

THE GREAT GREEN WALL

Conceptual Design

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ABBREVIATIONS AND ACRONYMS

ASSS	Authority of Saharan- Sahel States
SAAD	Strategic Axes of Agricultural Development
DDC	Departmental Development Committee
CEN-SAD	Community of Sahel-Saharan States
CILSS	Inter- States Committee to combat Drought in the Sahel
LCU	Local Coordination Unit
LDC	Local Development Committee
RDC	Regional Development Committee
RPD	Regional Project Document
PRPD	Provisional Regional Project Document
WEF	World Environment Fund
GGW	Green Great Wall
GMV	Grande Muraille Verte
GPS	Global Positioning System
IGAAD	Inter Governmental Agency against Drought and Desertification
OSS	Sahel and Sahara Observatory
UNDP	United Nations Development Program
PRODOC	Draft Document
PRONASEF	National Project for Forest Seeds
CS	Conceptual design
UCSR	Sub Regional Coordination Unit

I- BACKGROUND AND JUSTIFICATION

For many years, countries of the Sahel-Saharan region faced persistent water deficit which, combined with anthropic factors, seriously affected the great ecological balance, leading to degradation of natural resources ,soils and a fall in agricultural production, so many indicators of an almost inexorable process of desertification.

This context of high aridity placed most countries of the Sahel-Saharan region in a precarious situation of food and energy security and poverty.

Faced with this situation, the real challenge consists in creating the conditions for the restoration of the bases for food and energy security and the maintenance biological biodiversity with the active participation of all actors. Within this framework, efforts have been done at the technical, financial and institutional levels to re-orientate these trends. These efforts focused on the implementation of development projects, in particular, irrigation schemes, water control, and the establishment national and sub regional coordination bodies. Sahel countries, for some years initiated an approach taking into account agricultural diversification , actions of combating desertification and degradation of farming land, digging of retention ponds, artificial rains, development of flood cultivation and the improvement of living conditions incomes of farmers.

In spite of the efforts made here and there to design coherent and effective agricultural, forest and pastoral policies, and some occasional successes, it should be mentioned that the results, in terms of effectiveness of strategies and policies remain below the objectives.

Societies living at the edge of the Sahara have always developed conservatory practices maintaining a balance between collection and renewal of resources. These practices have been overturned by the increasing urbanization and the continuous encroachment of the desert. The old land and pastoral systems having been transformed, the fragile balance was broken. Saturated and degraded soils, expeditious clearing and overgrazing, irregular rainfalls, bush fires aggravated the effects of drought and encouraged the natural encroachment the Sahara desert towards the South.

De-population of arid zones is a natural response of the populations in the face of the hostility of the environment and the lack of adequate equipment; it is also the result of an approach of several development programs that are among their intervention criteria in a locality<< the presence of water>>.

Taken individually, countries of deserts and semi deserts do not possess the sufficient technical, human, and financial resources to face these major constraints. Thus the need and urgency to put in place regional and sub-regional cooperation mechanisms as part of a concerted global approach.

Also the proposal of His Excellency **Olusegun OBASANJO, Former**, President of the Federal Republic of Nigeria, to build a great wall named « Great Green Wall » at the Sahara/Sahel interface, from Senegal to Djibouti, perfectly falls within the major axes of Sahara development. This proposal was endorsed by the Leaders and Heads of State during the summit held from 1st to 2nd June 2005 in Ouagadougou (Burkina Faso)

The building of the Great Green Wall is thus seen as one of the major priority projects of the Authority of Sahara and Sahel States established for the development of the Sahara.

The particular feature of this « Great Green Wall » option is, while establishing and consolidating a defense line by reforestation and development activities, to effectively contribute to the integrated development of rural zones crossed and actions to combat poverty as part of sustainable development. However, variations in biophysical, pedological and cultural contexts impose a global development by the consideration and integration of local specificities.

The implementation of such a project shall be based on a **Regional Project Document (RPD)**, having studied and defined the different constraints and modalities of implementation.

The **Conceptual design** document sets the strategic approach, objectives, expected results, and the development strategy of the GGW Regional Project Document. It also gives an overview and criteria for the determination of an indicative course, as well as an illustrative list of plant and animal species submitted for the appraisal of the experts of each country.

II. BIOGEOGRAPHICAL AND GEOLOGICAL FRAMEWORK

2.1. Biogeographical and ecological framework

The Sahara is the largest desert in the world. It is situated in the Northern part of the African continent and stretches over a surface area of 9 065 000 km², from the Atlantic ocean to the West to the Red Sea and Egypt to the East (being over 4830 Km long) and between the River Niger Valley and Sudan to the South and the Atlas mountains and the Mediterranean Sea to the North (being some 1930 Km wide)

The Sahara covers almost all of Mauritania, Algeria, Niger, Libya and Egypt, the south of Morocco and Tunisia, the North of Mali, Senegal, Chad and Sudan. It divides the continent into two zones, North and South of the Sahara, which are distinct in terms of agro climatic conditions. A strip of semi-arid savannah called the Sahel occupies its southern border.

The Sahara is characterized by severe climatic conditions with a low rainfall (100 to 200mm) often torrential, a very low relative moisture rarely reaching 30%, high temperatures capable of exceeding 50°C with diurnal variations of over 30°C. The winds are strong, hot, dry, and dusty.

The Sahel that means « shoreline » is a transition zone between the arid and semi-arid part of the Sahara to the North and the more humid tropical regions to the South. It forms a belt which stretches from the Atlantic to the Red Sea, through Mauritania, Mali, Niger, Chad and Sudan. Rainfall spreads between 100 to 200 mm to the North to 600 mm to the South with two generally well distinct seasons.

2.2. Geological and geomorphological framework

The geological and structural evolution of the zone commonly called Sahara Space is marked by the early building of Precambrian crusts. This eroded and established cratonic mass served as a platform of deposits on which the major events of the Phanerozoic built light blankets of sediments. The precambrian formation of the platform crops out very little, covered, most often, by the large intra and pericratonic basins. Its basement remains highly rich in metals, minerals, precious stones and other gems, whereas the basins turn out to be among the most mature in the continent.

Geomorphologically and paleogeographically speaking, the Sahara has broad and very monotonous flat and rocky spans intersected with depressions and on which crop up some reliefs such as the Mauritanian Adrar, the Air, the Hoggar the Tibesti). Attempts of

paleogeographical reconstitution of the sedimentary sequences indicate that the Sahara was for a long time a forest zone in a context of interior basins. The desertification process only manifested and increased later. The visible relief and forms of erosions, characterized by meanders, valleys, terraces and dunes are because of water action. The levels of tillite observed in the stratigraphical sequences of the Sahara also bear witness of glacial and interglacial periods.

III. OVERVIEW ON ECONOMIC POTENTIALS

3.1. Water resources

The Sahel forms the southern belt of the Sahara. Its landscape is characterised by a steppe vegetation of yearly grass, Acacia and various thorny plants.

The large streams of the Sahara (Nile and Niger) are basically supplied by rainfall from equatorial regions. However, water is present at the surface or at the shallowness of little rivers (wadis), oases, relics of wet periods represented by lakes, marshy and salty wet lands.

Water is also present in the depth of large water circulatory systems such as:

The water system of the Nubie sandstones, shared by Libya, Egypt, Sudan and Chad; with a width of 2 million km² for water reserves of 60000 to 150 000km³;

The Northern Sahara water system, shared by Algeria, Libya and Tunisia; with a width of 1 million km² for water reserves 30 billion m³;

The Lake Chad basin, shared by Chad, Niger, Cameroon and Nigeria ;

The lullemeden basin, shared by Niger, Mali and Algeria ;

The Taoudeni basin, shared by Mali, Mauritania and Algeria ;

The Senegal-Mauritania basin, shared by Mauritania, Senegal, Guinea-Bissau and the Gambia.

The huge water potentials of these basins are a great opportunity for the pour la valuation of the Sahara and Sahel regions. At the moment, these resources are poorly exploited because of the depth of the layers and sometimes, the salinity of the water.

The increasing development of Water Retention Basins and Artificial Lakes based on simple and reproducible planning techniques, in Sahel countries for the mobilization of huge quantities of runoff water also opens other alternatives.

3.2. Energy and mineral resources

More than 2/3 of the liquid and gaseous hydrocarbon reserves of the continent were discovered in trans-border sedimentary basins of North and West Africa. Africa today has 99.6 billion barrels of crude oil and 497.5 trillion *cubic feet of supplementary gas*. Over 81% of reserves and 65% of production are held by Libya, Nigeria, Egypt, Sudan and Chad, all of which are CEN-SAD Member States.

However, African electricity production is the lowest in the world. With less than 8%, this electrical deficit is the actual factor limiting the socio-economic development and industrial development of most African countries.

Some potentialities exist in the field of renewable energies. However, their share in the production of electricity is below 750Kwh/ yr. Biomass, in particular fuel wood accounts for 3/4 of the source of energy in rural areas of Sahel and Saharan countries.

Sources of solar and wind energy abound but are underexploited. Solar contribution only stands at 0.6 **tep/inhab** in Africa as against 4.5 and 9 **tep/inhab** in Europe and America respectively.

In summary, in Africa, 30% of the energy consumed is traditional fuel derived from fuel wood. In sub-Saharan countries, this rate may exceed 90% in the coverage of domestic energy. This reliance on traditional fuel creates a high pressure on forest cover which affects soil conservation, wildlife habitat and biodiversity.

3.3. Agricultural resources

For decades, Sahara-Sahel have been facing a persistent rainfall deficit which, combined with anthropic factors, led to a degradation of natural resources, soils and a drop in pasture and agricultural production. Thus, in spite of all the efforts made in combating desertification, 1/3 of the land became arid or semi-arid and 35% of cultivable lands are threatened.

This context of high aridity has placed most Sahara-Sahel countries in a precarious situation of food and energy security and poverty. Multiple constraints weigh on the agricultural development of these countries including, in particular, the degradation of natural resources and land heritage, fall in output, insufficiency of adapted seeds, water shortage, phytopathology and zoopathology.

Considered individually, countries of the arid and semi-arid regions do not have the technical, human and financial resources to effectively and sustainably face the constraints of agriculture.

3.4. Cultural and tourist resources

The development of the Sahara-Sahel region also entails most especially, giving an important place for the participation of the populations and their knowledge. This participation is even more necessary as the populations are directly involved with the physical environment, the substrate and the outcome of all development activities.

Studies conducted by visionaries such as Cheikh Anta Diop showed that the Sahara was a bridge between the North and the South and that for centuries the populations transmitted decorations, forms as well as ways of life and solidarity which produced an implacable nature. These are the objective reasons of taking stock of the socio-cultural heritage of the Sahara-Sahel region and to work toward its conservation. Many development projects and programs of these arid regions failed for not sufficiently taking into account the cultural dimension of development.

It is against this backdrop that the project of building the GGW should integrate into its activities:

- 1- An inventory highlighting the relationship between development, the fight against poverty and the sociocultural dimension;
- 2- Identification and study of the of social organizational forms of the populations concerned ;
- 3- Establishment of a directory of the knowledge and know how of the local populations and establishing benchmarks which would be useful in the effect and impact assessment device.

IV-NEW VISION

4.1- Issue of the management of arid and semi-arid zones

Since the signing of the International Convention to combat desertification in Paris in October 1994, various national and sub-regional action plans have been prepared, various institutions to combat desertification and drought were set up : the Permanent Inter-State Committee for Drought Control in the (CILSS), the Sahara and Sahel Observatory (OSS), the Inter Governmental Agency Against Drought and Desertification (IGAAD), and huge financial resources mobilized.

In fact, neither reforestation, intensification of production systems, irrigation schemes nor micro-credit were able to promote the development of the rural world and reverse the process of desertification.

In Sahel- Saharan countries, the effects of desertification and drought resulted in trends of migratory movements and massive concentrations of human settlements in littoral zones, thus abandoning the bulk of land situated within the mainland.

4.2. New strategic approach

In Sahel -Saharan countries, the issue of sustainable development remains recurrent and the need of thinking about other alternatives calls for a paradigm shift. The new vision is based on an approach of putting into synergy actions of mitigating the effects of desertification with those of the development of the potentials which the zones in question contain. To quote the President of the Republic (1) of Senegal, Barrister Abdoulaye WADE, ***there is need to colonise and harness the Desert.*** In other words, instead of watching the populations of these arid and semi-arid regions desert them (who go seeking refuge in sudanese and guinean regions), it is necessary to increase the value of its natural resources and develop the human settlements.

4.3. Strategic axis of the development of the Sahara region

With a multi-sectoral approach, the development of the arid regions is based upon the areas of mines and energy, agriculture, water especially underground water and the development of storage basins, infrastructure, tourism and finally, the development of the 'Environment and the management of biodiversity.

At the level of agricultural development, apart from agricultural, forestry and pastoral activities, we envisage the erection of a Great Green Wall which would serve as a « front » against the encroachment of the desert. This new agricultural development approach is built on the following six (6) strategic axes for agricultural development:

- ASDA1 : Combating soil degradation and desertification,
- ASDA2 : Diversification and intensification of agricultural activities,
- ASDA3 : Improving and securing seed heritage,
- ASDA4 : Development of biodiversity,
- ASDA5 : Regional cooperation and food security,
- ASDA6 : Erection of the Great Green Wall,

4.4. Policy framework and implementation mechanism

4.4.1. Community of Sahel –Saharan States

The political will of African countries to promote the development of the Sahara and its surroundings was concretised by the Constitutive treaty of the Community of Sahel –Saharan States CEN-SAD (23 members) signed on e 04 February 1998.

On 14 and 15 March 2003, the 5th Session of the Conference of Leaders and Heads of State, held in Niamey (Niger), adopted the decision to establish the Authority for the Development of the Sahara (AMVS).

The 7th Ordinary Session of the CEN-SAD Conference of Leaders and Heads of State held in Ouagadougou (Burkina Faso) on 01 and 02 June 2005 favorably considered the idea of **erecting a Great Green Wall** from Dakar to Djibouti, expressed by His Excellency **Olusegun OBASANJO**, Former President of the Federal Republic of NIGERIA .

4.4.2. Authority of Saharan- Sahel States (ASSS)

The Authority of Saharan-Sahel States is the coo-operation instrument for the development of the Sahara. It is aimed at promoting co-operation among CEN-SAD Member States, with a view to a rational and judicious use of all potentials comprising among others, water resources, geological, mineral, oil resources, as well as opportunities of scientific research and exploration offered by the Sahara.

The functioning of the Authority is based on the following principles:

- Sovereign equality of Member States,
- Sustainable conservation and management of natural resources and the Environment,
- Permanent sovereignty of States on their natural resources,
- Peaceful resolution of disputes,
- Use of Sahara resources for peaceful purposes,
- Distribution of party agreements on the resources of the operating zone.

The Authority enjoys privileges and immunities on the territory of each of its members enabling it to engage in the accomplishment of its functions in compliance with the UN Convention of 13 February 1946 and the African Union Convention of 11 July 2000.

V. THE GREAT GREEN WALL: A MAJOR REGIONAL PROJECT

5.1. Specifications

As proposed by His Excellency **Olusegun OBASANJO**, Former President of the Federal Republic of NIGERIA, the Great Green Wall (GGW) is a strip of multi-specie Vegetation with a width of 15 km linking Dakar to Djibouti over a length of 7000 km. At the operational plan, each country concerned with the wall should provide a strip of 15 km wide in compliance with the general indicative course. The strip should necessarily be located within the Sahel zone with averages rainfall between 100 to 400 mm.

The green wall would thus be a large green avenue, more or less linear but continuous as far as possible. It integrates several systems of land use such as:

- **natural farms:** reserved forests (managed by the State), community forests (Villages, municipalities, rural communities etc.), private forests (belonging to individuals or private groups);
- **old artificial farms** (results of the zone's projects) or new ones (to be established);
- **agro-forestry units:** annual orcharding , wooded hydro-Agricultural areas, paires des terroirs ;
- **grazing zones:** village or community;
- **Animal parks;**
- **community wildlife areas:**
- **national parks:** entirely or in part ;
- **botanical reserves:** for the conservation of plant biodiversity;
- **deferred grazing:** at the level of more or less degraded forest areas
- **orchards:** fruit farms.

These green units shall be managed by the natives, individually or in groups, private producers, research /training institutions, local governments or by forest services.

5.2. Global objective

The contribution in combating the encroachment of the desert and the development of Sahel-Saharan regions for a sustainable management of natural resources and combating poverty.

5.3. Specific objectives

- 1- the conservation/putting into value of biodiversity ;
- 2- the restoration/conservation of soils ;
- 3- the diversification of farming systems ;
- 4- the satisfaction of domestic needs (i wood and non-wood products)and the promotion of income generating activities;
- 5- the improvement of the sequestering of carbon in vegetation covers and soils.

5.4. Expected Effects and Impacts

The building of the Green Wall in these arid and deprived regions will have very positive effects and impacts on the populations and their living environment. More specifically, GGW will ensure integrated development and produce various effects and impacts on its coverage area.

The expected effects and impacts include:

1. **slowing soil erosion:** the presence of vegetal cover slows winds speed and favors rain water infiltration;
2. **degraded soil restructuring:** an increase in organic matter of vegetal and animal origin entails soil restructuring;
3. **higher reforestation rate in countries crossed by GGW:** in order, among others, to restore eco-climatic balances and biodiversity;
4. **revival, development and diversification of agriculture and stockbreeding,** both in terms of vegetal and animal production volumes and size of the active population employed in these sub-sectors;
5. **vegetal and animal biodiversity restoration, conservation and development,** the deferred grazing and other privately-owned wooded areas contribute to natural vegetation regeneration and return of wildlife: birds, small game, snakes, etc.

6. **increasing coverage of local needs in forest products**, especially firewood, lumber and also ligneous and non-ligneous products: gum, resins, roots, leaves, barks, fruits, pharmacopeia etc.
7. **improved living standard and health** due to noticeable improvement in nutrition, living environment and more easily available household needs (water, energy, social infrastructures etc);
8. **reversal of rural migration phenomenon**, gradually, “ecological migrants” and the bones and sinews looking for employment will repopulate these zones that have been rehabilitated by GGW proximity.
9. **control of water resources**, through water retention pond, artificial lakes and hydraulic schemes that will contribute to enhanced production system

III. 5. Beneficiaries

GGW effects and impacts will benefit various categories of actors including:

1. **international community**, as indeed, GGW perfectly intersects international concerns for Clean Development Mechanism: reduction of greenhouse gas, carbon sequestration, reducing ecological and economic migrations;
2. **States**: find in it an opportunity to revitalize their reforestation program and to reduce the rhythm of degradation of their forests, to reactivate their ecosystem conservation. In fact, as the FAO (2005) report, **table 1** indicates, the efforts of conservation of forests in Sahel countries are low as compared to the deforestation process so that the rate of forest regression is alarming. Impacts are also in terms of poverty reduction and food security;
3. **local communities**: regions, municipalities and rural communities find in GGW a tool to boost local development through the recovery of agricultural productions, reduced unemployment, and more generally, through higher income;
4. **primary producers**: farmers; herdsmen; coalmen; gum, honey and resin harvesters; healers; hunters; wood carvers; etc. While for farmers, GGW will expand cultivable zones and productivity of cultivated zones, for the remaining primary actors, more importantly it will increase the availability of raw materials.
5. **private businessmen**: who are initiators of safari parks, modern farming, ecotourist sites find in it some economic opportunities etc ;

6. **educational, training and research structures:** GGW will be a privileged site for regional multidisciplinary research allowing great mobility of African scientists and increased synergy in program implementation;
7. **populations living in GGW coverage area:** in addition to offering greater possibilities of fuelwood, gathering, fodder and water access, they find important opportunities to reduce under-employment, migration and poverty.

Countries concerned with the GGW	Rate of forest regression
1. Burkina Faso	- 15 000 ha/yr
2. Mali	- 99 000 ha/yr
3. Mauritania	- 10000 ha/yr
4. Niger	- 62 000 ha/yr
5. Nigeria	- 398 000 ha/yr
6. Senegal	- 45 000 ha/yr
7. Chad	- 82 000 ha/yr
8. Sudan	- 956 000 ha/yr
9. Ethiopia	- 40 000 ha/yr
10. Eritrea	- 5 000 ha/yr
11. Djibouti	—
Total	-1 712 000 ha/yr

Table1 : Annual regression rate of forest cover (Source: *Situation of forests in the world ; FAO, 2005*)

5.6. Methodological approach

The GGW is a major project whose feature is to bring together all the countries concerned in a common fight, to restore and develop the natural resources of the Sahel. It is designed to move from Dakar to Djibouti over about 7000 Km. It thus appears as a very relevant element in the NEPAD Environment component.

The setting up of the Great Green Wall (GGW) shall be done according to bottom-up participatory approach, associating the populations in the designing, implementation, follow up and the conservation of achievements .

Considering the geographical scope of the project and the difficulties in coordinating the activities in all the countries crossed, it was agreed to separate the accomplishment of the wall into two components:

•**Component I (West)** : Senegal, Mauritania, Mali, Burkina Faso, Niger and Nigeria;

•Component II (East): Chad, Sudan, Ethiopia, Eritrea and Djibouti

This approach does not question the uniqueness of the Great Wall project. It was agreed that the High Authority for the Development of Sahara (HADS) would harmonize the works of the two components to guarantee the unitary and continual character of the great green wall. The High Authority for the Development of Sahara through a pan-African Agency of the Great Green Wall could coordinate the accomplishment.

Considering the innovating nature and scope of the GGW, which is supposed to be a continental program, it is essential to envisage pre-studies on the indicative course of the wall.

These studies shall focus in particular on the baseline ecological, socio-economic and infrastructural reference in the regions crossed. The information and data that would be collected shall help in identifying and controlling all the strengths and weaknesses of the project and to formulate a project document based on the objectives stated earlier on.

Activities to be carried out shall concentrate on the collection of basic information on:

- 1) Identifying the best possible course in relation to the objectives of the project;
- 2) Establishing the baseline case in the wall strip for:
 - forest and vegetation ;
 - agriculture ;
 - water resources ;
 - breeding ;
 - wildlife ;
 - soil, land occupancy;
 - cultural and socio-economic background;
- 3) opportunities and constraints for the setting up and sustainable management of the wall, especially through pilot actions at the national level;
- 4) administrative and institutional background in the countries crossed by the wall;
- 5) formulation of an institutional cooperation framework,

- 6) analysis, processing and grading of data collected,
- 7) drafting of a blueprint of the GGW project,
- 8) Steps for the validation and adoption of the project document of the GGW.

The table 2 summarizes the stages and process for the elaboration of the Great Green Wall (GGW) Document Project and the implementation of the GGW.

Stage	Objectives	Activities	Operators	Maturity date
1	Validate a Conceptual Design (regional project design document)	Identifying the plan and structure of the GGW Project	National Scientific Committee (Senegal)	November 2005
		Validating the plan and structure of the GGW Project	Experts Meeting	March 2006
		Validating the Great Green Wall Achievement Approach	Environment Ministers Conference	March 2006
II	Operational modalities implementation of Great Green Wall Project	Identifying GGW Line; operational modalities for implementation; coordination of the GGW project	Experts meeting, Environment ministers Conference	January 2008
		Preparing and validating the TDR /GGW Project		
		Acquiring basic data, Elaborating the GGW Document Project	Consultants and local Experts	December 2008
		Validating and Approving the GGW Document Project	Environment Ministers Conference	1 st quarter 2009
		Funds raising for Great Green Wall edification		
III	Great Green Wall Implementation	Realization of the GGW National Component, Coordination, Monitoring	Local Coordination	2nd quarter 2009

Table 2: Preparation stages of the implementation of the GGW project

5.7. GGW indicative course Identification

5.7.1. GGW Indicative course Criteria

The course of the Great Green Wall (GGW) does not affect the Sahara. It is located in the Sahel between isohyets 100 to 400 mm. It is about 15km wide, linear and continuous as much as possible. However, due to some factors, the course may divert, move northwards or descend southwards. These factors are among others:

- water courses : rivers, lakes,
- mountains or rocky hills,
- flat but rocky terrain impossible to revitalize,
- marshy areas,
- urban settlements,
- areas the local populations consider haunted or sacred.

One of the determining ecological factors is the level of rainfall. In fact, if a major portion of the GGW shall be situated in dwelling zones, another non-negligible portion shall be situated in uninhabited zones and shall only rely more on rains for their maintenance. That is why the GGW should always be located at latitudes where annual average rainfall is above 100 mm. Nonetheless, the presence of a network of water retention ponds will attenuate rainfall shortage.

Since GGW runs through inhabited zones (village soil zones), its maintenance can be assured by the local populations, and its management in uninhabited areas (reserved forests, national parks, safari parks, wild-flower sanctuaries, community reserves) handled by the public services, local communities or private concerns.

The GGW Indicative course (annexe 1) was prepared using a database containing the phyto-geographical limits of the WWF, enabling an appropriate location of the climatic zoning, and a map of land use that helps in identifying the boundaries of large plant formations and the boundaries of countries in the sub region. The main input to propose the course is the land use map.

GGW National Component layout is specified for individual countries by their national experts. However, it must be integrated into overall layout and take into account the parameters defined hereinafter.

5.7.2. GGW Structure and Composition

GGW integrates agro-forestry units, several systems of land use, network of water retention ponds and different social basic infrastructures within GGW area.

5.7.3 Criteria of the vegetal and animal species selection

Plant formations of the GGW are dominated by species all present adjustment mechanisms to drought. GGW plant associations are dominated by the species that all have drought-adaptation mechanisms.

Vegetal species should meet in particular the following major criteria:

- they must have ecological plasticity such as would allow them to live and develop in ecological zones with up to 100 mm rainfall;
- they must be useful to the populations' needs and the environment;
- they must be common to many neighboring countries crossed by GGW layout;

Species selection consists in:

- identifying the species most adapted to arid and semi-arid zones and necessary clues on the conditions of successful production and transplanting of seedlings in the eco-geographic zones crossed by the layout;
- promoting agroforestry;
- favoring economically profitable existing species and also accepted by the populations especially fruit forests which contribute to the nutritional balance of the populations and poverty reduction;
- taking into consideration the populations' needs in species selection with a view to meeting most of their needs in ligneous and non-ligneous products.

ANNEXES 2 gives a list of plant species adapted to the ecogeographical zones characterized by a high aridity.

5.8.. Preparation of GGW Project Document: Terms of Reference (TORs)

5.8.1- Planning

a) Overall Objective: identifying GGW layout and structure and defining an efficient and performing strategy for good coordination of GGW building activities.

b) Specific Target: finalizing a consensual framework for implementing and coordinating GGW-related national and sub-regional interventions.

5.8.2. Expected Outcomes

The expected outcomes relate to the following aspects:

Outcome₁: *Reference situation has been determined for arid and semi-arid zones;*

Outcome₂: *Developments in the biophysics context have been fully controlled;*

Outcome₃: *GGW social and environmental impacts have been well identified;*

Outcome₄: *Production system enhancement operations have been tested and approved and GGW layout and composition identified and adopted.*

Outcome₅: *An actor organizational chart for participatory and sustainable management and a coordinating and communication strategy have been proposed;*

Outcome₆: *The (human, financial, technical and logistical etc...) resources needed for GGW project implementation have been identified and evaluated;*

Outcome₇: *GGW operational documents have been prepared and adopted;*

Outcome₈: *Funding sources, mechanisms and terms for resource mobilization to finance GGW have been identified.*

5.8..3. GGW Project Document Preparation Strategy

The following has been considered to harmonize interventions in the two groups:

1. consultations (C) are held concomitantly by two groups in the two sub-regional components (East and West) and in individual countries;
2. SRC work will be coordinated by an expert-designate and at individual country level by the National Coordinating Unit (NCU);
3. the two documents produced by the two sub-regional components will be consolidated by an ad hoc committee made up of national and international experts;
4. the provisional project document will be validated and adopted in the wake of countries at a meeting of Sectoral Ministers;
5. the mandate has been set to last 12 months and in accordance with the chronogram indicated in the Project Design Document (Conceptual Chart);
6. regional coordination will be handled by a GGW Pan African Agency under the institutional supervision of the High Authority Development of the Sahara (HADS).

5.8.4. – Contracts, Studies and Research

Contracts, Studies and Research have been proposed for GGW Project Document preparation mandate.

Component 1: The Reference Situation of Arid and Semi-arid Zones has been clearly established

The purpose here is to analyze the reference situation of arid and semi-arid zones which are likely to be covered by the Great Green Wall. This analysis will focus on the following domains:

- forest and vegetation
- agriculture;
- water resources;
- energy resources;

- stockbreeding;
- wildlife;
- soils, land use and real estate;
- cultural and socio-economic context;

Activities under Component 1 (Act.1) include:

- Act.1.1: determining ecological averages (climate, water, soil, flora and fauna) and the level of vegetal cover in layout;
- Act.1.2: studying the sociology and household needs of those living the arid zones ;
- Act.1.3: establishing demographic references;
- Act.1.4: studying the real estate system;
- Act.1.5: characterizing economic activities;
- Act.1.6: determining the poverty level of the populations living in GW coverage area,
- Act.1.7: characterizing the types of economic and social infrastructures.

Component 2: Analyze Developments in Biophysics and Ecological Framework (Act.2)

- Act.2.1: study and map out soils and geological formations;
- Act.2.2: study and map out river systems, land use (vegetal cover, relief, human settlements etc.);
- Act.2.3: identify and take an inventory of water resources (surface and underground waters);
- Act.2.4: study and map out ecogeographic and their hydro-climatic constraints;
- Act.2.5: take an inventory of efficient SDR/SWC (Soil Defense and Restoration / Soil and Water Conservation) techniques.

Component 3: Study GW Expected Social and Environmental Impacts (Act.3)

- Act.3.1: take an inventory of natural resources (forest products, honey, milk, cheese and, arable soils, water resources, etc...), the social infrastructures of GW coverage area;
- Act.3.2: study all possibilities of income-generating activities offered by GW;
- Act.3.3: assess GW environmental impacts

Component 4: Identify GW Layout, Composition and Structure (Act.4)

The identification process will primarily focus on national component then sub-regional component. The countries concerned will consult on layout intersection at the borders.

Act.4.1: identify in relation to project objectives the best geographically referenced layout both for national and sub-regional components;

Act.4.2: take an inventory of and propose resilient vegetal and animal species adapted for use in GGW;

Act.4.3: identify new vegetal and animal species and mainstream them in production systems (forest fruits, fodder species, rabbit and duck rearing, etc) and conduct acceptability tests on these species;

Act.4.4: study relevant SDR/SWC activities and carry out introduction tests on new agro-sylvo-pastoral techniques: irrigation, herd management, cultural techniques, new energy sources, etc.

Act.4.5: determine the opportunities and constraints to GGW establishment and sustainable management, particularly through pioneering actions at the national level;

Act.4.6: analyze the context and administrative and institutional constraints in countries and borders crossed by GGW;

Act.4.7: have the National Coordinating Committee validate the elements of each National Component.

Component 5: The Actor Organizational Chart and the Coordinating and Communication Strategy have been defined (Act.5)

Act 5.1: identify GGW's SRCU (Sub-regional Coordinating Units) and NCU (National Coordinating Units) structure and missions;

Act 5.2: identify in each country local committees in the communities involved with GGW;

Act.5.2: study the organization and operation of GGW Pan African Agency (under the supervision of the Supreme Sahara Development Authority) and its relations with the sub-regional institutions related to the problems involved;

Act 5.3: draw up a communication strategy;

Component 6: Identify and Assess GGW Project Implementation Needs (Act.6¹).

¹ Member countries and development partners will bear the cost of this study.

The purpose here is to study the needs (in terms of budgets, equipment and material, logistics, human resources etc...) for Project Document preparation phase and GGW implementation phase. The study primarily focuses on each country (NCU, National Component), then will be consolidated at the sub-regional level (SRCU, Sub-regional Component).

Act.6.1: identify for each Component (national and sub-regional), the needs in terms of material and logistics (field equipment and material, vehicles, materials and information, animation and sensitization materials), human resources and infrastructures;

Act.6.2: identify and evaluate operating expenses in each component (national and sub-regional);

Act.6.3: prepare an indicative overall budget for each of the sub-regional components.

Component 7: Preparation and Adoption of GGW Operational Documents

GGW Project Document will be prepared by having the two Documents relating to Sub-regional Components consolidated by an ad hoc committee made up of national and international experts. The final document will be validated and adopted during a ministerial conference;

Act 7.1: analyze, process and format collected data;

Act 7.2: have each country prepare a technical operation plan;

Act 7.3: have each sub-regional component prepare initial Project Document draft and organize a sub-regional validating workshop (SRCU country);

Act.7.4: finalize provisional project document and organize its adoption by member countries of the sub-regional component.

Component 8: Identify funding sources and mechanisms for financing GGW Implementation

Act.8.1: identify funding sources, mechanisms and terms for resource mobilization,

Act.8.2: identify financial institutions and donor round table format for the financing of Regional GGW Establishment Project.

5.8.5. – Reports and Validation Arrangements (specified when bid was being released)

5.9. Financing the GGW: indicative elements of implementation Cost

5.9.1. Justification

The edification of the GGW is going to engender effects and impacts highly favourable to men and to the environment. It integrates, by its expected objectives and impacts, several mechanisms associated with development and environment. These are in particular: (i) the Sustainable Development Mechanism, (ii) the Poverty Alleviation Mechanism, (iii) the Ecological and Economic Migration Reduction Mechanism and finally the Clean Development Mechanism. The GGW also appears as a common heritage of mankind and a model for the integrated development of underprivileged zones which occupy ever-growing surface areas in Africa in general and in Sub-Saharan Africa in particular, as a result of desertification against which Africa must create a united front with a new vision and other weapons or disappear.

The Great Green Wall, designed as a 15-km wide greenery strip made up of plant species chosen according to specific criteria, and going from Dakar to Djibouti, is a CEN-SAD initiative, endorsed by the African Union. It fully comes within the plan of action of NEPAD's environment component. Investing for the implementation of the GGW project is investing for Africa's development and for the world's Clean Development Mechanism. **In fact, the non negligible contribution of the GGW to the sequestering of carbon** deserves special attention. With an average productivity of 1T Carbon/Ha/year, the GGW is eventually going to generate an annual biomass of 1Tx (7000 x 15) x 100, or **10, 500, 000 T Carbon/year** , **likely to make available** a large number of units for the certified reduction of emissions (UCRE) that can be used by the industrialized countries to abide by their own emission reduction commitments and indicatively representing "carbon" revenues in the order of 56, 700, 000, 000 Fcfa/year, or 126, 000, 000 US dollars/year, at the price of \$US 12 a T.

5.9.2- Indicative elements of the GGW implementation cost

The implementation of the Great Green Wall will be done through a Great Green Wall Project Paper (GGW/PP), drawn up on the basis of a conceptual blueprint (draft paper) and a conceptual note already studied and adopted by the Conference of Ministers in charge of Environment held in Dakar on 27 March 2006.

Within the framework of the design of the GGW/PP, different basic studies will be needed. The Terms of Reference (TORs) were studied and adopted during the conference of ministers held on 1 February 2008 in Dakar.

The indicative elements of the cost of the implementation of the Great Green Wall also focus on the financing of the studies needed for the design and adoption of the Project Paper, as well as the main activities related to the edification of the Great Green Wall, namely:

- (i) Agro forestry
- (ii) retention ponds and hydraulic works networks,
- (iii) soil conservation and pedological monitoring,
- (iv) micro construction works,
- (v) coordination and monitoring,
- (vi) environmental monitoring,

The indicative costs are given on the basis of the average per country (11 countries crossed by the GGW) and a 7-year follow-up period. The following components are concerned:

Preliminary Studies Component (for the design of the Project paper):

This rubric includes the studies required to establish the reference situation, the equipment needed for pilot trials and the different meetings of information and/or validation of the study reports.

On the basis of the TORs adopted, the duration of the mandate is 1 year and an average cost of 100 million FCFA is provided for per country.

$100,000,000 \text{ Fcfa} \times 11 \text{ (countries)} = \mathbf{1,100,000,000 \text{ Fcfa}} / \mathbf{2,619,000\$US}$

Agro Forestry Component:

This component focuses on the putting in place of production systems with the overall protection mechanism. But it also includes all communication, training and sensitization costs.

$430,000 \text{ Fcfa/Ha} \times 7000 \times 15 \times 100 = \mathbf{4,515,000,000,000 \text{ Fcfa}}$ $\mathbf{10,750,000,000 \$US}$
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Retention ponds and other hydraulic works component

In arid zones, non availability of water in required quantity and quality is one of the limiting factors. The scarcity of surface water resources will also be further reduced by the putting in place of retention ponds and/or hydraulic works networks. With an average of 80 retention ponds per country, 880 retention ponds are provided for in the GGW project. At the rate of 70, 000, 000 Fcfa / per pond, the cost of this component stands at.

$880 \times 70,000,000 \text{ Fcfa}$	$= 61,600,000,000 \text{ Fcfa}$
146,667,000\$US	

Soil conservation and pedological monitoring component

The soil conservation and monitoring component has two sub-components:

- the establishment of the reference state and potential aptitude cards:

$$= 393,750,000,000 \text{ Fcfa}$$

- the pedological monitoring = 131,250,000,000 Fcfa

Or in total	$= 525,000,000,000 \text{ Fcfa}$
1,250,000,000 \$US	

Micro-construction works component

The success of the recolonisation of Africa's arid and semi-arid zones will be largely dependent on the decline of poverty in the rural areas by improving incomes through income-generating activities and access to domestic needs and basic social infrastructure (health, education etc.). The Great Wall, by its objectives and the expected effects and impacts, offers a conducive environment. To this end, micro-construction works will be developed thanks to the putting in place of a revolving support fund to back up and develop income-generating activities (IGA) and make for the creation of basic infrastructure.

$500,000,000 \text{ FCfa} \times 11 \times 7$	$= 38,500,000,000 \text{ Fcfa}$
91,667,000\$US	

Costs of management and monitoring/evaluation structures

These are the operating and equipment costs of the following structures:

- **The Pan African Agency of the Great Green Wall** assuring regional coordination,
- **Sub-regional Coordination Units (SRCU)** are 2 in number, to ensure coordination and monitoring in the two (02) regional components defined as: **West** (Senegal, Mauritania, Mali, Burkina Faso, Niger and Nigeria) and **East** (Chad, Sudan, Ethiopia, Eritrea, Djibouti),
- **National Coordination Units (NCU)** in each of the 11 countries.

Coordination structures should operate during the first minimal phase of 7 years to integrate the reality of the GGW in the Sahelian ecosystems but also in the collective conscience of African populations and institutions.

The indicative costs are given on the table below:

Structures	Operation	Equipments
Pan African Agency GGW		150,000,000 x 2 times = 300,000,000 Fcfa (years 1 and 5)
SRCU	180,000,000/year x 7 x 2 = 2,520,000,000 Fcfa	120,000,000 x 2 x 2 = 480,000,000 Fcfa (years 1 and 5)
NCU	300,000,000 Fcfa x 7 x 11 = 23,100,000,000 Fcfa	80,000,000 x 2 x 11= 1,760,000,000 Fcfa (years 1 and 5)
TOTAL	29,840,000,000 Fcfa/ 71,048,000	

Table1: Elements of coordination and monitoring /evaluation costs

Environmental monitoring component

This is about the monitoring of the GGW impact from the biophysical and socio-economic standpoints. On the basis of maps and surveys, environmental monitoring should bring to the implementation of the GGW the corrections needed for its eventual success.

70,000,000 Fcfa/country x 7years x 11 = 5,390,000,000 Fcfa (for the initial phase of 7 years)	/12,833,000 \$US
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The table 2 below recapitulates the estimated costs of indicative elements:

Items	Amount in <u>Fcfa</u>	Amount in \$US 1 US\$ = 450 FCFA	Sources of funding
Preliminary studies	1,100,000,000	2,444,444	Donors and State counterparties
Agro-Forester	4,515,000,000,000	10,033,333,333	National budgets Donors + MDP
Retention ponds and hydraulic works	61,600,000,000	136,888,889	National budgets Donors
Soil conservation and pedological monitoring	525,000,000,000	1,166,666,667	Donors
Micro-construction works For 7 years	38,500,000,000	85,555,556	Donors + PRSP
Management and monitoring-evaluation For 7 years	29,840,000,000	66,311,111	National budgets Donors
Environmental monitoring For 7 years	5,390,000,000	11,977,778	Donors

Table 2 : recapitulation of estimated costs of the indicative elements

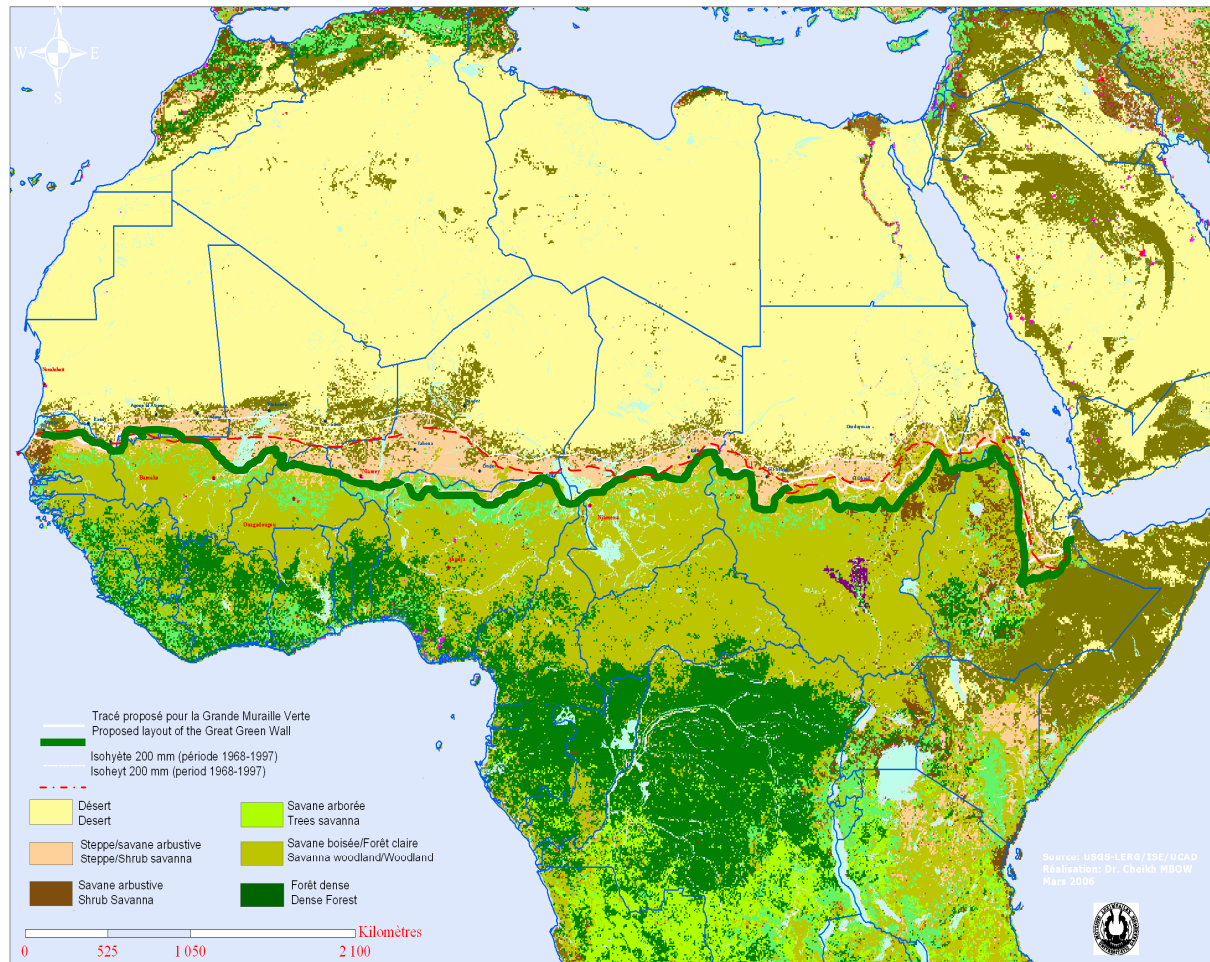
VII-ANNEXES

Annex 1 : Indicative course of the Great Green Wall

Annex 2 : Illustrative List of plant species

Annex 1 : Indicative course of the Great Green Wall

Tracé de la Grande Muraille Verte, Dakar-Djibouti



Annexe 1. Indicative course of the Great Green Wall from Senegal to Djibouti



Annex 2 : Illustrative List of plant species

N°	SPECIES	Distribution	ECOLOGY	USES
1	Acacia raddiana Savi / tortilis (Forsk.) Hayne	Senegal, Mali, Niger, Chad, Sudan, Eritrea	- 50 to 1000 mm, - sandy (anchored dunes), ferruginous, tropical soils, sandy silt, lateritic talus	Energy wood, lumber fodder tree, medication
2	Boscia senegalensis (Pers.) Lam. ex Poir.	Senegal, Mali, Burkina, Niger, Chad, Soudan	- 50 to 1000 mm - Sandy-argillous (consolidated dunes), argillous, rocky, stony soils	Food, fodder, medication
3	Acacia senegal L. (Willd.)	Senegal, Mali, Niger, Nigeria, Chad, Soudan, Eritrea	- 100 to 800 mm, - arenaceous-loamy (fossil dunes), lightly loamy (depressions), lithosols	Gum (food, medication, cosmetics) fodder, energy wood, lumber
4	Acacia nilotica (L.) Willd. ex Del. var. adansonii and var. tomentosa / scorpioides L. (A. Chev.) var. adstringens Schum	Senegal, Mali, Niger, Nigeria, Cameroon, Sudan	- 100 to 1000 mm, - Deep, arenaceous-loamy (fossil dunes), argillous soils, river shores	Lumber, Energy wood, lumber, fodder, food, medication, gum, tannins
5	Acacia mellifera Benth.	Nigeria, Chad, Soudan, Eritrea	- 250 to 500 mm - Argillous soils	Fodderlumber, energy wood
6	Cadaba farinosa Forsk.	Senegal, Mali, Burkina, Niger, Cameroun, Chad, Sudan	- 250 to 500 mm - Sandy soils (consolidated dunes), rocky, pool shores	Energy wood, food, fodder, medication
7	Cadaba glandulosa Forsk.	Burkina, Mali, Niger, Chad, Sudan	- 250 to 500 mm - Stony soils	fodder
8	Calotropis procera (Ait.) Ait.	Senegal, Mali, Burkina, Niger, Chad, Soudan	- 250 to 500 mm - Degraded soils	medication, fibers, fodder
9	Capparis decidua (Forsk.) Edgew.	Senegal, Mali, Burkina, Niger, Chad, Sudan	- 250 to 500 mm - Sandy soils, river shores and pool shores	medication, fodder
10	Commiphora quadricincta Schweinf.	Niger, Nigeria, Chad, Sudan, Eritrea	- 250 to 500 mm - Sandy, argillous and lateritic soils	
11	Ficus ingens (Miq.) Miq.	Senegal, Mali, Niger, Nigeria, Chad	- 250 to 500 mm - Spring rocks,	medication,
12	Ficus salicifolia Vahl	Niger, Chad, Sudan, Eritrea	- 250 to 500 mm - Mountain rocks	
13	Grewia flavescens Juss.	Senegal, Mali, Niger	- 250 to 500 mm - Pool shores, sandy, argillous, stony and lateritic soils	medication, food, fodder
14	Grewia tenax (Forsk.) Fiori	Senegal, Mali, Niger, Sudan	- 250 to 500 mm - Rocky, argillous soils, pool shores	Fodder, food
15	Grewia villosa Willd.	Niger	- 250 to 500 mm - Sandy, rocky, stony, hardpan soils, river shores	Fodder, medication, food, lumber
16	Leptadenia pyrotechnica (Forsk.) Decne. / spartium Wright.	Senegal, Mali, Niger, Chad, Sudan	- 250 to 500 mm - Sandy soils, dunes	Medication, fodder log fender, food
17	Maerua crassifolia Forsk.	Senegal, Mali, Sudan	- 250 to 500 mm - Sandy soils, dunes	Fodder, lumber, fruits, medication, food
18	Maerua oblongiflora A. Rich.	Niger, Chad, Sudan,	- 250 to 500 mm - Sandy soils, dunes	

19	Maerua aethiopica Oliv.	Niger, Chad, Sudan	- 250 to 500 mm - Sandy soils, dunes	
20	Salvadora persica L.	Senegal, Mali, Niger, Chad	- 250 to 500 mm - River, lake and pool shores	lumber, kitchen salt, medication
21	Tamarix aphylla (L.) Karst.	Sudan,	- 250 to 500 mm - Temporary water points	
22	Tamarix senegalensis DC. / gallica L.	Senegal, Niger	- 250 to 500 mm - Sandy (dunes), salty soils, brackish depressions, river shores	Medication
23	Ziziphus mauritiana Lam.	Senegal, Mali, Niger, Burkina, Chad, Cameroon	- 250 to 500 mm - Sandy, rocky soils, river shores	Edible fruits, medication
24	Acacia laeta R. Br.	Mali, Burkina, Niger, Nigeria, Chad, Sudan, Eritrea	- 250 to 750 mm, - arenaceous-argillous, rocky and stony soils	Gum, fodder, lumber, energy wood
25	Combretum aculeatum Vent.	Senegal, Mali, Burkina, Niger, Chad, Sudan, Eritrea	- 250 to 800 mm - Sandy, argillous, stony soils on termites' nest	Energy wood, food, fodder, medication
26	Commiphora africana (A. Rich.) Engl.	Senegal, Mali, Burkina, Niger, Nigeria, Cameroon, Chad, Soudan, Eritrea	- 250 to 800 mm - Sandy, argillous and lateritic soils	Lumber, energy wood, fodder, food, medication, insecticide
27	Cordia gharaf (Forsk.) Ehrenb.	Senegal, Mali, Burkina, Niger, Nigeria, Chad, Sudan, Eritrea	- 250 to 800 mm - Rocky soils, river shores	
28	Grewia bicolor Juss.	Senegal, Mali, Niger	- 250 to 800 mm - Pool shores, sandy, stony and lateritic soils	Medication, fodder, food, lumber, energy wood
29	Maerua angolensis DC.	Senegal, Mali, Sudan, Eritrea	- 250 to 800 mm - Sandy soils, dunes	Food lumber, fodder, medication
30	Ziziphus nummularia (Burm.) Wight et Arn.	Mali	- 250 to 800 mm - Sandy and rocky soils, river shores	
31	Acacia seyal Del. / stenocarpa Hochst.	Senegal, Mali, Burkina, Niger, Nigeria, Cameroon, Sudan	- 250 to 1000 mm, - Argillous and stony soils, floodable depressions liable to flooding	Fodder, gum, energy wood, lumber, medication
32	Balanites aegyptiaca (L.) Del.	Senegal, Mali, Burkina, Niger, Nigeria, Cameroon, Chad, Sudan	- 250 to 1000 mm, - Great ecological amplitude, sandy, stony, argillous, alluvial soils, pool shores	Energy wood, lumber, fodder, food, medication
33	Boscia angustifolia A. Rich.	Senegal, Mali, Burkina, Niger, Nigeria, Chad, Sudan	- 250 to 1000 mm - Rocky, lateritic and argillous soils, pool shores	Energy wood, lumber, fodder, food, medication
34	Boscia salicifolia Oliv.	Niger, Chad, Sudan, Eritrea	- 250 to 1000 mm - Coarse-textured soils	Energy wood, fodder, food
35	Acacia Ehrenbergiana Hayne / flava (Forsk.) Schwth.	Niger, Chad, Cameroon, Sudan	- 300 to 400 mm, - Sandy and argillous soils	Fodder
36	Acacia hebecladoides Hams.	Chad, Nigeria, Northern Cameroon	- Silt soils	
37	Rhus oxyacantha Cav.	Niger		