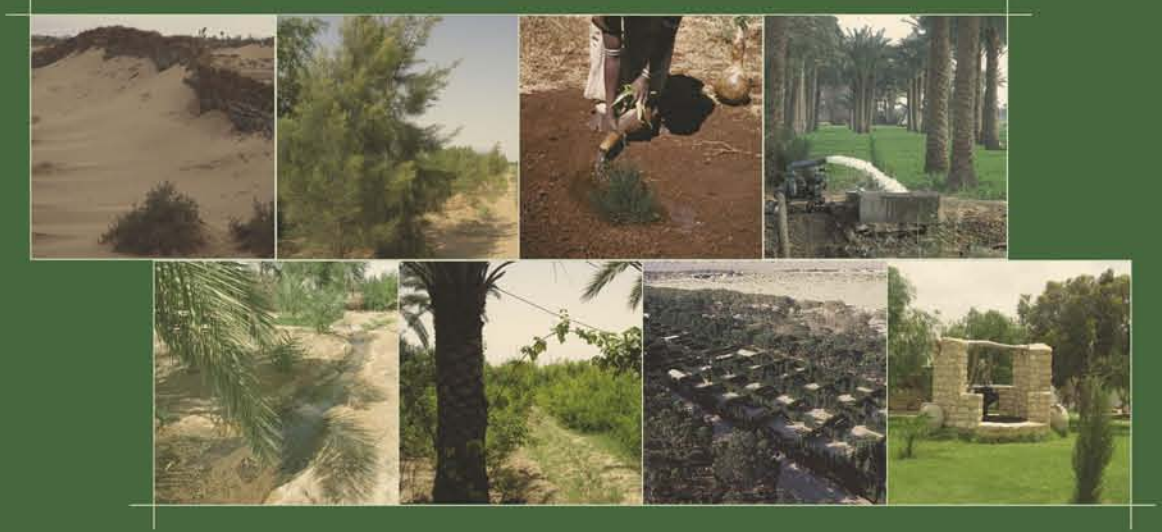
Introductory note No. 3

The Great Green Wall Initiative Of The Sahara And The Sahel



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The Great Green Wall Initiative of the Sahara and the Sahel

Introductory note No. 3

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Chedli Fezzani and Wafa Essahli, the then Coordinator of the OSS Research for Development Programme, coordinated the production of the initial document on the basis of papers, reflexions, and bibliographic syntheses elaborated by the OSS Environment Programme team which consisted of: Sandrine Jauffret, the Long-Term Ecological Observatories Monitoring Network programme manager; Aboubacar Issa, the Support for the Implementation of the United Nations Convention to Combat Desertification project manager and Mourad Briki, the Environmental Early Warning project manager.

An expert group was invited to enrich the study with conceptual notes on greenbelts and "green dams". The group took part in an OSS workshop held on 24-25 March 2006 in Tunis which was based on a document prepared by Mohamed Sahbi Hajjej, expert and consultant (Tunisia). The expert group consisted of:

- Arthur Reidacker, Research Director (INRA, France);
- Boubacar Cissé, Secretariat of the United Nations Convention to Combat Desertification (Germany);
- El Haj Sène, HYLEA International (Senegal);
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- Houcine Khattelli, Director General, Institut des Régions Arides (Tunisia);
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- Moustapha Ould Mohamed, Coordinator, Nouakchott Greenbelt (Mauritania);
- Omar Askarn, Inspector General, Haut Commissariat des Eaux et Forêts et de la Lutte contre la Désertification (Morocco);
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This note has integrated the inputs of the OSS executive secretariat members, and those of all the above-cited experts. It has also considered the recommendations formulated by the CEN-SAD secretariat.

CONTENTS

INTRODUCTION

The threat prosed by desertification is particularly acute in Africa, one of the continents most affected by the processes and impacts of land degradation and the deterioration of the communities' living conditions, particularly in the CEN-SAD[1] (Community of Sahel-Saharan States) area characterised by climate ranging from hyper-arid to dry sub-humid. Livelihoods in the countries located in this sub-region are heavily dependent on soil, water and vegetation resources, which have become increasingly fragile due to the mounting pressure being exerted on them.

Furthermore, for several decades, the CEN-SAD countries have faced persistent rainfall shortages which, despite the occurrence of rainy years, have led to a southward isohyets migration in the Sahelian countries, and to a northward migration in the north of the Sahara.

Drought, in combination with human-induced factors (such as mono-cropping, bushfires, lack or shortage of manure and overgrazing), has affected the main ecological equilibriums, causing the degradation of natural resources and soils, and a decline in agricultural production - all of which are indicators of a desertification process in motion.

Large areas of forest and rangeland are devastated by bushfires

From the socio-economic perspective, population growth and the stagnation of agricultural production have jeopardised the improvement of communities' incomes which, combined with the lack of alternative sustainable sources of income and basic economic and social infrastructure, explains the persistence and the exacerbation of poverty in rural areas.

Faced with the sheer acuteness of poverty in certain areas, most of the so-called local development projects and programmes have privileged solutions such as infrastructure or others of an economic nature (income-generating actions) without considering the ecological aspects that are crucial to sustainable natural resource conservation.

[1] CEN-SAD is a regional economic community composed of 25 member states from North, West, Central and East Africa.

For most CEN-SAD countries, where the bulk of the population is rural, sustainable development means, first and foremost, the "conservation of renewable natural resources and ecosystems and consolidation of production systems" in order to meet the growing needs linked to development.

It is in this context that the CEN-SAD Summit of Leaders and Heads of States, convened in June 2005 in Ougadougou (Burkina Faso), adopted the Great Green Wall initiative as one of its priority programmes.

The CEN-SAD General Secretariat mandated the OSS Executive Secretariat to compile all the elements needed for a review that would fine-tune the concept of the Great Green Wall programme along with the appropriate orientations for its implementation with a view to meeting the CEN-SAD member states' needs for sustainable development.

This note summarises the results obtained from available documentation and consultations with key experts and practitioners. It draws lessons from past experiences while considering current development needs. **The Great Green Wall Initiative, has not been conceived as a wall made up of trees planted across the Sahara, but rather as a set of cross-sectoral actions and interventions aimed at the conservation and protection of natural resources with a view to achieving development and, particularly, alleviating poverty.**

1

The African experience

The idea of a greenbelt saw the light of day in the 1950s, long before the United Nations Conference on Combating Desertification (Nairobi, 1977). The best known projects are the **greenbelt** in Niamey (1965), the **green dam** in Algeria (1971) and the **greenbelt** in Nouakchott (1975). In the other countries, reforestation and dune fixation activities were often carried out with the assistance of the forestry departments. Considered as infrastructure, these undertakings provide a public environmental service. Their implementation is carried out by the State.

1.1- Definitions

The **Green Dam** refers to a large-scale reforestation activity on an arid strip of land reaching a length of up to1500 km. Its main objectives are protecting arid areas from sand encroachment and curbing deforestation and erosion by increasing forestland productive capital.

The **Greenbelt** is a tree plantation ring-fencing urban areas to protect cities, including outskirts, from sand encroachment and erosion. The greenbelt is also aimed at protecting specific public infrastructure such as roads.

Windbreaks, a technique used to tackle encroaching sand

1.2- Preliminary achievements

1.2.1- In North Africa

In North Africa, the first achievements, dating back to the beginning of the 20th century, were aimed at combating sand encroachment in order to protect the agglomerations. At that time, the terms "greenbelt" and "green dam" had not yet come into existence.

The Moroccan experience started in 1915 with the biological fixation of coastal dunes along the Atlantic Ocean coast to protect cities such as Tangiers, Kenitra and Agadir. Rainfall levels were often favourable (200-700 mm/yr), thus allowing the introduction of fast-growing imported species, such the Eucalyptus, Acacia cyanophylla and Acacia cyclops. Over 34,000 ha were planted in 60 years. The size of the greenbelt varies greatly from one site to another, ranging from 14ha to 12,000 ha. Since1979, Oases and continental cities have also been equipped with smaller greenbelts ranging from 3 to 165 ha.

In Tunisia, the aim was to protect the oases and the roads. The project involved 20,000 ha of plantations comprising both local and introduced species.

These first projects took the form of peri-urban or rural infrastructure, generally built by the public authorities with no specific production or exploitation purpose.

1.2.2- In Sahelian Africa

In Sahelian Africa, the idea of a peri-urban green belt was initiated in the 1960s in response to the problem of land degradation in peri-urban sylvo-pastoral areas, and with a view to meeting the needs for:

- protection against sand encroachment and for depolluting the dusty urban environment;
- firewood.

These needs are prioritised depending on the specific needs of the concerned urban areas.

1.2.3- From protection to production

With time, the goals of the plantations in these two regions shifted from protection of populated areas and public infrastructure to production that could contribute to improving incomes.

1.3- The "green dam" experience in Algeria

Starting from the 1970s, Algeria has been putting in place a green dam along its border with the Sahara. This project, which is still underway, has gone through several phases. Its underlying concept has also witnessed an important evolution.

The original concept entailed the reforestation with Aleppo pine planted on an east/west arid strip of essentially pastoral land covering 3 million hectares (1,500 km x 20 km) in the zone located between the 200 and 300 mm isohyets. Since the goals were too ambitious to be implemented through ordinary structures and institutions, resorting to the national army proved necessary.

The first experiences with small-scale reforestation were encouraging. The idea, thus, was to replicate it at very large-scale and to allocate considerable means as if it were a

civil engineering undertaking or construction site of huge proportions. Aspects such as reference frameworks and technical assistance (supervision), ecological impacts, land tenure and the involvement of the local communities (herders and farmers) were either under-estimated or ignored altogether.

This experience suffers an "ecological incoherence" since land clearance, which was part of the technical "monospecific reforestation" package, disrupted both the soil and vegetation components, and the communities and animal populations of the steppe ecosystem.

Starting from the 1980s, the green dam concept grew into a set of agro-sylvo-pastoral development actions in the originally delineated zone where the reforestation component remained dominant but was diversified (thirteen species. The programme was implemented jointly by the army and the forestry departments.

The green dam concept was abandoned in the beginning of the 1990s and revived in 1995 as part of the agricultural and rural development schemes.

Actions were then targeted at more suitable areas (deep soils, water available for irrigation). With this in mind, the green dam was henceforth composed of a discontinuous strip of irrigated crops with high added value (market crops, fodder, fruit trees to improve the income levels of the local communities), and also with well-equipped, rationally managed rangelands (planting fodder shrubs, enclosed areas) and forest plantations.

Reforestation was included in the "national agricultural and rural development programme". The goals related to dune fixation and sustainable management of rangelands were still combined with the development of infrastructure and the sustainable improvement of the communities' incomes. urban areas and roads are subject to specific arrangements comparable to what has been described in the section devoted to the greenbelts.

Ultimately, the best green dam consists of a human settlement surrounding an area with prosperous agriculture – thanks to irrigation – and rangelands which are managed with a view to ensuring sustainability.

1.4- The green belts

1.4.1- Niger

In 1965, Niger put in place a greenbelt around the capital, Niamey. It is still visible today. This is the country's biggest achievement in this field. It is composed of the greenbelt per se – a 2,500 ha plantation of local and introduced species – and a 2 ha recreational park.

The urban greenbelt, a protection against encroaching sand

In general, there are two types of models:

- The "large urban area" model (the Niamey greenbelt)

- the "urban areas and developed basins (cultivated lands)" model in Saharan zones, which includes small protective greenbelts (10 -150 ha) covering a total area of less than 1,000 ha.

1.4.2- Mauritania

This is unarguably the country where the greenbelt experience is the most diversified and extensive in terms of the number and distribution of projects and sites. Three types of greenbelts have been installed all of them had a protective rather than a productive purpose namely the "large urban area" model, the "urban area and cultivated zone" model and the "road" model.

- The "**large urban area**" model concerns the national capital and the regional capitals or main cities. The Nouakchott greenbelt is located in a Saharan climate. It was planted using a variety of techniques: mechanical stabilisation followed by biological fixation (mainly Prosopis juliflora plantations). This played an important role in protecting the city and its outskirts and in providing informal employment. On the other hand, plans for the greenbelt did not take account of pressure caused by urban expansion. Inherent problems of post-investment management have not yet been fully resolved. The Kiffa greenbelt in the Sahelian zone was created through direct reforestation of moving rows of sand dunes without mechanical stabilisation or irrigation. This greenbelt sets a good example by its relatively low installation cost.
- **The** "**urban area and cultivated zone**" model (oasis in Saharan and Sahelian zones, rainfed agriculture in Sahelian zone) includes greenbelts of an area ranging from 15 to 335 ha that could provide effective protection and also produce wood to cover maintenance costs, especially in the Sahelian zones where extending the greenbelt area would not be costly.
- The "**road**" model: is applied to sites ranging from 5 to 15 ha, and aimed at ensuring punctual protection.

The Mauritanian experience covered over 100 sites. It showed that, on the one hand, forestry plantations could provide long-term protection without irrigation wherever rainfall levels exceeded 150 mm or in sites benefiting from the existence of groundwater tables; on the other hand, the participation of local communities, which was almost non-existent in the beginning, has improved on the basis of contracts that stipulated conditions and modalities for sharing the direct costs. More that 15 small greenbelts, ranging from one to twenty ha, were installed thanks to local initiatives, supported by incentives in kind such as the supply of tools and products that were not available locally. Last, the Mauritanian experience also showed that protecting the plantations is difficult for objective reasons such as poverty and lack of means, especially at the local level.

1.4.3- Mali

Mali's experience with greenbelts only dates back to 1990 when a sand encroachment control programme was started in the Timbuktu and Gao regions.

According to the concept developed by this country, the greenbelt is composed of two parts: an "intensive protection" perimeter located next to the urban area where mechanical dune stabilisation is followed by biological fixation, and an "extensive protection" area in the so-called "supply" zones, upstream of the protection area, in order to reduce the pressure of the moving dunes on the area.

The project's implementation approach was original. In order to produce nursery plants, three ways were explored and tested, namely the direct administration to meet 20% of the needs; private producers under contract to meet 30% of the needs; and by the local communities to meet 50% of the needs (300 nursery managers, of which 180 were women. For mechanical stabilisation and tree planting, two methods were tested: pilot sites under State administration to enhance and test the techniques, and extrapolation to prepare for extension to other areas by transferring responsibility to the beneficiary communities.

1.4.4- Senegal: the Dakar greenbelt

The urban greenbelt: useful in tackling atmospheric pollution

The conceptual originality of the Dakar greenbelt resides in the fact that it consists of a network of natural forests that are part of a forestry regime consolidated and completed by plantations, perimeters for the stabilisation of soils, and green spaces as well as roadside plantations, involving local communities and municipalities.

The natural forests component, despite a rather rigid status, lost ground to urban expansion, but this did not jeopardise the effectiveness of the system. As for the second component, the local institutions were not able to ensure the sustainable management of the works in place.

1.4.5- Burkina Faso: the Ouagadougou greenbelt

The Ouagadougou greenbelt illustrated three salient elements in the Burkina Faso experience:

- opting for the concept that the greenbelt would be part of urban and peri-urban landscape development;
- opting for community participation;
- opting for irrigation in spite of the prevailing Sudanese climate (rainfall: 700 mm).

On the whole, despite these sound approaches, there are still enormous problems, especially in the outskirts, that prevent the development and consolidation of efforts made, and even jeopardise achievements in the absence of an adequate solution ensuring the sustainable management of what has been accomplished.

1.4.6- Egypt

In Egypt there are two types of experiences worth mentioning: the Cairo peri-urban green-belt and the greenbelts aiming to thwart sand encroachment, using treated sewage water and poor quality water from the deep water tables. The Cairo peri-urban greenbelt has two components: 50 meter wide shelterbelts (rows of trees) along the Cairo circular road and suburbs using drip irrigation with water from the purification stations supplied by the sewage system. The objective was to cover a cumulated length of 100 km. Here, as in the case of the Algerian green dam, the implementation is entrusted to the national Army. Four forest species, – Eucalyptus, Casuarina, Cypress and Acacia, – have been selected. The second component consists in the introduction of green spaces within the urban area.

With its two components, the Cairo greenbelt intends to rid the air from sand and dust brought by the wind. Thus, it acts as an atmosphere depollution mechanism rather than an intervention to fixate dunes in motion. It has been designed as an investment for the Ministry of Environment with an installation phase, sub-contracted to the Army, and an "unlimited" maintenance phase integrated into the young graduates employment policy. This makes it an element of urban infrastructure just like the road networks that it is supposed to accompany or protect. Its role will be only protection, not at all (or very little) production. The greenbelt concept here is reduced to its basic meaning or simplest expression. Its form and contents clearly reflect its name, and vice versa.

Planting trees…

1.4.7- In East Africa: Kenya and Sudan

The countries of East Africa, such as Kenya, seem to favour the fragile ecosystem restoration concept based on the adaptation of prevailing land use methods and the decentralisation of responsibility to the local institutions. Two experiences are worth mentioning: those of Kenya and Sudan.

The Kenyan experience with plantations is original for two reasons: first, the concept is based on the principle of environmental conservation through community development by and for the people, optimising local resources and know-how, and second, the Greenbelt Movement was launched at the initiative of a women's group, Kenya's National Council of Women. Planting trees has had a catalysing effect and has integrated development actions. It has also played a role in conserving biological diversity.

The Sudanese experience is characterised by the involvement of the local institutions and has succeeded in rehabilitating an ecosystem which was itching toward degradation, and allowed the sustainable use of forestry resources in a natural reserve located in an arid region.

I.4.8- The "North African greenbelt" sub-regional project

Following the 1977 Nairobi Conference, the United Nations Environment Programme (UNEP) launched the idea of a "greenbelt" in the shape of a subregional project for the six counties of North Africa. The main project document called for the coordination of national projects and for the strengthening of efforts in the following fields:

- the combat against desertification and the protection of farmlands against the harmful effects of desert encroachment;rangeland organisation and improvement and the development of the country's animal stock;
- reforestation and extension of green areas;
- development of rural and Saharan communities;
- increasing food production to overcome food shortages in the countries concerned by the project.

…to protect farmland and combat desertification

This collective project is devoted to food security. But its contents seem more tightly focused on the problem of desertification rather than the concept of greenbelt.

The objectives listed above have not been fully achieved, although the following activities have been carried out as part of the project:

- twenty studies in fields ranging from renewable energy sources to reforestation;
- organisation of 22 technical seminars and meetings on subjects related mainly to forestry and pastoralism;
- organisation of 16 training sessions covering a variety of subjects, including cell culture, remote sensing and reforestation.

In contrast with its title, the project actually consists in sectoral and punctual studies and the organisation of meetings (seminars and training sessions) on a wide variety of themes without any direct link with the countries' work on the ground. This gap considerably reduced the range of expectations from this programme.

1.5- Conclusion

In the light of these experiences in Africa, it may be possible to consider a greenbelt concept that is very open with regard to the theme but highly "focused" or "targeted" with regard to the issue being addressed, thus ensuring enough coherence between the project's title and its content.

In the rural areas

As part of the "village terroirs" approach, integrated agro-sylvo-pastoral development can be assimilated to an "open", or "discontinuous" greenbelt in which:

- protection against sand encroachment is a component of infrastructure and part of farmland protection;
- the fight against erosion is part of land protection and crop production improvement (thanks to an improved water balance);
- firewood is produced, with a view to meeting local needs and reducing pressure on nearby natural forests;
- the development and management of natural forests involves the neighbouring populations and the external actors;
- fodder and pastoral production is envisaged with a view to increasing family incomes and reducing pressure on nearby rangelands.

Protect soil erosion

In the urban areas

The city models for the greenbelt fit in with urban development policies and have three main objectives:

- protection of cities against sand encroachment and pollution;
- recreational areas for city dwellers;
- wood production in adequately managed plantations.

2 The main lessons

2.1- Concerning the term "greenbelt"

Considering the actual achievements on the ground, the term "greenbelt", beyond a mere slogan, expresses concern, determination and hope:

- concern about a "danger", namely degradation of natural Aleppo pine forests in the case of the green dam, degradation of the steppe in the case of the greenbelt in North Africa, encroaching sand and sand saltation in the case of the peri-urban green belts;
- determination to confront and contain these dangers;
- hope to restore greenery to spaces which formerly represented productive, protected and protective ecosystems. Trees are considered as the best, or even the only, resource that can provide protection and greenery.

Whether it is a greenbelt, a green dam or a green wall, the intervention always has a curative nature, and is generally punctual and correlated with the means available rather than the acuity of the danger being confronted.

Despite the evolution in the perception of the issues pertaining to the Combat against desertification (CD) and sustainable development (SD) toward the integration of these concepts – in such a way that protective actions are considered as development actions –, the term "greenbelt" is still used for the large cities (Nouakchott, Timbuktu, Cairo), presumably because of its awareness-raising effect on communities, decision-makers and cooperation partners.

2.2- The technical level

The experience of the African countries and their partners is, from a technical point of view, very instructive. Many technical achievements and failures deserve to be evaluated in-depth

so that all can benefit from past mistakes and lessons learned. On the whole, the technical packages[2] seem to be well managed. But when considered in detail, several improvements are possible, and even necessary – notably in the field of cost reduction through better technical choices.

The multitude of technical reference systems being used from one country to another and within the same country represents a wealth of techniques allowing to handle a wide range of situations, but also a deficiency given that none of those techniques could be singled out for general use.

2.3- Concerning the valorisation

Despite numerous publications such as evaluation reports, manuals and handbooks, projects findings are, often, far from being shared– in other words archived and made easily accessible- and, in all cases, they are rarely used to inform political decisions or feed into the myriad, more or less related projects.

2.3.1- Technical valorisation

Valorisation , aimed at improving experience-sharing and the exchange of technical reference systems, could be envisaged under the following themes:

- **The choice of species**, in relation to biodiversity, water availability and plant disease aspects:
  - there is a dilemma between local slow-growing species that are well adapted to the environment and the fast-growing introduced species;
  - in some cases, plant proneness to parasite attacks jeopardised important plantations, e.g. processionary moth attacks on Aleppo pine and Phoracantha attacks on the Eucalyptus trees;
- **plant production techniques in nurseries**: large state-owned nurseries or small private nurseries, with a focus on success rates in the nursery and in the plantation;
- **planting techniques**, related to rainfall conditions and water availability; the definition of "equilibrium density" that considers soil and water conditions and the needs of the species used, with a view to reducing supplemental irrigation which is considered to be the most expensive cost item under "recurrent costs";

Fixating sand dunes through afforestation is cost effective

[2] A technical package is a series of well controlled and commonly used practices to obtain a targeted result.

- **mechanical stabilisation of dunes** using vegetation, prior to biological fixation, seeking a compromise between cost reduction and speedy green-belt installation.

2.3.2- Scientific valorisation: apprehending economic profitability

Usually, project promoters start seeking greater economic profitability only after ensuring ecological effectiveness. It is understandable, even logical, that they consider infrastructure consolidation and viability as urgent, rescue actions.

The few attempts to make economic evaluations have been hampered by:

- methodological difficulties which reduced the work to simple, quick econometric calculations;
- lack of monitoring-evaluation instruments, hence the impossibility to obtain objective economic references.

Since concern for economic effectiveness is clearly growing, economic criteria will in the future have to be included in technical choices through the pre-project designing of a monitoring-evaluation tool adapted to project implementation.

2.4- the socio-economic level

2.4.1- Local communities' participation

Nearly all the projects have adopted the participative approach and adapted it to local conditions by defining ways to involve the beneficiaries, generally through contracts that very often resemble a form of individual or collective outsourcing agreements rather than an actuall assignment of resposibilities.

Adaptation to local conditions has meant that there are as many formulas as projects. This diversity could be seen as a methodological asset when it shows the capacity of the participating parties to find compromises that make it possible to reconcile the planners' and donors' methodological ideal with the practical feasibility needed for implementation. On the whole, these "formulas" are only applied during the greenbelt installation phase.

For the recurrent management phase, it seems urgent to find the right way of transferring total responsibility to the local institutions that act on behalf of the communities, such as municipalities.

Experience has shown that classifying greenbelts as protection areas, subject to the forestry code, does not protect them against illegal logging and grazing.

2.4.2- Greenbelts and employment

Greenbelt projects are labour–intensive by nature and therefore are often viewed as a way to reduce unemployment among the numerous, unqualified workers living in the outskirts of the cities (especially the capital cities) and the large towns.

The "**food for work**" formula was used in most projects in the Sahelian countries. It represents a non-negligible source of funding that is readily available, on a large scale, and may attract people who are unemployed and in search of alternatives.

A new type of contractual formula has recently been developed in the Sahelian areas. Members of the communities assuming responsibilities are paid in part at the time of planting. The remainder is paid two years later on the basis of the plant growth scale.

2.5- Implementation modalities

2.5.1- The players and their role

The implementation of forestry plantation actions has involved the State, local communities and private entrepreneurs.

The role of the State is preponderant, and nothing indicates that this will change in the foreseeable future, not because the administration is rigid and conservative but because of the following objective reasons: first, the concern for the rapid achievement of objectives, which, in quantitative terms, seem ambitious when considering the communities' capacity to carry them out; second, the public service component that is inherent to forestry plantation activities-the State must act given that the implementation of this collective infrastructure of scio-economic nature does not generate any direct or rapid revenues, third, when the State is in charge, the work is done either directly by the State-owned national forestry departments, or is outsourced to a national institution, in this case, the Army.

The role of local communities is fundamental: all the project operators agree that as long as the local communities are not involved from the planning through to the implementation and post-investment management phases, the sustainability of greenbelts will be nothing more than wishful thinking. In practice however, the participatory approach is very difficult to implement on the ground usually for objective reasons linked notably to precarious income and institutional instability. Hence the need to reconcile ideals with feasibility.

The compromise is a partial, multiform implementation of the green wall approach that varies from one country to another and within any given country, from one year to the next. It has been difficult, or even impossible to apply a **complete methodological package**. The nursery programme seems to be particularly convenient given that local communities could easily be in charge of it. But for them, it is more a source of revenue than a responsibility that comes with "rights and duties". As for post-investment management, local communities seem to reject it. The NGOs play a very small, or even non-existent role

although their experience with the participatory approach gives them a considerable comparative advantage.

The role of the entrepreneurs: private enterprises were mainly sub-contracted for mechanical dune stabilisation that required large quantities of vegetation and nursery plants.

2.5.2- Funding

In north Saharan countries, most funding comes from the state budget, unlike the situation in the Sahelian countries, where most funding comes from donations through bilateral and multilateral cooperation agreements, often with the United Nations system, (UNDP, UNSO, UNEP, WB, WFP, FAO, IFAD, etc.) but also through non-governmental organisations (Lutheran World Federation in the case of "GreenBelt of Nouakchott") and intergovernmental organisations (the European Union in the case of "GreenBelt of Timbuktu").

Donations, as we can imagine, are not "extensible" nor automatically renewable or repeatable. Furthermore, an institutional environment or framework is created specifically for the duration of projects' implementation. Since needs are continuous and exponential, the installation of greenbelts has to be assimilated to the construction of socio-economic infrastructure that is funded by resources mobilised for social and economic development actions. In other words, greenbelts have to be funded equally from local resources and from donations and loans.

In bidding countries that have not reached the food security threshold, priority will first be given to life-sustaining actions.

In principle, for projects stemming from the implementation of the Convention to Combat Desertification, the most appropriate source would be the Global Mechanism, but experience has shown that the **active participation of regional institutions can have a synergetic or catalytic effect**.

Recourse to the remittances of Africans working abroad could also be envisaged, but only as a supplemental effort: the younger generation seems to be more tempted by instantly profitable private projects than by collective investments with little or no financial profitability.

Supplemental irrigation is a constraint to sustainable management of greenbelts

2.6- Investment sustainability

2.6.1- "Post-investment" management

"**Post-investment**" management problems are often mentioned as threats to project sustainability. There are three decisive elements:

- **Supplemental irrigation**: experience has shown that irrigation is not only costly but can also be tricky and difficult to manage. The solution may lie in "non-irrigation" or in non-repetitive, punctual

irrigation. In principle, in areas where rainfall exceeds 300 mm/yr, trees should be treated during the installation period in such a way that they would no longer need irrigation in the future. This system has been tested throughout the Sahelian part of Mauritania. In water-stressed areas, turning over responsibility for the greenbelts to the Town Hall or the municipality, acting on behalf of the concerned community, would probably be more effective than taking the participative approach that gives shared and direct responsibility to the administration and the local communities together.

- **illegal logging**: this problem is only significant in the areas around the national capitals where people who have migrated from the rural areas live under precarious conditions. In the towns and cities where demographics are stable, illegal logging does not really affect the sustainability of the greenbelt.
- **damage caused by animals**: in principle this is only occurs in the post-investment phase, unless the trees implantation phase was not successful.

In any case, turning over the greenbelt responsibility, since the planning phase, to a **local institution that represents the local communities** appears to be essential, especially to ensure the coverage of the recurrent costs.

2.6.2- Water availability

Except for a few examples(the case of Nouakchott, for instance), water availability is not a limiting factor since:

- settlements cannot be created or developed unless they are near at least one renewable water source, e.g. river, deep watertables;
- large cities have large quantities of water available through the water purification stations;
- in sandy, deep soils with rainfall exceeding 400 mm/yr, irrigation is only needed during the greenbelt installation phase;
- thanks to technical and technological progress (drip irrigation), supplemental irrigation does not require large amounts of water.

2.6.3- Land planning

In the vast majority of cases, the first greenbelts, or at least their first phases, were edified without any "prior" land development plan, which means that no thought was given to the possibility of urban expansion or the risks of real estate speculation. In the case of greenbelts designed for production or ecosystem restoration, the idea that forest species could upgrade marginal lands finally gave way to the idea that forestry could only achieve good results in good quality soils.

This led to a tendency to systematise land planning studies but, as could be expected, these studies will pave the way to complementary actions carried out to ensure the sustainability of the main action. Such a partial but realistic integration has the advantage of providing a unifying framework for actions to be undertaken on the ground.

3

From a greenbelt to a "Great Green Wall" Understanding the concepts

3.1- The greenbelt: still on the agenda

As indicated earlier, the greenbelt experience has been around for the last three to four decades. It is a response to a real need exemplified by the scale of ecosystem degradation, expressed by the local communities and addressed by States and their development cooperation partners. However, a lot remains to be done. "No, far from it".

Resources obtained, largely in the shape of donations, **fall short of meeting the needs**: putting a greenbelt in place to protect a large city has taken over 30 years (Niamey, Nouakchott), while the investment could or should have been made in 5 years.

Additional needs are constantly growing: the sedentarisation process adds to the needs hat are currently being addressed, and leads to the emergence of new candidates for greenbelts.

The few attempts relying on the **preventive management** of peri-urban space, and based on the safeguard of natural vegetation, have **largely disappointed** those who placed hopes in "natural" greenbelts that cost "little" or "nothing".

In the past, the standards of living allowed the local communities to have only a limited access to "modern" fuel to meet their household needs. This trend is not likely to change in the future, and the use of **green energy** as an alternative source to cover household needs is **an alternative** that must be considered with more interest. In the absence of substantial investments into the production and management of this green energy, pressure on the natural environment, which is already high, will become unbearable for both the ecosystem and the communities.

Producing firewood requires well-managed plantations

This means that the "**greenbelt strategy**" is more topical and urgent than ever before. The role in recreation and atmospheric depollution that is often assigned to greenbelts would be relegated to the second or last place, or even ignored, at least in sub-Saharan Africa, due to the pressing needs for energy and protection against sand encroachment.

3.2- From a greenbelt to a "Great Green Wall"

An example of greenbelt alternating plantations and irrigated perimeters

3.2.1- Function

All the terms used so far (**greenbelt, green dam, green wall, green pole, green anchor**, etc.) strongly suggest a vocation for providing protection against a danger that is "advancing" toward the structure being protected (populated areas, roads, irrigated plots, etc.); this structure will, at the same time, spur and undergo an increased human pressure.

After 2 to 4 decades of experience, depending on the country, and after all the ideas that have been developed over the last fifty years by the international community, one is tempted by a concept that is ideal, integrative and open in which "all actions that may generate greenery around us" have a place under the "greenbelt comceptual umbrella". Such an idealised concept could easily turn into a catchall in which the most important elements are diluted or submerged by dozens of land planning and development schemes.

The long experience has also showed that the greenbelt concept has resisted a radical opening and continued to express two main ideas:

- the belt/dam/barrier/wall that reflects the objective sought, the protection or rather dual protection of settlements (socio-economic infrastructure), essentially against sand encroachment, and the protection of nearby forests that provide green energy, where pressure would be relieved thanks to the supply provided by new plantations;
- the greenery represented by the tree, which stands for the tool that can achieve the objective sought.

In its protective role, the "**greenbelt**" should be part of "classical" economic development actions, under the National Action Programmes to Combat Desertification, and should serve to "**ensure viability** upstream and **sustainability** downstream ". In its productive role, it should be viewed as part of the development actions.

3.2.2- What dimensions and what scope?

Grandiose national, transboundary or transnational projects that cover huge areas (many tens or hundreds of thousands of hectares), and whose objective is to restore ecosystems or

edify enormous "barriers" that will prevent "desert encroachment" have not been feasible in the past, and will continue to be hardly feasible, and/or rather unjustified considering the following:

- the "candidate areas for revitalisation" are almost always quite large. Rehabilitating these areas, even slightly, would require enormous resources that the African countries cannot mobilise because of other preceding priorities. In a difficult financial situation, the most adequate strategy is, logically, to concentrate efforts on useful, priority spaces, and eventually, to consolidate or extend these efforts;
- experience has shown that when the quantitative goals are very ambitious, the public authorities tend to outsource the work to a national institution (e.g. the Army for the green dam in Algeria), obscuring the role of the area's communities. This leads to well-known negative effects: jeopardy of sustainability (difficulties with post-investment management) and effectiveness of implementation with technical and logistical problems that make the results rather disappointing, or at least not up to expectations, thus encouraging the planners to lower their aim.

It has been well established that deserts do not creep forward but appear and expand wherever resources are overexploited, saltating manmade barriers, regardless of how high, wide or long they are.

However it is possible **to conceive a discontinuous great green wall**, covering a relatively vast area, composed of a network of small greenbelts installed where they are urgently needed (**curative**) and/or given high priority (**preventive**). The great green wall thus conceived can expand gradually depending on the needs and the means available.

3.2.3- What profile and what specifications?

The concept must be sufficiently open to be able to:

- meet national specificities, in other words, strategies and approaches selected by development plans and/or programmes, especially strategic poverty alleviation plans
- adapt to concepts developed in the three Rio conventions, i.e., the Convention to Combat Desertification, the Convention on Climate Change and the Convention on Biological Diversity:
  - involve local communities in the planning, implementation and post-investment management phases;
  - use local species wherever possible.

The "greenbelt" concept could then be defined as the range of land planning and development actions:

- covering a given area, especially village lands (terroirs);
- mainly sylvo-pastoral in nature;

- structured as a "long-term investment", in other words of unlimited duration;
- with the aim of combating desertification, under the Convention to Combat Desertification (CCD);
- oriented towards protection and– soil conditions permitting- production especially where there is a shortage of energy;
- carried out as a curative and/or preventive measure;
- spatially discontinuous, in relation to settlements;
- integrated or "integratable" in national and sub-national agricultural and/or socio-economic development programmes, or at least in synergy with them;
- providing support for alternative activities to natural resources exploitation, e.g. trade, transport, manufacturing and assembly plants for tools such as wheelbarrows, carts, gabions and fencing that are useful in reforestation programmes.

A greenbelt will only be "**useful**" and "**manageable**" if the local communities take over "owners". Developing and planting or sowing lands located outside the communities' range of action makes the lands "**anonymous**" or "public" and may make people lose interest in them, thus creating recurrent problems and risks of destruction. The greenbelt should fit in with land settlement and development plans for the village lands.

The greenbelt should be designed as two or three adjacent "bands" or "units":

- one located very close to the target (city, irrigated plot, farmland, etc.), with a **protective role**, since it is part of the urban or rural infrastructure that is indispensable for life in society; it is, in a way, the "wall" part of the belt;
- the second unit, ensuring the continuity of the first one, upstream of the endangered area, is to play a twofold role: **production** of wood , and **relieving pressure** on the protection unit by restraining most of the eroding soils;
- and a third unit or a complementary "private" component, "grafted" on agricultural or pastoral development actions: windbreaks, shade planting, etc.

This structural plan is increasingly essential, especially since degradation around populated areas is becoming worse and more intense, and access to fossil energy is becoming increasingly difficult and expensive. In areas where sand encroachment is not imminent, a greenbelt as prevention and a source of wood can always be justified.

This investment is in the general interest, given its collective or public character.

Anchoring the greenbelt in a local community and "sizing" it on the basis of medium-term needs, thus, is a logical choice. The size of the structure can be increased to meet the growing needs of new medium and long-term land development plans.

The size of the greenbelt, in principle, depends on the size of the structure that it is supposed to protect (if the vocation is protection) and/or the importance of the firewood requirements that it is supposed to cover.

For protection purposes, when trying to cut costs it is important to reduce the size to the minimum needed to ensure the viability of the protected structure, e.g. in large cities, **a 700 ha greenbelt could protect an agglomeration of 5,000 ha**. In a village, a 7.5 ha belt would be enough to protect an area of 50 ha. In both cases, there is a "**protecting area/protected area**" ratio of **1 to 7**. This ratio can easily be improved to **1 to 10** if wise technical choices are made and plans on the direction of site extension (urban land planning) are carefully designed. There are two possibilities regarding land tenure: either the greenbelt has the status of a public good (State ownership) or a community good (local community ownership). The latter would be more logical and rational than the former.

For production needs, the objective could be maximised if the project is sited only in places where production would be profitable. The belt does not have to have a geometrical form. It could be discontinuous and should be linked to the water and soil conditions that are the most potentially productive. Contrary to what happens on the large sites, whenever possible preference should be given to private plantations, especially around and in the farmlands, and even in the urban areas, especially home gardens.

Greenbelts may include private plantations (gardens…)

4

The "Great Green Wall" initiative

4.1- Response to an existing situation

The "Great Green Wall" Initiative saw the light of day when efforts made in the implementation of the Convention to Combat Desertification proved well below the objectives sought, both in terms of natural resource conservation and poverty alleviation.

This made it essential to consolidate, accelerate and strengthen the National Action Programmes to Combat Desertification.

This initiative, which is linked to sustainable development, reflects a strong political will to conduct in well delineated regions of the Sahelian and Saharan countries a set of concerted and coherent interventions with the aim of achieving simultaneously the three following goals:

- natural resource conservation, development and management;
- strengthening infrastructure;
- improving the living conditions of the resident communities.

4.2- Qualitative and quantitative "added value" for the UNCCD, UNFCCC and UNCDB

Although the initiative responds to a real need, it should not evolve into a programme that duplicates existing programmes, mechanisms or instruments which despite being operational often lack resources needed for implementation. This initiative should not become a tool for **centralising** and **concentrating** activities that normally devolve to other regional or international institutions or mechanisms. It should be part of a concerted

Desertification is a cause and consequence of rural poverty

synergetic implementation of the three Conventions.

The **great green wall** is essentially aimed at **combating desertification and poverty**, but this does not mean it should be constructed as a regional action programme for combating desertification that inventories and cumulates the countries National Action Programmes for Combating Desertification. It could and should benefit from the support and input of the institutions and mechanisms of the UNCCD, the UNFCCC and the UNCBD and, in turn, provide them with the impetus needed for the consolidation of:

- rural, urban and peri-urban forestry,
- biodiversity conservation,
- socio-economic infrastructure;
- development actions that generate revenue and create jobs and thus help stabilise the populations, especially the young people who are increasingly tempted by rural exodus and migration;
- adaptation to climate change.

For the UNCCD and the NAP/CCD, just as for the UNFCCC and the UNCBD, the Green Wall Initiative would provide support for scheduled and ongoing projects to improve their technical and economic efficiency and the sustainability of their impact. It could make two kinds of contributions.

- **a qualitative contribution**
  - thanks to the evaluation of the technical and socio-economic frames of references that have been fully developed and implemented on a large scale in the countries of the region for the last 30 to 40 years. Those that hold promise for better technical effectiveness and economic efficiency can be identified which can mean reduced costs and a greater capacity for project completion;
  - creation of stronger synergy between development and "local" scientific research, projects which will be more closely supervised since responsibility, both to carry out the work and in post-investment management, will be transferred more effectively to the local communities;
- **a quantitative contribution** through the mobilisation of additional funding thanks to the "construction" of inter-regional solidarity and better mobilisation of international solidarity.

4.3- "Pedagogic" support to inter-regional solidarity

The Great Green Wall initiative provides a concrete framework and a practical pedagogical basis to express the spirit of inter-regional solidarity that CEN-SAD is cultivating and that could have the following three dimensions:

- **political solidarity** to mobilise CEN-SAD intra-regional as well as international funding through increased dynamism and better supervision of the mechanisms established by the environmental conventions;
- **scientific solidarity**:
  - valorise scientific, technical, socio-economic and institutional achievements;
  - mobilise research institutions around the issues facing projects on the ground, and construct coordinated research-support programmes and strategies involving centres/stations and laboratories that are competent in the fields of action of the Great Green Wall initiative;
- **operational solidarity**, to valorise "local" and "national" know-how by analysing factors of success and failure in experiences in the CEN-SAD countries.

4.4- A genuine field programme

To become reality on the ground, the great green wall initiative has to be converted into a programme that could be called "the Great Green Wall Programme in the Sahara and the Sahel" with the following objectives:

- improve the effectiveness of rural, urban and peri-urban forestry work playing the role of greenbelts, through better experience sharing;
- strengthen the role and importance of forestry activity in national development programmes and plans by providing better information and raising the awareness of the national decision-makers and the development cooperation partners in order to mobilise funding more effectively and ensure rational, sustainable management of the achievements;
- devise new formulas for sustainable development that include the following three dimensions:
- lasting protection of infrastructure and natural resources;
- production of green energy and food crops;
- creation of jobs and stable incomes especially for young people, (who are increasingly leaving the rural areas and migrating), thanks to better management of water, soil and vegetation resources.
- Rather than appearing to be a mere forum or an instrument that replicates another, the programme would stand out as a genuine large-scale project, with well defined

objectives that are delineated in time and space, and can have a significant and lasting impact on the ground, by striving to:

- federate national efforts;
- build up synergy to enhance the value of the tools of cooperation, aimed at improving the use of energy and resources;
- better valorise know-how that has proven its worth over the last decades.

CONCLUSION

THE GREAT GREEN WALL IN THE SAHARA AND THE SAHEL PROGRAMME

1- Scope

The spatial and thematic field of action is well defined by the three conventions stemming from the Rio process. The Great Green Wall in the Sahara and Sahel Programme should be open enough to adapt to specific national requirements. Terms of reference that reflect the spirit and objectives of the Great Green Wall initiative could be formulated as "the Great Green Wall initiative eligibility criteria" that would define the priorities in terms of space and themes. Because of the ecological, economic and social characteristics of the north and south regions of the Sahara, the criteria, as can be expected, will not necessarily be the same. The programme's definition and formulation have to be completed. Until then, we can only say that the great green wall would cover the circum-Saharan fringe in a discontinuous manner, in other words:

- the arid and Saharan bioclimatic zones in the northern sub-region, where it would focus on:
  - oases ecosystems;
  - irrigated agricultural systems using surface waters;
  - pastoral ecosystems;
- the Sahelian and the Sahelo-Saharan fringes for the southern sub-region, where it would focus on:
  - ecosystems that play the role of oases;
  - sylvo-pastoral ecosystems;
- irrigated agricultural systems using surface waters from watercourses, ponds and shallow watertables;
- rainfed agriculture systems.

Oases: an example to be included in the programme

2- A regional federating programme for national initiatives

In each of the participating countries, the programme should be included in the National Economic and Social Development Plan or the Strategic Poverty Reduction Plan as a "NAP/CCD and NAPA implementation support project".

Two components could be suggested:

- **a national component**, focused on the implementation of field projects with two sub-components:
  - consolidation and viability of earlier work, including:

    - seeking and implementing procedures for transferring the existing greenbelts, (including their long-term management) to the local communities;

    - consolidating and spatially expanding the existing greenbelts wherever there are adequate water and soil resources, to produce wood and food crops;

  - new constructions, including:

    - a "peri-urban greenbelt" phase to protect populated areas from sand encroachment: urban areas, airports, dams, oases, croplands, roads, water points, etc.;

    - a "peri-urban and urban greenbelt" phase to produce firewood where water and soil conditions are favourable (street trees, green spaces, shade groves, etc.);

Farmland planning: an aspect to be reinforced at national level

    - a farmland planning and valorisation phase: water erosion control, windbreaks, agri-forestry plantations, water resource harnessing and exploitation for extensive and intensive agricultural production, etc.;

- **a regional component**, consisting in the establishment of a regional cooperation and experince-sharing network on greenbelts. This would include:
  - consultations on approaches and modalities for implementing the national component, through annual thematic workshops that involve the field project officers and are focused on analysing the results of the campaign and on formulating recommendations on improving the implementation process;
  - training and experience-sharing: which entails field training that valorises the countries' positive results. This would include four aspects:

- a joint, global evaluation of achievements made during the last three to four decades, which would contribute substantially to improving the technical and economic references and to the effective use of allocated resources;
- a training session that draws on the results of the global evaluation;
- preparation of a common framework for the economic evaluation, indicating which monitoring-evaluation tool is to be used to quantitatively assess the economic profitability of the national projects;
- experience-sharing sessions based on the results of national projects;

o coordination and intensification of funding mobilisation.

3 - Preparing and launching the Great Green Wall in the Sahara and the Sahel Programme

The Great Green Wall initiative was incepted at the highest political level in Africa as a response to a major concern, namely the combined effects of the degradation of the natural rural environment and drought. This initiative was adopted at the Summit of Heads of States and Governments (Syrte, Libya, July 2005) as a CEN-SAD priority programme.

The African Union officially adopted the Great Green Wall initiative in December 2006 in Abuja, Nigeria as one of the pillars of a rural strategy which reconciles development and environment.

Based on the above, CEN-SAD adopted the Great Green Wall initiative as a priority in its rural development and natural resources management strategy which defines the the main orientations for its interventions in the time period leading up to 2015. For the purpose of regional integration, the "natural resources management" component has adopted the following orientations:

- ensure the consolidation of actions aimed at combating desertification and valorising successful experiences, especially through intra-regional exchanges;
- add momentum to actions pertaining to the combat against desertification through a regional investment programme that could have a tangible, lasting socio-economic and ecological impact. The Great Green Wall initiative offers an adequate support and framework for this programme.

This was the background for CEN-SAD's request to OSS to make a proposal for the preparation and implementation of the Great Green Wall. The Great Green Wall programme will be carried out in two phases:

- an initial two-year phase will be devoted to the preparation and initiation of the regional integration. This will include establishing the current state of affairs, the identification of areas where countries in the CEN-SAD space can complement each other, and the initiation of a knowledge sharing process;

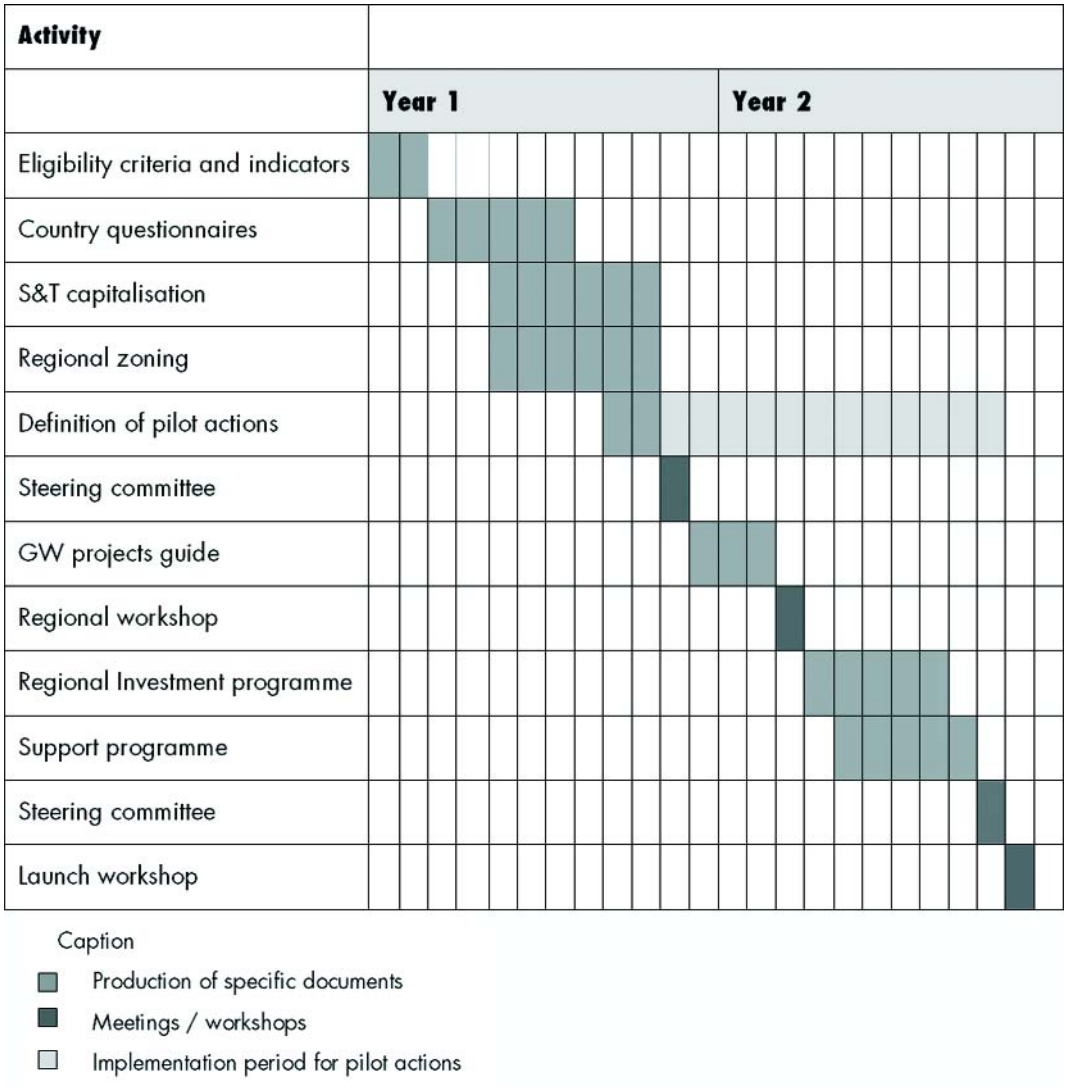
- the second phase, entails a five-year plan to consolidate regional integration, valorise regional potentials and implement the structural projects and programmes that have been identified and prepared during the first phase.

The preliminary activities for the first phase have been defined and described in detail in an OSS/CEN-SAD proposal in 2007. The activities and work plan scheduled for the two-year period are summaried in the Appendix 1 and 2 below. They have been designed to compile, valorise and implement the data required for consensual implementation of the joint programme and to define the integrated mechanisms for monitoring-evaluation, development-oriented research, and capacity building.

4- Appendix 1: Preparatory steps for the Great Green Wall programme

Activity	**Product**
Eligibility criteria and indicators	Proposal document
Country questionnaires	Summary and analysis of priority actions for each country
S&T valorisation	Summary of regional valorisation of experiences
Regional zoning	Summary on zoning
Definition of pilot actions	Micro-Actions in the contextof a participatory approach to combating desertification
Steering committee	Short evaluation
Green Wall projects guide	Document on the labelling Green Wall projects and monitoring-evaluation mechanism
Regional workshop	broad validation
Regional Investment programme	Proposal document: portfolio of projects to implement the Green Wall labelled projects and the monitoring-evaluation mechanism
Support programme	Document with four components for south-south cooperation in the regional investment programme: 1 - a regional research and development programme; 2 - a regional training network; 3 - a mechanism for exchange and consultation; 4 - a platform for partnerships and fund solicitation.
Steering committee	Short evaluation
Launch workshop	Validation of the terms of the calls for tenders and launch of the initiative

5- Appendix 1: Calendar of activities



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ABBREVIATIONS AND ACRONYMS

FAO		Food and Agriculture Organisation
GFM		Global Funding Mechanism
NAP/CCD		National Action Programme on Combating Desertification
NAPA		National Action Programme on Adaptation
UNCBD		United Nations Convention on Biological Diversity
UNCCD		United Nations Convention to Combat Desertification
UNDP		United Nations Development Programme
UNEP		United Nations Environment Programme
UNFCC		United Nations Framework Convention on Climate Change
UNSO		United Nations Soudano-Sahelian Office
WB		World Bank
WFP		World Food Programme

Since the early 20th century, natural ramparts have been erected around spaces which are vital to local communities in the circum-Saharan region. Initially aimed as a protection against encroaching sand and erosion, green belts (trees planted around agglomerations) and green barriers (intensive afforestation on large tracts of land) have gradually evolved into exploitable and productive structures, thus contributing to improving local incomes. Their concept and implementation vary according to country. In Mauritania, Burkina Faso and Kenya, for instance, communities participate fully in their set-up and maintenance.

The idea of a great green wall came as response to a major concern: tackling the combined effects of drought and natural resources degradation in rural environments.

Building on the experiences of green belts and barriers in circum-Saharan countries, the present note sheds light on the concept of the Great Green Wall Initiative, and suggests practical modalities of implementation.

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