherche Scientifique et Technologique* (National Centre for Scientific and Technological Research). INERA is responsible for realization of techniques and technologies that assure sustainable agricultural production, for sustainable soil management and for training of future researchers, teachers and development actors such as rural extension officers. The role of INERA is generation of knowledge and technologies and dissemination of said knowledge and technologies to users. INERA is divided into several departments:

- Department of Vegetable Production
- Department of Environmental and Forest Production
- Department of Animal Production
- Department for Management of Natural Resources and Systems of Production.

The latter is organized in regional programmes or so-called Regional Centres for Environmental and Agricultural Research (CRREA, *Centre Régional de Recherches Environnementales et Agricoles*):

- Centre-West in Saria (Koudougou)
- West in Farako-Bâ (Bobo-Dioulasso, includes two secondary stations in Niangoloko and Banfora and three antennas in Balla, Dindéresso and Valley of Kou)
- East in Kouaré (Fada-Ngourma)
- The Sahel (North) in Katchari (Dori)
- North-West in Di (Tougan).

Each of these programmes is responsible for developmental support in area of natural resources management and particularly for soil fertility management. Programmes work with

the MARHASA extension services in order to find an appropriate way for dissemination, to study constraints in the application of new technologies and to find a way for their adaptation to specific circumstances. The five programmes are supported by a number of laboratories that conduct analysis of studied soils. INERA has three laboratories; the main laboratory is situated at their research centre in Kamboinse, and two smaller laboratories operate in Saria and Farako-Bâ. INERA conducts research specific soil analyses and have develop their own methods in order to verify the impact of developed technologies on soil. INERA performs small-scale analysis, but larger series samples are sent to the BUNASOL laboratory.

### ***National policy and strategy documents regulating soil fertility management***

In 1996, the Soil Fertility Initiative (SFI, launched under the aegis of the World Bank) called on sub-Saharan African countries to elaborate national strategies and action plans to secure improvements in soil fertility. Burkina Faso and Ghana were the first countries to formulate National Action Plans (NAPs) (IFDC-A 2000). In Burkina Faso, the first step in formulation of the national strategy was the creation of a Soil Fertility Management Unit (SFMU) attached to the Ministry of Agriculture. The SFMU was assigned the following responsibilities:

- promotion and creation of awareness of the need to create a favourable environment for investments in soil fertility
- elaboration of a national strategy for integrated management and restoration of soil fertility
- elaboration of action plans to operationalize the strategy
- coordination of all soil fertility related activities in Burkina Faso at the national level.

The SFMU consulted extensively with all stakeholders (i.e. farmers, decision-makers, input suppliers, agro-processors, transport operators, extension agents, researchers, development agents). A series of grass-roots workshops were organized during which discussions were held with stakeholders on the urgent need for soil fertility restoration. These workshops provided the opportunity to develop a common understanding about the problems of soil degradation and to examine current practices in the light of what needs to be done. They also served as a forum where ideas could be exchanged between researchers, extension agents, NGOs and others working on projects in the area of soil fertility maintenance. Awareness was also created through the publication of a bimonthly magazine, *Sustainable Agriculture*, which informs stakeholders about soil fertility restoration. The SFMU also undertook a series of surveys to obtain information on farmers' strategies on soil amendments, accompanying technologies and developments in marketable products. The process of the strategy elaboration was iterative and involved all stakeholders from initial stages to its final adoption

by the government. The process of recording the state of knowledge on soil fertility work in Burkina Faso and the setting up specialized committees to provide advice culminated in the creation of a national strategy (see IFDC-A 2000).

The Government of Burkina Faso adopted a *National Strategy for Integrated Soil Fertility Management* (SNGIFS, *Stratégie Nationale de Gestion Intégrée de la Fertilité des Sols*) in 1999, accompanied by an *Action Plan for Integrated Soil Fertility Management* (PAGIFS, *Plan d'Action pour la Gestion Intégrée de la Fertilité des Sols*), that defines the main action plans for improvement and maintenance of soil fertility in Burkina Faso. There were three action plans involved in the national strategy, each addressing different issues as follows:

- for promotion of soil amendments
- for promotion of technologies that accompany soil amendments
- for development of input and output markets.

Action Plan 1 was based on the use of rock phosphate and dolomite that occur naturally in Burkina Faso. It included increased investment in production of these agro-mineral amendments and promotion and use of technological packages adapted to the agro-ecological and socio-economic conditions.

Action Plan 2 was based on available and proven technologies such as improved cultural practices with cereal-legume rotations, anti-erosion control techniques and agroforestry, water retention, the *zaï* traditional planting pits, mulching, use of organic and chemical fertilizers and crop-livestock systems. It included the promotion of organic fertilizer production by transforming agro-industrial and urban waste, as well as crop residues in rural areas (i.e. composting, wintering grounds, manure barns), as well the promotion of agroforestry and actions in the struggle against erosion.

Action Plan 3 aimed at creating the conditions necessary for farmers to invest in soil fertility improvement. It included actions designed to raise the value-cost ratio of purchased inputs such as fertilizers. It sought to create effective demands for products through agro-processing and value-adding activities (see Debrah 1998; PAGIFS 1999).

Actions meeting the objectives of the SNGFC were executed by various projects, programmes and NGOs even before the formulation of the national strategy (SNGIFS) and the action plan (PAGIFS). Each year, large areas were treated for anti-erosion and several thousand manure pits were made by farmers in villages throughout Burkina Faso. Technologies producing and

using natural deposits of phosphates and dolomitic limestone in association with organic matter were developed and adopted across the country. Various training projects for farmers were carried out using participative approaches for their empowerment. IFAD, International Fund for Agricultural Development (a specialized agency of the United Nations) financed the following projects and programmes in soil fertility management:

***Hauts Bassins/Volta Noire, Agricultural Development Project***

Total project cost: USD 23.0 million

Total IFAD financing: USD 4.1 million

IFAD loan: USD 4.1 million

Project type: Agricultural development

Approval date: 14 September 1982

The project's aim was to take advantage of good results obtained in the cotton sector, which were based on the adoption of agricultural manual techniques and the use of inputs by farmers in the traditional sector, in order to increase production. The project's specific objectives were to promote the integration of livestock and agriculture and encourage the use of organic fertilizers in the fight against soil depletion. The project supported research and encouraged the use of selected seeds of millet and sorghum. Literacy programmes have provided assistance in training of village groups and strengthening their ability to self-manage (see IFAD n.d.a.).

***Special Programme for Soil and Water Conservation and Agroforestry in the Central Plateau***

Total project cost: USD 13.9 million

Total IFAD financing: USD 8.4 million

IFAD loan: USD 7.6 million

IFAD grant: USD 0.8 million

Project type: Agricultural Development

Approval date: 4 December 1987

The project's objectives were to encourage population's efforts to integrate water and soil conservation into agroforestry. Its goal was to achieve greater stability in the production of subsistence crops and provision of tree products. Its activities focused on mobilization of local credit savings and development of farmers' organizations. According to the report published by the IFAD Evaluation Office (2004) the households that converted their land, improved food security for at least 350,000 people (see IFAD n.d.a.).

## **Special Programme for Soil and Water Conservation – Phase II**

Total project cost: USD 24.4 million

Total IFAD financing: USD 17.5 million

IFAD loan: USD 17.5 million

Project type: Agricultural development

Approval date: 5 December 1994

Like the first phase, the second Special Programme for Soil and Water Conservation aimed to increase the production, income and living standards of the rural population of the Central Plateau and to stop the degradation of fragile ecosystems. This project was successful in erosion control, integration of agriculture and livestock activities and better use of local resources. By creating niche services, it also contributed to the emergence of local know-how (see IFAD n.d.a.).

Since 2000, Burkina Faso has carried out many tasks appointed by the action plan (PAGIFS). Most progress was made in the area of extension and scientific research. Several important projects were carried out on the investment plan, addressing soil degradation, which was financed predominantly by IFAD. The government invested in the area of scientific research and in certain extension operations. Numerous anti-erosive layouts were constructed throughout the country; production and valorisation of organic fertilizers through manure and compost pits was accelerated (52,000 pits were made in 2002 and 200,000 more were planned for 2003); actions for popularization of practices for restoration of soil fertility and improvement of productivity were carried out; improved varieties were provided and selected seeds were promoted; and threshing, shelling and draining equipment for irrigated production (treadle pumps) were promoted (Burkina Faso 2004, 46).

The Institute of Environment and Agricultural Research (INERA, *Institut de l'Environnement et des Recherches Agricoles*) was working with the IFAD-financed PICOFA programme in the field of co-management of knowledge and innovation in cooperation with farmers in the eastern region of the country:

### **Community Investment Programme for Agricultural Fertility (PICOFA, *Programme d'Investissement Communautaire pour la Fertilité Agricole*)**

Total project cost: USD 26.9 million

Total IFAD financing: USD 12.1 million

IFAD loan: USD 12.1 million

Project type: Agricultural development

Approval date: 11 September 2003

The aim of the programme was to increase agricultural productivity through use of soil and water conservation techniques, restoration of soil fertility, as well as by agroforestry and creation of passage corridors for livestock. It worked to develop income-generating activities, to facilitate access to land for vulnerable groups, especially rural women and youth and to strengthen capacities of the rural poor and their organizations (see IFAD n.d.a.).

IFAD financed a PDRD programme as a continuation of Special Programme for Soil and Water Conservation and Agroforestry in the Central Plateau; Phase I and II were executed in 1988 and 2002. At the end of the interim evaluation carried out in 2003, it was necessary to continue actions to restore and protect the environment through a watershed approach:

**Sustainable Rural Development Programme (PDRD, *Programme de Développement Rural Durable*)**

Total project cost: USD 38.3 million

Total IFAD financing: USD 16.0 million

IFAD loan: USD 16.0 million

Project type: Agricultural development

Approval date: 2 December 2004

The aim of the programme was to help the rural poor by strengthening their organizational capacities, planning and land management (productive land resources). It envisaged watershed layouts and construction of irrigation systems in order to reverse the processes of crop and non-crop land degradation. Its key component was increasing the income of the rural poor, by improving agricultural production and productivity. It also helped improve living conditions of the target groups by developing people's access to basic social services and markets (see IFAD n.d.a.).

Two IFAD-funded projects have carried out activities in the Neer-Tamba<sup>1</sup> project area, the *Community Investment Program for Agricultural Fertility* (PICOFA), which completed its operations in June 2012 and the *Sustainable Rural Development Program* (PDRD) that ended in December 2013. These interventions focused on soil fertility management and supported

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<sup>1</sup> The name of the phase II for the IFAD projects carried out in North, Centre-North and East regions of Burkina Faso (see IFAD n.d.b.).



smallholders through implementation of soil and water conservation (SWC) techniques. The restoration of agricultural lands, which were abandoned because they were considered sterile, is an important achievement of these programmes. The use of SWC and soil defence and restoration (SDR) techniques appreciably improved the resilience capacity of the rural poor and enabled the rehabilitation of a vast area of degraded land. In spite of this, the target population faces considerable challenges, due in particular to the semi-arid climate of the Sahel and an increasing anthropogenic pressure. For this reason, Neer-Tamba continues investing in the PICOFA and PDRD intervention areas in SWC and SDR techniques, in which IFAD demonstrated a comparative advantage. A new Neer-Tamba project started in June 2013 in the North, Centre-North and East Regions of Burkina Faso, with the Ministry of Agriculture (MARHASA) as an implementing agency (see IFAD n.d.c):

**Participatory Natural Resource Management and Rural Development Project in the North, Centre-North and East regions**

Total project cost: USD 103.7 million

Total IFAD financing: USD 63.04 million

IFAD loan: USD 14.5 million

DSF grant: USD 48.54 million

BF Government: USD 21.6 million

Beneficiaries: USD 5 million in kind

Project type: Agricultural development

Approval date: 13 December 2012

The project is carried out in the North, Centre-North and East regions, which are inhabited by 3.6 million people equally distributed in each region. Half of the households living in the North and Centre-North regions and two-thirds of those living in the East region are economically poor. A significant part of the population also suffers from chronic food insecurity.

The target population comprises about 190,000 poor and food insecure rural households, equivalent to roughly 1,250,000 people. The target group consists of 40,000 households, one-third of which are youths. It is estimated that at least 30,000 women will access project services.

Neer-Tamba's objective is to improve the living conditions and income of the most disadvantaged inhabitants of the target areas and to support them in building and strengthening their capacity to play an active role in the construction of a sustainable economic and social fabric.

The project is implemented through four components, a management, monitoring and evaluation component and the following three operational components:

- Village-level, small landholding development. This component aims to improve the resilience of families, agricultural lands and villages to weather hazards. In order to do so, the project focuses on surface water management through scaling-up of techniques, which proved effective and adaptable to the local context.
- Intensification of small landholdings and production development. This component aims to intensify and valorise smallholdings through dissemination of best practices and funding of innovations and local initiatives in order to sustainably improve economic autonomy of the target population.
- Organization of stakeholders and networks development. This component aims to strengthen the capacity of the target population, their organizations and those of agricultural chambers. This will be achieved through provision of literacy training, deployment of information-education-communication campaigns and support of rural organizations. This component also provides institutional support to the agricultural chambers and regional directorates of the Ministries of Agriculture (MARHASA) and Environment and Sustainable Development (MEDD) (see IFAD n.d.c).

These projects and programmes should be credited for the implementation of a great part of the national strategy (SNGIFS), which has reached the point where it should be re-evaluated. The strategy from 1999 is no longer relevant, which makes preparation of a new orientation document necessary (personal communication from official at DGADI/MARHASA). At present, the problem of soil fertility management is perceived through several newer documents regulating agriculture, environment and food security area such as:

- Burkina Faso. 2004. *Stratégie de Développement Rural à l'Horizon 2015*, Ouagadougou. [Rural Development Strategy at Horizon 2015]
- Burkina Faso. 2011a. *Stratégie de Croissance Accélérée et de développement durable (SCADD)*, Ouagadougou. [Accelerated Growth Strategy and Sustainable Development]
- Burkina Faso. 2011b. *Programme National du Secteur Rural (PNSR)*, Ouagadougou. [National Programme of the Agricultural Sector]

- Burkina Faso. 2013. *Politique Nationale de Développement Durable au Burkina Faso* (PNDD), Ouagadougou. [National Sustainable Development Policy]
- [MAHRH] 2006, *Stratégie de Gestion de la Fertilité des Sols et des Ressources Naturelles dans la Région de l'Est du Burkina Faso: Etude de Base Relative à l'Établissement de la Situation de Référence dans la Zone d'Intervention du PICOFA. Rapport provisoire*, Ouagadougou. [Strategy of Soil Fertility and Natural Resources Management in the Eastern Region of Burkina Faso]
- [MAHRH] 2007. *Politique Nationale de Sécurisation Foncière en Milieu Rural*, Ouagadougou. [National Policy on Land Security in Rural Areas]
- [MAHRH] 2010. *Le Système National de Vulgarisation et d'Appui Conseil Agricoles* (SNVACA), Ouagadougou. [National System for Extension, Agricultural Support and Counselling]
- [MECV] 2007a. *Program d'Action National d'Adaptation à la Variabilité et aux Changements Climatiques* (PANA), Ouagadougou. [National Action Programme for Adaptation to Variability and Climate Change]
- [MECV] 2007b. *Inventaire des Besoins Prioritaires de Renforcement des Capacités pour la Gestion de l'Environnement National et Mondial*, Ouagadougou. [Inventory of Priority Needs for Reinforcement of Management Capacities of National and World Environment]
- *Ministère de l'Agriculture*. 2001. *Etude Opérationnelle sur la Filière des Intrants au Burkina Faso*, Ouagadougou. [Operational Study on the Inputs Sector in Burkina Faso]

### ***Integrated soil fertility management (ISFM) in practice***

According to different Burkinabe soil experts working at INERA, MARHASA and MEDD integrated soil fertility management (ISFM) integrates several aspects:

- **Environmental aspect** – sustainable soil management that considers the safeguarding and preservation of the environment;

- **Social aspect** – a participatory approach, i.e. involvement of researchers, extension agents and farmers in processes of soil management. The goal is to understand the constraints farmers are facing, to develop appropriate technologies that help overcome these constraints and to disseminate these technologies back to the farmers. The social aspect also includes farmers' access to inputs (e.g. fertilizers, pesticides, seeds), the costs of which are valorised through a marketing system;
- Complementary and appropriate application of **physical, chemical and biological techniques** in agricultural production, i.e. association of all techniques that facilitate soil and water conservation and enable effective use of fertilizers;
- **Value chain approach**, which considers the conservation of production and sales in the markets.

Such understanding of ISFM is also applied in the practical work of key national institutions in the area of soil fertility management:

DGADI/MARHASA identifies the problems faced by farmers, which are then presented to the researchers at INERA and BUNASOL/MARHASA who look for solutions. The solutions are brought back to the farmers through DVRD/MARHASA extension services. These solutions can be presented as improved traditional techniques, as successful techniques transferred from other parts of the country or as techniques, imported from abroad and adapted to fit country-specific conditions.

BUNASOL evaluates soil fertility and proposes corrections for soil restoration with application of corresponding types of fertilizers, amendments or crops. These corrections are made according to the potential of plants that are to be grown on a particular soil.

DGADI decides on the protection of soil surface according to type of soil degradation in order to limit soil erosion. One traditional technique that has been improved by research is *zaī*. This technique consists of digging holes, which are filled with compost or manure during the dry season and sown in the beginning of rainy season. The technique is traditionally used in the north of the country, which is characterized by heavily degraded soils. Another possible technique is the half-moons technique, where soil is collected in shape of half-moons and left to rest in order to regenerate. Various anti-erosive layouts are another widespread method, preferably permeable to water and made from stone in order to prevent inundation and eradication of crops. Layouts are usually straightened with grass-covered bunds.

DVRD/DGPV/MARHASA is in charge of dissemination and popularization of techniques improved by research. In 2013, DVRD started with extension actions to put in place a certain number of demonstration units, demonstration plots, farmer school fields, or showcase plots, in order to display good agricultural practices, all tailored to the needs of different regions. Integrated soil fertility management is most often demonstrated through demonstration plots where organo-mineral fertilizers and anything related to soil and water protection and conservation are applied (for example agroforestry or other natural soil regeneration techniques such *zai* and half-moons, as well as various anti-erosive layouts). DVRD promotes a three-step soil conservation approach with recuperation of soil, low tillage for soil regeneration and crop rotation or diversification of crops on the same plot.

DVRD advises farmers on the use of fertilizers, while DIDPV/DGPV/MARHASA is responsible for the distribution of the necessary agricultural inputs (i.e. seeds, fertilizers, amendments). Farmers are always advised to combine chemical fertilizers with organic ones in adequate quantities and in combination with locally produced phosphorus, in order to prevent degradation of physical and chemical properties of the soil. DVRD also encourages farmers to collect biomass and produce organic fertilizers.<sup>2</sup> DVRD promotes improved crop varieties, which are adapted to current rainfall conditions and can resist hydric stress and periods of drought. In order to ensure food production, DGPV puts special emphasis on actions designed to boost production of organic fertilizers and use of improved and certified seed varieties, which are adapted to climate change.

At present, the most important thing is to increase the level of knowledge possessed by the farmers. Today we work on the mind: farmers must start taking their soil into consideration, if we want to see a better tomorrow. We are less concerned with short term production, but look for a sustainable restoration of soil (personal communication, DRD official, July 2015).

### ***Sustainable soil management in training institutes for agricultural extension officers***

The key educational institutions dealing with soil fertility management in Burkina Faso are:

- CAP-M, Centre Agricole Polyvalent de Matourkou (Multipurpose Agricultural Centre of Matourkou);

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<sup>2</sup> In the past DVRD carried out numerous actions that focused on farmers' training in production of organic fertilizers. Farmers were encouraged to construct manure/compost pits with reinforced exterior, built in stones and cement. In certain areas of Burkina Faso, people refuse to build compost/manure pits because it reminds them of graves. In these areas was applied technique of heap composting.

- UPBD-IDR, *Université Polytechnique de Bobo-Dioulasso, Institut du Développement Rural* (Polytechnic University of Bobo Dioulasso, Rural Development Institute);
- UO-UFR-SVT, *Université de Ouagadougou, Unité de Formation et de Recherche: Sciences de la Vie et de la Terre* (University of Ouagadougou, Training and Research Unit Life and Earth Sciences);
- 2iE, *Institut International d'Ingénierie de l'Eau et de l'Environnement* (International Institute for Water and Environmental Engineering).

CAP-M is a training school for rural extension agents. Its mission is implementation of the vocational training policy set by the Ministry of Agriculture (MARHASA). The school offers secondary and higher education programmes up to BA degree. UPBD-IDR and UO-UFR-SVT are State's higher education institutions, which offer BA, MA and PhD programmes in a wide spectre of agriculture and in soil sciences specifically. 2iE is a private and international institution of higher education with BA, MA and PhD programmes in civil engineering and specializations in agricultural technology.

All of the training institutes include sustainable soil management in their curriculums. Future rural development engineers and consultants learn about different physical, chemical and biological management techniques that prevent soil degradation and improve soil potential. They learn about the characteristics of soils in Burkina Faso: soils are exploited, become quickly acid and, especially during the rainy season, their structure becomes compact. They are poor not only in terms of chemical elements but in organic matter. Because of the natural climatic conditions (drought, irregular rainfall, water and wind erosion) and predominance of clay, they are unable to retain sufficient organic matter and humidity. The farmers' production system is concentrated more or less exclusively on harvesting, which again leads to the exhaustion of nutritive elements in the soil. Taking these facts into consideration, students are taught that soil needs to be studied permanently, that it needs to be constantly maintained and most of all, that physical, biological and chemical soil management techniques are interconnected. They learn that the first step in the struggle against soil degradation is the limitation of erosion (construction of anti-erosive sites) and that application of organic matter and chemical fertilizers comes second. They learn that chemical fertilizers are indispensable in management of poor soil and of the importance of making the correct choice and application of organic fertilizer. Finally, they learn about crop rotation techniques and the importance of the right choice of crops.

## ***Initiatives addressing soil fertility or degradation issues***

### **Current ISFM projects**

Currently, MARHASA carries out an IFAD-funded project known as Participatory Natural Resource Management and Rural Development Project in the North, Centre-North and East Regions of the country. It presents a continuation of the Community Investment Programme for Agricultural Fertility (PICOFA) and the Sustainable Rural Development Programme (PDRD), completed in 2012 and 2013. The aforementioned programmes addressed soil fertility management in the regions with the most extensive soil degradation. In pursuit of the PICOFA and PDRD objective for soil recovery in efforts to stop migration to other areas of the country, the project continues to support smallholders in implementation of soil and water conservation (SWC) and soil defence and restoration (SDR) techniques by predominantly concentrating on the half-moons and *zaï* techniques.

### **ISFM scheme**

Burkina Faso is a beneficiary of the Alliance for a Green Revolution in Africa (AGRA) Soil Health Program (SHP) grant. The SHP is one of the core AGRA's programmes supporting government initiatives across Africa. The mission of the programme is to increase income, improve food security and reduce household poverty by promoting the use and adoption of integrated soil fertility management (ISFM) practices among smallholder farmers and creating an enabling environment for farmers to adopt the practices in an efficient, equitable and sustainable manner across sub-Saharan Africa. The SHP was established in August 2008 with the main objectives of:

- creating physical and financial access to appropriate soil nutrients and fertilizers for about 4.1 million smallholder farmers in Africa;
- improving access to locally appropriate ISFM knowledge-based agronomic practices and technology packages for targeted African smallholder farmers in an efficient, equitable and sustainable manner;
- influencing a national policy environment for countries to invest in fertilizer and ISFM;
- strengthening the capacity of national institutions.

The programme is implemented through four thematic sub-programmes that focus on each of the programme objectives highlighted above. These include (i) ISFM scale-out, (ii) extension and advisory, (iii) fertilizer supply and policy and (iv) training and education (see AGRA 2015a).

### **Fertilizer subsidies**

Fertilizer is a very costly production input once it arrives in Burkina Faso, a landlocked country far from seaports. While fertilizer imports from ECOWAS countries are not taxed, most fertilizer that enters Burkina Faso comes from non-ECOWAS suppliers. Factors affecting the cost include transport, taxation of inputs and warehousing at ports in Togo, Ghana or Ivory Coast (AGRA 2014, 1). In 2011, the prices of non-subsidized fertilizers at the negotiating level were USD 808/t for urea and USD 844/t for NPK. These prices were among the highest in sub-Saharan Africa (Holtzman et al. 2013, xix). Most of the fertilizer (up to 80%) used in Burkina Faso goes to the cotton sector, a portion of which is probably diverted by cotton farmers to food crops. The rest of the imported fertilizer, approximately 20%, is either purchased by government as part of the subsidized input scheme or brought in by private dealers (AGRA 2014, 5).

Since 2008, the government intensified its involvement in distribution of improved seeds and fertilizers in response to the rise in food prices. At first, subsidized inputs were delivered by the public sector itself, but increasingly, the government avails itself of private sector distribution channels. In 2013, AGRODIA, a private sector association of input providers moved 12,000 tonnes (t) of fertilizers and 8,000 t of seeds for a total cost of XOF 7 billion CFA (approximately USD 14,626,300) which represented the total government yearly subsidy. (AGRA 2014, 2).

According to estimates of available data between 2003 and 2011, the subsidy programme for fertilizers costs USD 7.7 million per year (Holtzman et al. 2013, xx). There are varying reports on the amount of subsidy. According to Holtzman et al. (2013), "in 2011, fertilizers were subsidized up to 28% of the cost of urea and 23% of the cost of NPK, although the subsidy was officially 50%". According to an interview with DIDPV/DGPV/MARHASA, the Government of Burkina Faso allocates a budget every year for the purchase of fertilizers that are to be sold to small farmers at 40% subsidized prices by the Ministry of Agriculture.

### **Special loan schemes**

Access and high cost of credit present binding constraints to agribusiness development. A generalized lack of credit for investment is due to a banking sector that is fundamentally not interested in agricultural development. There is tremendous pressure on government to do something about access to and cost of credit for rural enterprise activity. In fact, government



has already committed to establishing a dedicated financial institution, the *Caisse Nationale de Dépôts et Investissement agricoles* (CNDI) which will be co-owned: 49% by the government and 51% by the private sector, represented by FIAB and CPF (*Confédération Paysanne du Faso*). (AGRA 2014, 8–9).

The practice of inventory credit, or ‘warrantage’, has become increasingly common and apparently successful. ‘Warrantage’ is a credit system based on a stock pledge managed by farmer’s organizations in partnership with financial institutions, mostly microfinance institutions. The system is based on credit granting with a guarantee that consists of an agricultural product stock. The value of the stock is expected to increase during the operation. This is a system in which a farmer or a group of farmers sets a guarantee on his/their harvest in order to contract a loan from a microfinance institution. The amount of the granted loan is usually from 70% to 80% of the value of the stock at the time of harvest. At that time prices are the lowest, because farmers’ supply exceeds demand on the market. The loan is reimbursed 6 to 8 months later, before sowing, during the lean season. At that time grain prices are higher, as the family granaries are empty and demand on the market is high. This is the time when the farmer can choose to repay the loan from the revenues gained through off-farm microenterprise activities or recuperate the stock and sell it to repay the loan (COPSA-C n.d., 8).

Although it does not provide immediate credit for inputs at planting time, this inventory credit mechanism allows farmers to store their grain until prices are higher. With the credit, farmers are able to meet some of their immediate needs and become involved in off farm microenterprise activities. The fruits of those activities enable them to pay off the loan generally. It is a relatively low-risk form of credit in an environment where contracts are poorly enforced. The Government of Burkina Faso is keen to promote and expand ‘warrantage’. (AGRA 2014, 9).

Most cooperatives and farmers’ associations practicing ‘warrantage’ work through the *Réseau de Caisses Populaires du Burkina* (RCPB), which applies standard interest rates between 9.75% and 11%. Some commercial banks that are normally averse to agricultural financing are increasingly attracted to these opportunities. Some farmers’ organisations have begun working with Coris Bank and are benefitting from better terms than what they obtained with RCPB. The success of the *warrantage* system is ultimately defined by the quality and volume of one warehouse. Investment capital is still required to build and upgrade storage facilities. (AGRA 2014, 9).

Another financing mechanism that is increasingly used is leasing of agricultural implements and land (leasehold), which can play an important role in expanding access to credit (i.e. it satisfies the collateral constraint and is not hindered by poor credit history). While leasing can be used to get equipment (agro-machinery) or land to large-scale producers and agro-enterprises, it is not accessible to smallholders.

A recent study of IFAD's *fonds d'appui* in Burkina Faso under PROFIL (*Projet d'Appui aux Filières Agricoles*) concludes that initial subsidies to resource-poor farms and micro-firms to engage in productive enterprise along priority value chains is one way to move unbankable participants in the agribusiness system to manageable lending risks (IFAD 2013 in AGRA 2014). IFAD and DANIDA seem to be the only donors to support the poorest farms and firms with grants that are considered poor credit risks. (AGRA 2014, 9).

### **Beyond subsidies**

The only initiative that goes beyond fertilizer subsidies carried out by the Ministry of Agriculture (MARHASA) is the promotion of compost pits. Farmers are encouraged to produce their own organic fertilizer in order to profit from subsidized mineral fertilizers. The action is supported through a training programme carried out through contracted field schools with demonstration plots. Farmers learn through participant observation by cultivating three different and mutually comparable plots where they apply only organic fertilizers, only mineral fertilizer or none of the above, in order to learn from direct experience. This activity includes the use of locally produced phosphorus, which accelerates the decomposition process. The government allocates to DIDPV/DGPV/MARHASA a budget for the purchase of phosphorus from a company called Burkina Phosphate. The phosphorus is then distributed among farmers for organic fertilizer production. Each compost pit is allocated at least one bag of phosphorus, which is to be mixed with organic matter in order to improve the quality of organic fertilizer.

### ***Civil society institutions and their activities in area of soil management***

There are several civil society institutions in Burkina Faso that deal with soil issues as part of their programmes. The issue of soil degradation is a predominant agricultural worry in Burkina Faso. Most agricultural organizations include soil fertility management in their programmes. Civil society institutions dealing with soil fertility can be divided into research institutions and NGOs, which are largely focused on applied projects.

## **IRD, L'Institut de Recherche pour le Développement (Research Institute for Development)**

IRD is a French research institution specialised in development studies, which has been present in West and Central Africa for over 60 years, where it collaborates with 21 countries. More than 100 agents are expatriated there to conduct research, training and innovative activities in collaboration with over 200 permanent local workers. The main scientific topics cover extensive developmental issues such as:

- the impact of climate change and natural hazards (e.g. adaptation of plants to climate change);
- geosciences (e.g. coastal erosion, degradation and depletion of soils, pollution, etc.);
- ecosystems and management of natural resources (e.g. mineral resources, surface and subterranean water resources – and their utilization, fisheries, agricultural production – food security, biodiversity);
- the fight against poverty, international migration, socio-cultural and religious dynamics;
- health (e.g. malaria, HIV/AIDS, trypanosomiasis, emerging infectious diseases).

Since 2011, two regional pilot programmes have provided guidelines for the entire research activities, while they favour interdisciplinary activities and highlight distinctive characteristics of the regional ecosystems:

- The PPRFTH, *Tropical Rainforest – Biodiversity, Global Changes and Health in the Tropical Rainforests of Central Africa*
- The PPR-SREC, *Rural Communities, Environment and Climate in Western Africa*.

In 2003, IRD carried out a research project to halt land degradation in sub-Saharan Africa (*Arrêter la Dégradation des Terres en Afrique Subsaharienne*) which was carried out in Benin, Burkina Faso, Benin, Central African Republic, Chad, Congo (Republic of the), Democratic Republic of the Congo (DRC), Equatorial Guinea, Gabon, Gambia, Guinea, Guinea-Bissau, Ivory Coast, Mali, Mauritania, Niger, Senegal and Togo. The project was executed under the Desert Margins Programme (DMP) that aims to halt land degradation in sub-Saharan Africa and open the area to sustainable farming. It is supported by the United Nations Environment Programme (UNEP) and the Global Environment Fund (GEF). It aims to help sub-Saharan populations restore degraded land through active research conducted in partnership and to build up their competencies in managing fragile ecosystems.

IRD researchers and their partners in the national institutes of Senegal and Burkina Faso studied the methods which Sahelian farmers use to regenerate degraded soils. A particular

example is the *zaï* system, where the crop is sown in shallow pits dug out to concentrate water and nutrients. The researchers conducted a comparative typology of farms according to soil type, availability of organic matter and soil rehabilitation methods used. Examining ways to add organic matter to soil in order to increase farm output in a sustainable manner, they tested local composting methods and factors that determine the agronomic quality of the final stage of the compost. They assessed fertilizing properties of different types of compost in greenhouse trials with common crop species – maize, sorghum, millet and cowpea. Their findings confirm that it is important to control moisture levels in materials during the composting process and that adding tricalcium phosphate, which is naturally present in the region, could further improve the performance of compost while increasing phosphate levels in the soil. Outreach sessions have been held in villages to help farmers improve their composting methods and usage of fertilizer. To improve the ecological management of degraded soils, researchers studied how to better integrate trees and crops. They monitored a *zaï* agro-forestry system developed from bare soil in cooperation with local farmers and they studied the use of forest produce such as medicinal plants and wild foods.

The research also found that adding soil that had been previously digested by termites can significantly enhance symbiosis between ligneous species and fungi, boosting plants' resistance and growth rates. This effect was successfully tested in market garden crops (IRD *patent applied for*). Today, innovative practices such as erosion control structures combined with new cropping practices have succeeded in increasing tree and herbaceous cover in some parts of the Sahel, shedding a more optimistic light on the usually depressing picture of constant deterioration in the Sahel's dryland ecosystems (see IRD n.d.).

**CIRAD, La Recherche Agronomique pour le Développement (French Agricultural Research Centre for International Development)**

CIRAD is a French agricultural research and international cooperation organization working for sustainable development of agriculture in tropical and Mediterranean regions, which recently opened a regional directorate in Burkina Faso, under the concession of IRD. CIRAD collaborates with CNRST (National Centre of Scientific and Technological Research) through training young Burkinabe researchers in France, as well as through joint research of global climate change, taking into account the regional dimension of research. CIRAD is a targeted research organization and focuses its operations on developmental needs, from the field to the laboratory and from a local to a global scale. CIRAD's activities involve life sciences, social sciences and engineering sciences applied to agriculture, food and rural territories. The organization works to generate knowledge and to support agricultural development in

connection with main global issues concerning agriculture. CIRAD operates according to the climate-smart agriculture concept:

...based on the assumption that it is possible to ensure production operations that both satisfy farmers' requirements and can adapt to and mitigate climate change. This is what is known as a 'hat trick', or the three pillars of climate-smart agriculture. Taking up this challenge does not just mean using improved techniques. It calls for an integrated approach that allows for climate parameters, notably the uncertainties of climate change and its local nature. Public- and private- sector decision-makers need to be involved so as to help draft innovative public policy and find funding mechanisms for the changes required".(see CIRAD 2013a).

Between February 2008 and January 2012, CIRAD carried out a project know as Sharing Innovations in Agro Pastoral and Soil Fertility (*Fertipartenaires - Partage d'Innovations Agro-pastorales et Fertilité des Sols Fertipartners*), financed by The European Community. Fertipartners in Tuy province in Burkina Faso. Its objective was to improve food security on family farms based on cotton-cereal-livestock farming by improving soil fertility with optimal use of locally available organic manure (see CIRAD 2013b).

Currently, CIRAD is carrying out a project known as Smallholder Conservation Agriculture Promotion in Western and Central Africa (SCAP, 01/01/2008–31/01/2025). Its objective is to raise productivity and improve sustainability of natural resources in order to reduce rural poverty and improve access of rural poor to technology and natural resources, including soil and water. Project's activities are carried out in Sudanese and Sahelian zones of Burkina Faso (see CIRAD 2013c).

Numerous NGOs are registered in the country. The following deal with soil fertility management:

The most powerful organizations specialized in soil fertility management in Sub-Saharan Africa are the Alliance for a Green Revolution in Africa (AGRA) and the International Fertilizer Development Center (IFDC). Both organizations promote directly integrated soil fertility management (ISFM) (AGRA 2015b; IFDC 2015a).

#### **AGRA, Alliance for a Green Revolution in Africa**

AGRA is an Africa-based organization working in partnership with governments, agricultural research organizations, farmers, the private sector, civil society and other rural development stakeholders, to significantly and sustainably improve the productivity and incomes of

resources available to poor farmers in Africa. It was founded in 2006 through a partnership between the Rockefeller Foundation and the Bill & Melinda Gates Foundation. Today, AGRA also receives funding from other governments, agencies and international institutions. AGRA was singularly recognized as an effective public-private partnership for improving smallholder farming in the G8 in 2008 and 2009.

AGRA's vision is a food secure and prosperous Africa achieved through rapid, sustainable agricultural growth based on smallholder farmers. AGRA's mission is to trigger a uniquely African Green Revolution that transforms agriculture into a highly productive, efficient, competitive and sustainable system that ensures food security. AGRA advocates for policies that support its work across all key aspects of the African agricultural value chain – from seeds, soil health and water to markets and agricultural education. AGRA's programmes focus on four basic areas: soils, seeds, policies and markets.

In Burkina Faso, AGRA supports government initiatives such as the Agricultural Sector Investment Programme; it calls for diversification and intensification of production and strengthening of ties between production and the market. Burkina Faso is a receiver of AGRA's Soil Health Program grant as well as Program for Africa's Seed Systems and Market Program grants (see AGRA 2015a, 2015c).

#### **IFDC, International Fertilizer Development Center**

IFDC is a private, non-profit corporation, which qualified as a public international organization in 1977. IFDC is working with governments, other research organizations and farmers to develop new fertilizers, technologies and farm practices. The organization is known for its expertise in fertilizers that service developing countries.<sup>3</sup> They provide training on the efficient use and production of their technologies for farmers and industry professionals. The organization has offices and/or staff stationed across Africa, Asia and Europe. IFDC's priority is to help smallholder farmers in developing regions move from subsistence to commercial farming and to escape the poverty trap. IFDC is also committed to helping developing economies increase their agricultural productivity, food security and nutritional health of their people while protecting the environment. Since 1974, IFDC has focused on increasing and sustaining food security and agricultural productivity in over 100 developing countries through the development and transfer of effective and environmentally sound crop nutrient technology

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<sup>3</sup> The majority of fertilizers in use worldwide were developed at NFDC (TVA's National Fertilizer Center) and/or IFDC.

and agribusiness expertise. From South America to sub-Saharan Africa to East Asia, their projects engage policymakers, empower farmers and create agricultural markets.

IFDC's key projects in Burkina Faso are Support Programme for Modernization of Family Farms – Inputs Component (PAMEFA, *Programme d'Appui à la Modernisation des Exploitants Familiales Agricoles – Volet Intrants*) and USAID C4 Cotton Partnership (USAID C4CP). The C4CP is funded by USAID for the period 2014–2018 and aims to increase food security and incomes for men and women cotton farmers in targeted areas of Benin, Burkina Faso, Chad and Mali. The project objectives are to raise the incomes of cotton producers and processors by introducing competitive and sustainable strategies to boost farm productivity and improve post-harvest processes; and to help regional organizations achieve their objectives and focus, particularly in the regional coordination capacity of cotton developed by the West African Economic and Monetary Union (UEMOA). C4CP specifically addresses the challenges women face in cotton-producing households and introduces economic and social strategies to benefit these women farmers (see IFDC 2015b).

PAMEFA is funded by the Swiss Agency for Development and Cooperation (SDC) for the period 2015–2017 and seeks to increase the productivity and incomes of 315,000 smallholder farmers in Burkina Faso. The project objectives are to improve the availability, accessibility and affordability of quality agricultural inputs in rural areas of Burkina Faso by enhancing the capacity of agro-dealers and institutions, by providing training and technical assistance to farmers and agro-dealers through initiating technology transfer centres and by supporting agricultural marketing initiatives and warehouse receipts programmes for access to inputs (see IFDC 2015c).

**FNGN, Fédération Nationale des Groupements NAAM (National Federation of NAAM Producers Groups)**

NAAM is a farmers' organization that promotes self-governance and supports local farmers and village communities based in Ouahigouya, north Burkina Faso.

NAAM was founded in 1967 by Bernard Ledea Ouedraogo, a teacher who tried to teach village communities in Burkina Faso farming techniques in the fifties. To his astonishment the village communities were not able to work with his western management approach. To find out why his approach was not working, Ouedraogo immersed in the local culture and discovered that the villagers worked along the principles of the *kombi-naam* tradition, a model that has a lot in common with cooperatives. Ouedraogo decided to adopt local customs and habits and integrate the NAAM-method. (Summer Foundation n.d.).

The NAAM-method promotes dynamic and local leadership, respects and cherishes traditional community values, forbids all forms of exclusion and discrimination and provides training and motivational programmes which are set up from within the community itself. The philosophy behind the NAAM-movement is to make the village responsible for its own development, choosing development without destruction, starting with the farmer: acting on the basis of who people are, what he is (based on their African identity), what he knows (respect for traditional knowledge), what he can do (rediscovery of traditional techniques), how he lives and what he wants. (Summer Foundation n.d.).

NAAM is currently one of the largest farmers' organizations in West Africa with no less than 85 national and 11 international unions, bringing together nearly 5,500 local grassroots groups and over 650,000 members. (Summer Foundation n.d.).

NAAM supports local farmers and village communities in the form of targeted assistance such as customized training, education and work programmes. The aim is to set up autonomous communities, self-sufficient in food, labour and finance.

NAAM has a rich experience in soil management, especially in the area of soil. It builds dams, stone bunds and dikes, rock barriers; promotes use of manure/compost pits, delfino plows and soil restoration techniques like *zaï* and half-moons. NAAM is the first organization in Burkina Faso to address soil degradation issues, starting with activities for soil fertility restoration (see FNGN n.d.).

#### **AZN, Association Zoramb Naagtaaba**

AZN is an association of 10 villages surrounding Guiè village in the Central Plateau region of Burkina Faso. Villages united in 1989 in order to fight desertification, which has threatened them since the late 1960s. In the same year, Guiè village established a pilot farm dedicated to soil restoration. Its aim was to experiment with the introduction of new agricultural techniques, train farmers in the use of these techniques and promote the use of these techniques in their villages. The pilot farm sees itself as an innovation catalyst for the region. The first 5 years were dedicated to the instalment of the farm. Initiators started from scratch on a completely barren plot. For the first few years, they developed in-house techniques, conducted experiments and established work foundations. In 1995, they started to work with a small group of four farmers with 2 ha of farming land. In the following years, they developed 10 ha of land;



in 1998 they undertook a larger development on 100 ha of land. In 2006, they completed their fourth land development, which encompassed 115 ha.

The pilot farm is dedicated to the restoration of dried and degraded soils. Several techniques are implemented, all converging towards an agricultural system never practised before in this region, i.e. 'wooded perimeters', also called *bocage*. A wooded perimeter is defined as a rural landscape consisting of grasslands and/or fields, surrounded by hedges and woods. A wooded perimeter is a balanced, man-made environment. It combines trees, crops and livestock. To implement, popularize and develop the Sahelian *bocage*, the pilot farm commits itself to research, experimentation and training, while technically assisting farmers who request it. The first step for farmers who want to develop a wooded perimeter is to form a land grouping. The technique of land development concerns groups of farmers who are interested in developing their land. They have to agree to joint ownership and choose a plot of land ranging from 100 to 150 ha. Within this area, each farmer is in charge of parcels of land made up of several fields. Each field is developed using the technique of anti-erosive ridges built into the soil. Farmers construct soil embankments around the fields to retain rainwater. This is the so-called "zero-run-off" technique: when it rains, all the rainwater is kept in the field instead of draining away. Ponds are dug out at the lowest point of the fields to facilitate infiltration of excess water into the subsoil.

After field development work, farmers usually construct a barbed fence and plant hedges around it. Fields are divided by pathways and other shared spaces such as stockyards where livestock are kept at night, bigger ponds holding water for the animals or bigger streams which cross the perimeter by the paths. All these developments are constructed within the perimeter.

Once a perimeter development is completed, the farmers will benefit from an area where their crops will be protected from wandering livestock, water loss and soil erosion. But first, they must learn about soil techniques and the restoration of degraded land. The most important of these techniques is *zaï*, which consists of digging holes and filling them with decomposed compost. With the *zaï* technique, water is retained in holes, which ensures successful planting. Another technique, widely popularized by the pilot farm, is rational stockbreeding. Combining agriculture and stockbreeding provides manure for crops and hedgerows. To practice stockbreeding in a more rational way, animals are kept in fields, which provide compost; they are always shepherded when they are out in the bush, not left to wander and cause damage in the fields. The rest period of the fields is used to grow grass. Animal movement is controlled by electric fences. From the fallows, farmers collect hay, which is used during the long, dry season when there is a shortage of grass (see AZN 2015).

## **Groundswell International**

Groundswell International was created in 2009 as a global partnership to contribute to farmer-led social movements (bottom-up solutions) across the world. Groundswell's founders and partners have worked for decades to enable rural communities and organizations in Africa, Asia and Latin America to sustainably improve their lives. As they state on their web page (Groundswell International 2015a), they have been “at the leading edge of developing methods to spread agro-ecological farming practices, farmer innovation, farmer-to-farmer extension, community health and strengthening local organizations to lead their own development processes”.

Since 2010, Groundswell International has worked with a Burkinabe NGO called *Association Nourrir Sans Détruire* (ANSD) to strengthen community-led processes that can reverse the trend of rapidly declining soil fertility and deterioration of farmers' natural resource base. Their programme is improving the lives of thousands of farm families living in eastern Burkina Faso by spreading practical ecological farming methods (also known as agro-ecology) as well as sustainable livelihood solutions.

Groundswell International is supporting farmers to learn about and adopt soil conservation and soil improvement techniques. One of the most promising ecological agricultural practices for the region is Farmer Managed Natural Regeneration of Trees, a strategy that Groundswell International has increasingly emphasized since 2013 with the launch of a regional project in West Africa. This includes farmer-managed natural regeneration of trees (FMNR) and promotion of nitrogen-fixing trees and cover crops. FMNR is a form of “simultaneous fallowing” i.e. fallowing and farming on the same plot at the same time. Through FMNR, farmers select shoots from the “underground forest of stumps” that survive on their land and allow these to regenerate. Regenerating trees and agroforestry systems improve organic matter, fertility and production levels of soil, while providing fuelwood and animal fodder. This approach promises to help re-green the Sahel. The combination of FMNR and other ecological agricultural techniques, such as harvesting rainwater and composting to increase organic matter in soils, have helped to increase food production and improved community resilience.

In January 2013, Groundswell launched a 2-year initiative called Scaling Farmer-led Agro-ecology in West Africa, with ANSD and local partners in Ghana (Centre for Indigenous Knowledge and Organizational Development) and Mali (Sahel Eco), as well as Food First and ILEIA (see Groundswell International 2015b).

## SOS Sahel

SOS Sahel is an international NGO that aims to improve the living conditions of the population across the Sahel. The organization carries out social, economic and environmental development projects, such as sustainable agriculture, access to water and sanitation, hygiene, education and fight against desertification. Since the early 1980s, SOS Sahel has been contributing to the diffusion of traditional practices in the fight against desertification across the Sahel. SOS Sahel assists people in initiating their transition to agro-ecological systems through transmission of knowledge and strengthening of endogenous initiatives. It operates several food security projects which all take soil management into consideration.

In the period from 01/01/2010 to 30/09/2011, SOS Sahel carried out a project called Fight against Food Insecurity in the North Central Region of Burkina Faso (*Lutte contre l'Insécurité Alimentaire dans la Région Centre-Nord du Burkina Faso*), financed by Air France, Lemarchand Foundation, Aviva, Bel, L'Occitane, Kinder in Not and the European Union. The project included 28 communities in provinces of Bam, Sanmatenga and Namatenga. The aim of the project was to restore 3,500 ha of degraded soils by applying improved soil management techniques and produce 5,000 t of compost fertilizer in 1,000 compost pits. This was to be used for fertilization of fields and improvement of farmers' yields. The project also included recruitment of 2,500 people for the realisation of 30 filtering dikes (see SOS Sahel 2013a).

Development of Agricultural Production of Small Farmers in Burkina Faso (*Développement de la Production Agricole des Petits Exploitants au Burkina Faso*), financed by the European Union, French Development Agency, Foundation J.M. Bruneau, Jardiland Institute and Seed Foundation, is a 4-year project being carried out in Gnagna province which includes Bogandé, Coalla, Bilanga, Liptougou, Manni, Pièla and Thion communities. The project supports small farmers through production and marketing of their crops. It includes eight field schools for women, established in order to teach them about soil fertility management (see SOS Sahel 2013b).

Improvement of Resilience and Food Security in Burkina Faso (*Amélioration de la Résilience et de la Sécurité Alimentaire au Burkina Faso*), financed by the European Union and Foundation J.M. Bruneau, is a 2-year project carried out in the provinces of Loroum and Bam in Burkina Faso. Its objective was to increase agro-pastoral productivity and incomes of poor households in order to improve food security. Its activities included soil and water conservation by introducing organic fertilizer production (training of 500 farmers in heap composting in order to manage production of 5 t of organic fertilizer per person annually) and restoration of 1,200

ha of land through *zaï* traditional soil conservation technique and half-moons (see SOS Sahel 2013c).

Agricultural Development and Fight against Malnutrition in Burkina Faso (*Développement Agricole et Lutte contre la Malnutrition au Burkina Faso*), financed by the European Union and Foundation J.M. Bruneau, is a 4-year project carried out in Yatenga and Loroum provinces in Burkina Faso. Its objective was sustainable improvement of food security and resilience to crises for poor households. Among other activities, the project promoted soil restoration techniques such as *zaï* and half-moons, organic and mineral fertilizers, offered training in the use of organic and mineral fertilizers (distribution of data sheets) and established eight nearby shops selling fertilizers (see SOS Sahel 2013d).

### **Lutheran World Relief**

Lutheran World Relief (LWR 2015) is an international NGO, which seeks to promote sustainable development in the most impoverished communities in 35 countries across the world. LWR promotes peace and reconciliation, responds to emergencies, engages in Fair Trade and helps communities to bring change for healthy, safe and secure lives. It began working in Burkina Faso in 1986 to address the food crisis affecting the country's largely rural population. LWR supports agriculture and climate programmes, which are designed to improve livelihoods. In times of emergency, LWR and its partners use cash-for-work approaches to allow farmers to earn immediate income to feed their families while at the same time carrying out critical actions designed to build resiliency.

LWR works in the predominantly rural northern and eastern regions of Burkina Faso, including Passoré province and the commune of Bittou in Boulgou province. In Burkina Faso, LWR uses a climate-smart agriculture approach to promote environmentally sound improved cultivation practices and crop varieties, such as drought-tolerant sorghum and cowpea varieties and innovations in irrigated and rain-fed horticultural production. LWR addresses producers' need for credit to increase and sustain agricultural production by linking farmer organizations with financial institutions, using its innovative Tripartite Rural Financing Model where initial loan guarantees and technical assistance allow farmers and their organizations to build a relationship of mutual trust and success with financial institutions (see LWR n.d.).

### **CEAS, Centre Ecologique Albert Schweitzer (Albert Schweitzer Ecological Centre)**

CEAS is a Swiss NGO, founded in 1980. Its mission is to develop technical innovations in order to improve living condition of disadvantaged communities in Burkina Faso, Senegal and Madagascar. Applied research and professional training are at the heart of their work. They

collaborate with Swiss universities and African training centres in order to invent and share innovations, which help local farmers build their own future by protecting their environment. Their activities cover the fields of crafts, renewable energy, food processing, water and sanitation and sustainable agriculture.

CEAS has been teaching farmers how to optimize their production without polluting the soil and groundwater by replacing chemical products with natural fertilizers and insecticides. Natural insecticides such as *neem* and *Cassia nigricans* are the two main natural weapons that farmers can produce and use on their crops. Locally found in most of the African continent, these plants are now also used in Burkina Faso. CEAS also organizes training for farmers where they learn how to build good quality compost or raise bees.

CEAS carried out a year-long project known as *Creation of Wells and a Gardening Perimeter in the Village of Tiguendalgué (Création de Puits et d'un Périmètre Maraîcher dans le village de Tiguendalgué)* in Kadiogo province in Burkina Faso. The project's objective was to improve the living conditions of women and youth in the village of Tiguendalgué through improved contra-season agricultural production. It aimed to create four access points to permanent water, surround the fields with a protective fence and encourage composting through integration of agriculture and breeding, in order to increase food production and ensure economic stability in the village (see CEAS n.d.).

### **Africare**

Africare is a NGO committed to addressing African development and policy issues by working in partnership with African people to build sustainable, healthy and productive communities. Africare began its operations in Burkina Faso in 1974. Since that time, it has implemented projects across more than 28 provinces addressing agriculture and food security, civil society capacity building, education, gender, good governance, health, HIV/AIDS, humanitarian and emergency relief, natural resource management, nutrition, private sector capacity strengthening, water resource management and women's empowerment.

Currently, Africare operates the African Regional Rain Fed Agriculture Project, financed by the Australian Department of Foreign Affairs and Trade, with the following implementing partners: Ministry of Agriculture (MARHASA), Ministry of Secondary and Higher Education and Research (MESSRS, *Ministère des Enseignements Secondaire, Supérieur et de la Recherche Scientifique*) and the National Federation of NAAM. The project objective is to contribute to

adoption of sustainable water harvesting and conservation techniques in Yatenga province in the northern region of Burkina Faso (see Africare 2015).

**Nouvelle Planète, Organisation d'Entraide internationale (New Planet, International Assistance Organization)**

Burkina Faso was the first country in which *Nouvelle Planète* engaged in the technology sector in the 1980s. *Nouvelle Planète*'s strategy in Burkina Faso is based on long-term collaboration with approximately 15 local associations, including active rural women's groups, local or regional associations of farmers, as well as organizations that take care of children. All of them aim to improve the standard of living of the local population while focusing on the environment. *Nouvelle Planète* does not design projects, but supports existing local projects, which are relevant in the specific context and are carried out by beneficiary groups. *Nouvelle Planète* supports small, efficient and effective projects, which have been proposed by local partner groups. In the field of agriculture, it promotes organic farming, fights against desertification and aims to recover a portion of infertile land in the Sahel region. One such project was one which recovered 60 ha of land to make it fertile again in Rim, Burkina Faso (see *Nouvelle Planète* 2013).

**Solidar Suisse, Œuvre Suisse d'Entraide Ouvrière OSEO (Swiss Labour Assistance)**

Solidar Suisse is a Swiss NGO subsidized by the Swiss Confederation, cantons and activists from 10 countries in south and south-east Europe. Solidar works with partner organizations to implement projects aimed at improving living conditions and achieving a more equitable distribution of resources. Currently, its activities cover the following countries: Bolivia, Burkina Faso, El Salvador, India, Kosovo, Mozambique, Nicaragua, Serbia, South Africa and Sri Lanka. Solidar and its partners work through national and international networks to achieve synergy and increase the impact of their programmes. Solidar's activities in Burkina Faso began in 1974; it aims to promote endogenous development based on the approach of self-promotion. Solidar does not carry out projects in the field, but supports State or private partners' programmes in the target country. Its programmes concentrate on protection and restoration of soil in order to increase agricultural productivity and promote new production techniques, such as use of improved seeds, compost pits, rock barriers, *zaï* and half-moons. The organization also carries out campaigns against bush fires and excessive logging (see Solidar Suisse n.d.).

### ***Farmers' access to fertilizers and information about soil management options***

Following the food crisis in 2008, the Government of Burkina Faso began intensively distributing improved subsidized fertilizers in order to increase agricultural production and ensure food security. This action included the sensitization of farmers on the mechanism of acquisition of fertilizers at all levels; training of MARHASA directors in the capital at the level of regions and provinces; and training of chiefs and extension agents. Municipalities, regional chambers and actors at the village level helped to identify the beneficiaries for subsidized fertilizers. DVRD/DGPV/MARHASA developed a dissemination programme, which includes collaborative work linking research, extension and beneficiaries according to the National System for Extension, Agricultural Support and Counselling (2010; SNVACA, *Le Système National de Vulgarisation et d'Appui Conseil Agricoles*). Currently, information on improved techniques and technologies and use of fertilizers is being disseminated according to the National System for Extension, Agricultural Support and Counselling.

Extension agents supervise farmers and inform them about sustainable soil management options and improved techniques and technologies. Special attention is paid to the use of mineral fertilizers, standard formulas and appropriate use: quantity, timing, importance of association with organic fertilizers etc. Extension agents rely on INERA's technical datasheets to provide information on cultivation steps (from seed to harvest) to farmers. Certain training courses are organized within farmers' organizations and led by UPBD-IDR and INERA researchers. Members of farmers' organizations can benefit from these training courses and get information on improved soil management options at first hand. The UPBD-IDR interns working in these organizations present another source of information to members of farmers' organizations. Farmers who are not members of any organization get their information by listening to the radio or watching television, which means that their access to information is very limited.

Farmers can access fertilizers through different channels:

Subsidized fertilizers are available through the Ministry of Agriculture (MARHASA), which is organized on all levels, from the central down to regional, provincial and local levels of village communities. Fertilizers are distributed to local communities through private distributors, which collect contributions by beneficiaries and deposit them to the account of the Public Treasury (*Trésor Publique*). This cooperation of the public–private sector facilitates the work of extension agents and enables them to concentrate on monitoring and supervision.

Both individual farmers and farmers' organizations are entitled to subsidised fertilizers. Beneficiaries are identified by village committees and listed on *Expression of needs*, a form created by DIDPV/DGPV/MARHASA. Villages are divided in three groups and each group is entitled to subsidized fertilizers every third year. This principle of allocation of subsidized fertilizers was established because the State is not able to provide for all.

DIDPV policy states that fertilizers should arrive to farmers at the level of a field and on time. Farmers should face no obstacles and distances should be minimized; this is not always possible due to poor transport networks in the interior of the country. During the rainy season, many dirt roads leading to villages are flooded, making the villages inaccessible to trucks carrying fertilizers.

In spite of the government's subsidy programme, the costs of fertilizers are still too high for many farmers. However, some farmers' organizations have organized a mechanism of facilitated access which functions through their shops with agro-materials and those who fell through the subsidy scheme but are members of these organizations can obtain fertilizer through these shops. Organisations in the cotton sector also established a supplying system, which enables their members to cover fertilizer costs after the harvest. Farmers who remain outside farmers' organizations have to rely on their own means and usually buy fertilizers of uncertain quality from retailers at local marketplaces.

### ***Private service providers for fertilizers and information on improved soil management***

There is almost no private sector for fertilizers in Burkina Faso; it is poorly organized and lacks qualified personnel. Private operators are absent from almost all municipalities in the north (AGRA 2014; *Le Hub Rural* n.d.). The market for agricultural inputs is influenced by actions of the State. In response to the rise in food prices in 2008, the government intensified its engagement in distribution of improved seeds and fertilizers. At the beginning, subsidized inputs were delivered by the public sector, but in 2013 the government availed itself of private sector distribution channels. Association of Wholesalers and Retailers of Agricultural Inputs AGRODIA (*Association des Grossistes et Détaillant des Intrants Agricoles*) and traders' Cooperative of Agricultural Equipment and Inputs COCIMA<sup>4</sup> were indispensable to these efforts. AGRODIA comprises 757 members made up of importers (10%), wholesalers (40%) and retailers (50%). In 2013, AGRODIA moved 12,000 t of fertilizers and 8,000 t of seeds for

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<sup>4</sup> Created in 2005 by Association of Professionals of the Private Irrigation and Related Activities APIPAC (*Association des Professionnels de l'Irrigation Privée et des Activités Connexes*).



a total cost of XOF 7 billion (approximately USD 14,626,300), which represented the total government yearly subsidy. According to estimates for the period 2003 to 2011, the subsidy programme for fertilizers costs USD 7.7 million per year (Holtzman et al. 2013, xx). In 2013, the government reported beneficiary satisfaction as high as 93%, although it recognized serious deficiencies in the timing and quality of inputs (AGRA 2014, 1–2). The private sector is involved in the distribution of fertilizer, both in the cotton sector and in the government-run subsidy scheme. AGRODIA and COCIMA each participate in conventions that may include training of retailers in safe handling (AGRA 2014, 5).

In Ouagadougou, Bobo Dioulasso and other towns, numerous other retailers work on their own. They often work through vendors who lack adequate knowledge about the fertilizers' quality and their use. The problem of small retailers is that they often stock up in non-authorized importers' parallel circuits of uncertain quality (*Ministère de l'agriculture* 2001, vi–vii). However, these retailers play an important role in the distribution of fertilizers since they are the main supply source for farmers with small cultivation surfaces who usually remain outside farmers' organizations.

The only producer and provider of fertilizer in Burkina Faso is the Industrial Company of Agricultural and Merchant Production CIPAM (*Compagnie Industrielle de Production Agricole et Marchande*). It holds workshops for farmers on the quality of inputs and the optimal use of fertilizers for better yields. CIPAM works in partnership with farmers' organizations and their financial partners. According to DIDPV/DGPV/MARHASA, there are no other private service providers of information on improved soil management.

### ***Available fertilizer mixes***

Private service providers of fertilizers such as AGRODIA and COCIMA, as well as CIPAM, distribute NPK, DAP and urea (N). There is no fertilizer production in Burkina Faso except CIPAM and a company for exploitation of phosphates called Burkina Phosphate (*Faso Société d'Exploitation des Phosphates du Burkina*) – which must be considered as an amendment and not as a fertilizer. The majority of fertilizers used are imported and most fertilizers that enter Burkina Faso come from non-ECOWAS suppliers (AGRA 2014, 2).

CIPAM was established in 2005 for the formulation of NPK, adapted to the demands of Burkinabe customers. The company's fertilizer mixing capability is, according to Holtzman et al. (2013, xxi), underutilized. This company could provide a higher proportion of fertilizer used in Burkina Faso, as well as blend a larger variety of fertilizer formulas suitable for different

types of soil across the country. The factory has a capacity of processing 60 t per hour or 480 t per day, assuming a single 8-hour shift, which makes an annual capacity of 108,000 t. It has never reached this level; the maximum was 60,000 t or 56% in 2006. From 2008 to 2011, the factory did not exceed 14% of its production capacity. The average fertilizer treated by the factory for the period was 25,800 t per year, representing 24% of the production capacity (Holtzman et al. 2013, 43). Fertilizers produced by CIPAM are mainly used for cotton growing. Between 2009 and 2011, a larger volume of fertilizers sold by CIPAM has been used for other crops including cereals (Holtzman et al. 2013).

Burkina Faso has phosphate reserves (Kodjiari) that could compensate the phosphate deficiencies in Burkinabe soils. According to CORAF/WECARD (*Conseil Ouest et Centre Africain pour la Recherche et le Développement Agricoles*/West and Central African Council for Agricultural Research and Development), researchers realized that Kodjiari natural phosphate must be complemented by soluble phosphate, because the effectiveness of Burkina phosphate depend on farming practices, especially water and soil conservation techniques (Coraf Action, in Holtzman et al. 2013). According to Holtzman et al. (2013), the use of Burkina phosphate remains low, representing 1,318 of 129,679 t (1.0%) estimated in 2008, but it could be used for a long-term period (2013, 44).

## **Institutional/political obstacles surrounding efforts to improve access to fertilizers and other soil management options**

### ***Lack of funding***

Burkina Faso faces numerous problems that prevent improvement of agriculture and related soil fertility management issues, but there is really only one major obstacle behind all of these problems – the lack of funding. Government budgets depend heavily on donor support (71% of public funding for agriculture between 2006 and 2010) and there are insufficient funds for investment and operations, particularly field extension. The capacity of public sector institutions to support agricultural sector development is limited, as government agencies face infrastructural, management, organizational and human capacity shortfalls (AGRA 2014, 1). A risk-averse banking sector does not willingly invest in agriculture (AGRA 2014, 2). The only reason the National Strategy for Integrated Soil Fertility Management (SNGIFS) 1999 could not be fully implemented was because of a lack of funding (personal communication from a researcher at INERA, July 2015).

The lack of funding results in low actors' capacities at all levels: weak institutional capacity, poorly trained human resources in both the public as well as the private sector (AGRA 2014 2). On a national level, Burkina Faso lacks specialists from different fields (i.e. agronomists, geologists, lawyers etc.). There is a problem of capacity to train personnel in the necessary skills. The lack of financing hinders the implementation of necessary activities. There are problems with dissemination of knowledge and soil information, distribution of fertilizers and other supplies to local levels, as well as with unregulated land ownership. The government does not allocate sufficient financial means for soil management research (personal communication from a researcher at UO-UFR-SVT, July 2015).

While the government makes an effort when it comes to subsidies for fertilizers and recruitment of teachers and researchers, researchers still lack equipment like laboratories and technical accessories in order to carry out their work. With equipment problem resolved, UO-UFR-SVT could annually train fifteen (15) MSc and five (5) PhD candidates in soil fertility and neighbouring sciences, which would importantly contribute to improving experts' capacities in the country.

Environmental soil experts at BUNEE lack tools for pollution control and even basic kits for field testing. According to AGRA, the absence of accredited laboratories presents a constraint on the development of effective seed and fertilizer industries, as well as the emergence of

scientific agriculture. It also increases the cost of laboratory testing as samples had to be sent to foreign countries' labs. Burkina Faso should therefore invest in upgrading public sector laboratories and move toward ISTA and ISO accreditations. Testing of soil samples, seed properties, fertilizer content and efficacy are necessary to move Burkina Faso toward scientific agriculture (Burkina Faso 2014, 3).

Lack of funding are reflected in low actors' capacities at the local level:

### ***Land ownership***

According to Kent Elbow in 2009, Burkina Faso adopted one of the most innovative pieces of rural land tenure legislation (Loi No 034-2009/AN) seen in West Africa (Burkina Faso 2013, 1).

By the beginning of the 2000s, the need for an overhaul of rural land tenure legislation in Burkina Faso had become glaringly evident. Demographic, climatic and social factors all contributed to intensifying competition for land and natural resources. Conflicts over land and natural resources were pervasive and increasingly violent. Each of the two land tenure systems in Burkina Faso – the statutory regime of the central government and local customary land tenure managers – seemed powerless to prevent the slide into insecure landholdings and constrained access to land. (Burkina Faso 2013).

Prior to the new law, customary land systems were not officially recognized and the State was the sole land proprietor based on the belief that the central government was best placed to manage the development of and access to land. (Burkina Faso 2013, 2).

The Land Law of 2009 was developed with the participation of all affected – farmers, herders, women's producer groups, customary authorities and government officials. It recognizes customary practices and authority systems as a starting point for land tenure systems. (Burkina Faso 2013, 3).

The difference between the 2009 law and previous land legislation is the new law's clear recognition of a land tenure starting point defined by customary practices and authority systems. (Burkina Faso 2013, 5)

“Article 1 of the 2009 law identifies four objectives that echo the original motivation for rural land tenure reform: achievement of fair and equitable access to land; enhanced productive investment; sustainable resource management; and social harmony” (Burkina Faso 2013,

4). “Strategies introduced in the law to achieve these sometimes-competing goals present a strong contrast to the tradition of centralized land management in Burkina Faso:

- Rather than alienate informal land practices and rights through their non-recognition, the new law introduces mechanisms for their formalization and protection.
- Rather than monopolize management of land rights at the level of the central government, the new law assigns important land management authority to local governments and even establishes technical support services to help local governments assume their land management responsibilities.
- Rather than claim all land as State property, the new law establishes three legal land domains of equal status: the State domain, the domain of local government and the private domain.
- Rather than maintain an overriding emphasis on technologically driven economic development, the new law provides safeguards to secure and enhance access to land on the part of women and vulnerable groups.
- Rather than limit land conflict resolution options to reliance on an over-burdened court system, the new law provides for management of land conflicts at the village level. (Burkina Faso 2013, 5)

Formalization of informal land tenure and management practices that vary by locality requires ingenuity and new ways of thinking. The law’s provision for a new Rural Land Certificate of Possession (APFR) is an example of such ingenuity. The APFR provides recognition and protection for existing informal individual and corporate land rights subject to the condition that they have been rigorously vetted and approved by the local community. The holder of an APFR may take the further step of applying for a full land title. (Burkina Faso 2013, 5).

The APFR, designed for individualized holdings, is not the only tool provided by the 2009 Rural Land Law for formalizing customary land rights. Among the most innovative features of the new law is the introduction of a tool to formalize community rights to common property land and natural resources. Examples of common property natural resources in Burkina Faso include: village woodlots, pastures, lakes and waterways, sand and gravel quarries and sacred sites. In the past, customary authorities often actively managed common property land and natural resources and were recognized as possessing the necessary authority to do so. Today, in most cases, customary authority over common property resources has eroded. To restore local management authority, the 2009 law introduces the concept of a local, rural land charter (Burkina Faso 2013, 5).

However, work on formal registration of agricultural land is proceeding very slowly despite the Rural Land Law and establishment of only one one-stop shop for land registration and transactions. Implementation of the law has stalled due to lack of funding. According to AGRA, one-stop shops need to be established in the provinces and the Burkina Faso Government needs to publicize and disseminate land laws. Burkinabe farmers who are unable to register land will not be able to access finance from microfinance institutions (MFIs) or commercial banks (AGRA 2014, 4).

Land ownership remains one of the principal constraints in soil management. Land transactions do not guarantee long-term use of land, which is why farmers tend not to invest in land improvements. As land security is not assured, only those farmers who own their land invest in improved soil fertility management.

Another problem stemming from the land ownership issue are practices that encourage land exploitation and simultaneously prohibit its restoration. For example, village land belongs to first inhabitants, while newcomers can ask for a piece of land to cultivate. However, in certain areas reforestation is considered to be a sign of land appropriation and tenants who are allowed to cut trees in order to make a field are not allowed to plant in order to restore it. A programme for raising awareness of this problem should be carried out in order to encourage more sustainable soil management behaviour on rented lands.

### ***Poor market access/transport networks***

Burkina Faso is a landlocked country and prices of mineral fertilizers are high. In order to facilitate farmers' access to fertilizers the State provides subsidies but they are not sufficient and access to fertilizers remains limited. The purchasing power of poor farmers is weak. According to AGRA, extreme poverty and the immediate need for cash force farmers to sell their produce at harvest time rather than storing and selling it when prices are higher. This cycle precludes many farmers from accumulating capital and investing in fertilizers and other improved technologies (AGRA 2014, 2). Due to the high prices of chemical fertilizers, farmers do not respect recommended doses. Another obstacle is the availability of fertilizers. Inadequate supply is a problem, especially for poor, small farmers who need smaller amounts. The unavailability of fertilizers (including Burkina Phosphate) through local suppliers presents a serious constraint in the use of fertilizers (Holtzman et al. 2013, 50). Another problem is the poor quality of fertilizers purchased in marketplaces where there is no quality control. According to Bassolé (in Holtzman et al. 2013), who carried out a study on the quality of

fertilizers, only 21% of the analysed fertilizers meet the three NPK elements and at least 80% of NPK fertilizers used for cotton experience deficiencies in one or two of the three elements. Another serious issue is a lack of crops appropriate formulas. Holtzman et al. (2013) stress that fertilizer formulas corresponding to the needs of each crop and soil conditions (acidity level, deficiencies of certain elements) should be locally adapted. Currently used fertilizers are not optimal and they do not ensure maximum efficiency. Thus, it is necessary to have compound fertilizers rather than fertilizer from 'bulk blending' (Holtzman et al. 2013).

Another obstacle on the way to improved soil management is low production and use of organic fertilizers by the farmers. Farmers are encouraged to build manure and compost pits, but cement is needed in order to reinforce the walls. Heap composting requires application of composting activators and farmers are often not able to buy required materials. Costs of soil fertility management are high and small farmers can often benefit only from sporadic actions carried out by different projects. The problem with such projects is that they are often not sustainable. After the conclusion of a project farmers are left to their own devices, lacking the financial capacity to continue project activities.

Poor transport networks only add to the problem. While Burkina Faso did develop principle roads connecting the country from West to Northeast (Orodara – Dori), North to South (Ouahigouya – Pô), Center to East (Ouagadougou – Diapaga) and Centre to Southeast (Ouagadougou – Pama), the interior of the country still lacks good transport networks. A rural access to transport is low, marked by the index of 24-25%. The road access is better in more populated central region of Burkina Faso and it is limited in drier Sahelian regions with a low population density. More than half (56%) of companies interviewed for the *Enterprise Survey* reported that the poor condition of roads present one of the main constraints to good business in Burkina Faso. Transporters have indicated that the state of secondary roads should be improved, although the principle roads are generally in good condition and regularly maintained (Holtzman et al. 2013, xxiv).

### ***Black market sales of fertilizers***

Import and distribution of fertilizers is subject to a regulation under the Act No. 026-2007/AN from 20 November 2007. After Article 4, import and marketing of fertilizers is subject to obtaining approval issued by the Ministry of Trade (MCPEA, *Ministère du Commerce, de la Promotion de l'Entreprise et de l'Artisanat*) after being approved by the Ministry for Agriculture (MARHASA). However, according to Holtzman et al. (2013, 42), there is no effective control on imported and sold fertilizers in the Burkinabe market. Theoretically, the imported fertilizers

are subject to quality control by the Directorate for Vegetable Production (DGPV/MARHASA) or National Office for Soils (BUNASOL/MARHASA). Standards are defined by *Burkina Standards* and National Laboratory for Public Health and based on the Codex alimentarius.<sup>5</sup> According to Holtzman et al. (2013), the issue of labelling seems simple but it is very problematic. In general, fertilizer control is seriously questioned. A lot of fertilizers enter into the country illegally, without verification. This results in unstable quality. Some distributors and farmers complain on the poor quality of some fertilizers, which also contributes to a weaker demand among farmers. Progress is being made on harmonization protocols for fertilizers. A fertilizer National Committee for Fertilizer Control CONACER (*Comité National de Control des Engrais*) was created in 2014, but is not yet operational. AGRODIA is a member of this committee (AGRA 2014, 6).] According to AGRA, the committee needs to become operational as soon as possible. Its mandate, decision-making role and priorities need to be clarified and its work in harmonizing fertilizer protocols should be supported and completed. The work of this committee should clarify the legal and regulatory environment for fertilizer importation and distribution for prospective private sector participants. The current subsidy programme and dominance of fertilizer importation and distribution by cotton companies also provide disincentives to private sector participation in the fertilizer trade (Holtzman et al. 2013, 2).

### **Poor dissemination of agricultural knowledge information**

An important obstacle on the road to improved soil fertility management is the lack of knowledge on the part of the farmers. As stated by a soil expert at DVRD/DGPV/MARHASA:

In Burkina Faso one becomes a farmer if they didn't succeed in school. Farmer's profession is viewed as a result of failure. Farmers are not aware that being a farmer is a profession like any other and that it takes knowledge to practice it. Because of the lack of knowledge farmers are not aware of their harmful practices which degrade the soil. Farming profession should therefore become a real profession, obtained through appropriate training. In the past, nature endowed but today there is nothing left, so one should farm with intelligence.

Farmers' knowledge is empirical, isolated and focused only on each farmer's plot (personal communication from a researcher at UPBD-IDR). Farmers are not well informed about improved soil management options. All information is transmitted through documents in

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<sup>5</sup> A collection of internationally recognized standards, codes of practice, guidelines and other recommendations relating to food, food production and food safety.



French, while very often farmers are illiterate and speak only the language of their ethnic group.<sup>6</sup> The State organized an extension programme, but due to the lack of funding its popularization was not efficient and relevant knowledge remains in the cities. BUNASOL/MARHASA classified soils across 42 country provinces and produced high-precision maps, but this information was not disseminated efficiently and farmers lack data on soil properties of their land. In practice this means that farmers do not work according to already available soil data and apply fertilizers in inappropriate ways. High prices of soil analyses, inaccessible to small farmers, only add to poor dissemination of soil information.<sup>7</sup> Consequently, the application of fertilizers is not based on soil evaluations and cannot be efficient. As stated by the above-mentioned researcher, “many times we can hear about inefficiency of fertilizers, but first we have to know properties of the soil well and only then can we talk about efficiency of the applied technique”. The problem of inappropriate use of fertilizers is also linked to low capacity of salesmen of fertilizers, who should, according to a researcher at INERA, be trained in their appropriate use and quality.

### **The level of knowledge in key training institutes and in rural extension personnel throughout the country**

The key training institute for rural extension personnel in Burkina Faso is the Multipurpose Agricultural Centre of Matourkou (CAP-M), which is a school established by the Ministry of Agriculture (MARHASA). CAP-M trains agricultural technicians, technical agents, consultants and engineers, as well as extension engineers and soil engineers. CAP-M presents the main human resource for MARHASA personnel.

Training programmes at CAP-M are designed to meet the needs of MARHASA, various projects and job market in general. They are constantly revised in order to meet new challenges faced by the ministry. The last revision of curricula was held in 2012 with participation of the following structures: higher education (UPBD), research (INERA) and

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<sup>6</sup> Burkina Faso is a multilingual country. An estimated 69 languages are spoken there, of which about 60 are indigenous. The Mossi language is spoken by about 40% of the population, mainly in the central region around the capital, Ouagadougou, along with other, closely related Gurunsi languages scattered throughout Burkina. In the west, Mande languages are widely spoken, the most predominant being Jula, others including Bobo, Samo and Marka. The Fula language is widespread, particularly in the north. The Gourmanché language is spoken in the east, while the Bissa language is spoken in the south. The official language is French, which was introduced during the colonial period. French is the principal language of administrative, political and judicial institutions, public services and the press. It is the only language for laws, administration and courts (Lewis 2009).

<sup>7</sup> According to obtained information soil analysis cost at least XOF 75,000 (USD 126,132 ).

training, central and regional directorates of MARHASA, the Ministry of Public Service Labour and Social Security (MFPTSS, *Ministère de la Fonction Publique du Travail et de la Sécurité Sociale*) and the Ministry of Secondary and Higher Education and Research (MESSRS, *Ministère des Enseignements Secondaire, Supérieur et de la Recherche Scientifique*), professional users, partner projects, monitoring committee of protocol of agreement PAFASP-CAP-Matourkou and a representative of the World Bank (see CAP-M 2015).

The CAP-M's aim is to ensure implementation of vocational training policy of the Ministry of Agriculture. CAP-M is responsible for:

- adaptation of agricultural training programmes to the needs in the field (the ministry and other users);
- provision of initial and ongoing training for extension agents and their application in the field of agriculture;
- organization of internships and additional training courses on demand;
- provision of advisory support and services in areas within its competence;
- training and provision of monitoring support on demand of agricultural producers;
- development and execution of appropriate training programmes;
- development of agricultural entrepreneurship expertise (see CAP-M 2015).

The second key training institute in this field is the Rural Development Institute of the Polytechnic University of Bobo Dioulasso (UPBD-IDR). The institute is training rural development engineers in five fields: agronomy, breeding, waters and forests, rural sociology and economy and agricultural extension. While students of all five fields study 'soil science' (a basic course on soil formation), agronomy students also attend the following courses: fertilization (includes soil management in general), integrated soil fertility management (course includes different soil management techniques), soil and water conservation/soil protection and restoration (course deals with problems of soil degradation related to water and wind erosion, as well as to various agricultural practices), soil mapping and prospecting' and soil evaluation. Studies at UPBD-IDR concentrate on the situation in the country in general.

Both institutions work in close collaboration with MARHASA directorates and associate their teaching curriculums with MARHASA's soil fertility management programmes. The CAP-M and UPBD-IDR students regularly work as interns at directorates of MARHASA, where they gain first-hand experience on government's implementation of soil fertility management programmes in the country. Certain courses at CAP-M and UPBD-IDR are run by researchers from the Institute for Environmental and Agricultural Research (INERA). Thus, training of the

future rural extension personnel in Burkina Faso takes into consideration both the government's implementation policies and research.

It takes 2 years to become an agricultural technician at CAP-M, additional 2 years to become a technical agent (secondary comprehensive education is divided into two cycles) and additional 3 years to become an agricultural consultant and engineer, extension engineer and pedology engineer (higher education). Higher education training at UPBD-IDR takes 3 years. BA students undergo internship at MARHASA or in other research, development or farmers' organizations, where they work on a chosen topic and write a thesis.

### ***Extension agents across the country***

DVRD/DGPV/MARHASA maintains annual records on the number of extension agents who are in direct contact with farmers across the country. According to records from June 2014, there are 329 area chiefs of technical support (*chefs de zones et d'appuis techniques*) and 470 agents in charge of technical animation units (*agents chargés des unités d'animations techniques*) in all 45 provinces/13 regions of Burkina Faso. The goal of the Ministry of Agriculture is to assign one rural extension agent to each village in Burkina Faso (approximately 8,000). There was no accessible information on the average number of rural extension personnel serving at the time of writing this document.

### **Knowledge national training institutes have of soil management strategies employed by farmers**

The principal policy documents on soil degradation issue in the country, i.e. the *National Strategy for Integrated Soil Fertility Management* (SNGIFS) and the *National Program of Agricultural Sector* (PNSR), reflect the situation at each level of the country down to level of a village and apply to all of its 13 regions (personal communication from researcher at INERA, July 2015). These documents were formulated by Burkinabe soil experts who are familiar with the difficulties faced by farmers and have a good knowledge of the different soil management strategies used by them. Burkinabe researchers intensively study management strategies implemented by farmers. Techniques of soil conservation such as *zaï* and half-moons have been improved by scientific research but they originate in the rural milieu and were invented by farmers. These techniques, once improved by research, were fed back to farmers through the implementation actions of the national strategy (SNGIFS) and were also included in the curriculums of Burkinabe training institutions.

Lecturers teaching at the Rural Development Institute of the Polytechnic University of Bobo Dioulasso (UPBD-IDR), at the Training and Research Unit Life and Earth Sciences of University of Ouagadougou (UO-UFR-SVT), at the International Institute for Water and Environmental Engineering (2IE) and at the Multipurpose Agricultural Center of Matroukou (CAP-M) are all also researchers with extensive experience on various soil management projects. They teach not only according to SNGFS and PNSR and the latest scientific findings, but also include their own research findings. Courses are regularly updated with the experience gained through their project work.

Another feedback on farmers' soil management knowledge comes from students undergoing internship or working towards their BA, MSc or PhD degree. At the end of their studies, the UPBD-IDR students undergo a 10-month-long internship at a chosen locality in the country where they work using the so-called Accelerating Method of Participatory Research (MARP, *Méthode Accélérer des Recherches Participatives*). This includes participant observation among farmers through which students gain knowledge of key problems that farmers meet in their work and results in a BA thesis, which is further discussed in the institute's courses and thus fed back into the institute's curriculum.

Work at the 2IE is similar, students undergoing 3- or 4-month long internship are sent to the rural milieu, most often to the Sahel, south, south-west or east of the country. 2IE also intervenes via consultant offices and private companies which ask for their expertise. 2IE students participate in these actions. The UO-UFR-SVT students working towards an MSc or a PhD usually work on topics coming from the field and proposed by the institute.

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