

Annex 1

Some woody and grassy species used in sand dune fixation

SPECIES USED ON INLAND DUNES

Acacia raddiana SaviNatural stand of *Acacia raddiana**Acacia raddiana* seedling

Main sources. von Maydell, 1983; Jaouen, 1988; Centre Technique Forestier Tropical, 1989.

Other scientific names. *Acacia tortilis* Hayne, *Acacia fasciculata* Guill. & Perrott., *Acacia tortilis* (Forsskal) Hayne *ssp. raddiana* (Savi) Brenan, *Acacia tortilis* Hayne var. *pubescent* A. Chev.

Common names. Hassaniya: talha; Pulaar: djilouki; Wolof: seing; French: faux gommier, verék; English: umbrella acacia.

Family. Leguminosae, Mimosaceae.

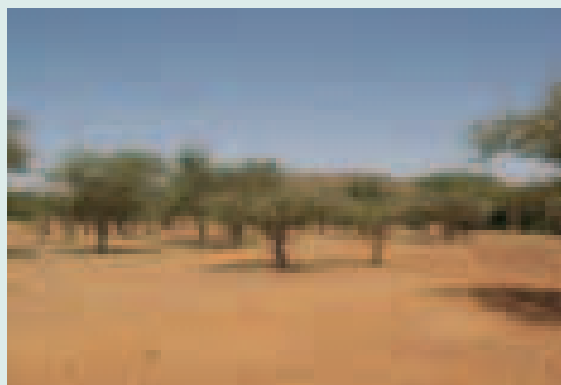
Characteristics. The most widespread tree in Mauritania, it reaches a height of 10 to 15 m, with a hemispheric or spreading crown and hanging branches. Its axillary 2- to 10-cm-long thorns are grouped in pairs. The leaves are alternating and bipinnate, with two to five pairs of pinnules, having six to fifteen pairs of folioles. The highly scented flowers take the form of whitish to pale yellow balls, with characteristically spiral seedpods 10 cm long and 0.5 cm broad.

Distribution. A tree found in the arid and semi-arid regions to the south and north of the Sahara, it grows on sandy or at least deep soils. It is exceptionally drought-resistant, growing with annual rainfall of between 50 and 1 000 mm despite long periods of drought and very high daytime temperatures and night-time temperatures close to 0 °C.

Multiplication. A pioneer species that regenerates well through shoots from the stool or through seeds. There are about 14 000 seeds in 1 kg. In order to obtain good germination in nurseries, seeds are first soaked either for a few moments in sulphuric acid or for several hours in hot or cold water. However, their growth on-site is fairly slow during the first years.

Uses. The species provides excellent fuelwood and wood for charcoal with a high calorific value. It fixes and enriches the soil in nitrogen. It is a particularly useful species for reforestation and dune fixation in zones that have been fairly well mechanically stabilized and protected. It is used to make fences and also supplies poles for construction. It is a good fodder species, and its leaves and seedpods are highly sought after by both domestic and wild animals. It is also used in traditional medicine (as a vermifuge and to treat skin ailments, using the leaves and bark, which contain tannin).

SPECIES USED ON INLAND DUNES

***Acacia senegal* (L.) Willd.**Natural stand of *Acacia senegal**Acacia senegal* branch

Main sources. von Maydell, 1983; Jaouen, 1988; Centre Technique Forestier Tropical, 1989.

Other scientific names. *Acacia verec* Guill. & Perrott., *Acacia rupestris* Stokes, *Acacia trispinosa* Stokes, *Mimosa senegal* L.

Common names. Hassaniya: ewrwar, eirwar; Pulaar: patouki; Wolof: verec; French: gommier; Sudanese: hashab; English: gum Arabic acacia.

Family. Leguminosae, Mimosaceae.

Characteristics. Gum Arabic acacias are bushes or small trees, reaching heights of 4 to 6 m, with a bole about 30 cm in diameter. The branches are generally highly ramified starting from the base. The small blackish thorns are grouped in threes at the base of the leaves. The fruit is a dehiscent seedpod 10 cm long containing three to eight flat, light-brown seeds. There are about 12 000 seeds in 1 kg. The highly scented flowers are arranged in 3- to 8-cm-long spikes. The root system generally involves a tap-root that is moderately developed for a dry-zone species, with very long lateral roots that colonize the upper layers of soil, stretching up to 15 m from the trunk. The species rarely lives for more than 25 or 30 years.

Distribution. A species typical of the African Sahel from the Atlantic Ocean to the Red Sea, it grows between the 100 and 750 mm rainfall isohyets with average annual temperatures of 30 °C, but cannot withstand frosts. It is well adapted to long periods – eight to eleven months – of drought and prefers well drained sandy soils.

Multiplication. Similarly to *Acacia raddiana*, the seeds have to be treated prior to sowing, whether in nurseries or directly on-site.

Uses. The species supplies the best gum Arabic, which is particularly prized for use in certain culinary dishes, human and veterinary medicine, and the pharmaceutical, cosmetics and chemical sectors (good-quality glue for stamps and envelopes). Its timber is well suited for use both as lumber and as fuelwood, since it has a high calorific value. Thanks to its highly ramified lateral roots, *Acacia senegal* is effective in fixing the soil and is often used in agroforestry. It is much appreciated by livestock, particularly the young seedpods – which is a disadvantage for natural regeneration of the species.

SPECIES USED ON INLAND DUNES

***Balanites aegyptiaca* (L.) Delile**

M. OULD MOHAMMED

Balanites aegyptiaca seedling

Main sources. von Maydell, 1983; Jaouen, 1988.

Other scientific names. *Ximenia aegyptiaca* L., *Agialida senegalensis* van Tiegh., *Agialida barteri* van Tiegh., *Agialida tombuctensis* van Tiegh., *Balanites ziziphoides* Mildbr. & Schlechter.

Common names. Hassaniya: teichott; Pulaar: murtoki; Wolof: soump; French: dattier du désert; English: desert date, Egyptian balsam.

Family. Balanitaceae.

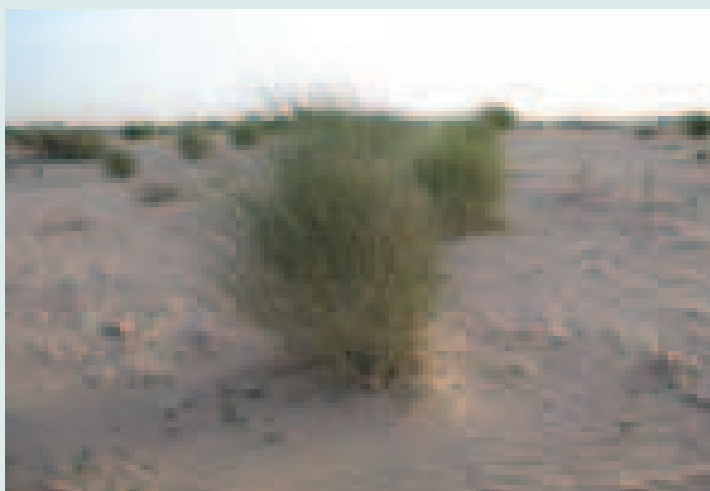
Characteristics. A small tree, seldom exceeding 10 m in height and with a diameter of 30 cm, it has a rounded or oval crown. It has a large tap-root and large, strong thorns that are often 8 cm long. Its leaves are bifoliolate with ovoid folioles that are entire and have strong veins. The flowers are a greenish yellow, but fairly inconspicuous. Its fruit grows in date-like drupes and is edible, although slightly laxative. Its seeds vary considerably in size and weight, with from 500 to 1 500 in 1 kg. It is slow growing and takes a number of years before reaching harvestable size.

Distribution. The species is found throughout the Sahelian region and is frequent in the Sudan and the Sahara, except in extremely arid zones. It is a very hardy, adaptable, drought-resistant species, growing equally well on slightly modified dunes and in alluvial valley bottoms, although it does not tolerate areas that are flooded for long periods.

Multiplication. Seeds gathered from livestock excreta germinate very well. Otherwise, they have to be soaked for ten minutes in hot water or for a day in cold water. Seeds are generally sown in nurseries or directly on-site during the rainy season. *Balanites* can also be multiplied through suckers.

Uses. The species has many uses and is held in high regard by the local inhabitants. Its pale to brownish yellow wood is heavy and insect-resistant, and is prized for making tools and small farm implements, and also as construction timber. It provides excellent fuelwood and charcoal. It can be planted as hedges and live fences. Cattle, sheep and camels eat its leaves and fruit, while people eat its fruit and kernels. In traditional medicine, the bark, roots, fruit and leaves are often used to treat diarrhoea, stomach ache, sterility, mental disorders, yellow fever and toothache. Oil for culinary and medicinal use is extracted by pressing the kernels.

SPECIES USED ON INLAND DUNES

***Leptadenia pyrotechnica* (Forsskal) Decne.**

M. OULD MOHAMMED

Leptadenia pyrotechnica seedling

Main sources. von Maydell, 1983; Jaouen, 1988.

Other scientific name. *Leptadenia spartium* Wight.

Common names. Hassaniya: titarek, assabay; Wolof: thiekhet, cexet; French: genêt d'Afrique; English: broom bush, desert broom.

Family. Asclepiadaceae.

Characteristics. A bush growing to a height of 1 to 4 m, almost leafless, with green branches reminiscent of European brooms (to which it is not related). Its colourless latex is sparse. Its branches are erect, cylindrical, smooth and pale green. Its flowers are small – 4 mm long – and greenish yellow, grouped in cymes. Its fruit are very narrow, smooth follicles between 6 and 12 mm long and 6 to 8 mm broad. The seeds are flat and oval shaped, with a coma.

Distribution. North Senegal, Mauritania, Niger, Chad, Mali, and the Sahara as far as the Arabian peninsula. It is a plant that grows more on fixed dunes than on live dunes. In the Sahel, its abundance is an indication of environmental degradation following overgrazing.

Multiplication. From seeds sown in nurseries or in the natural environment.

Uses. Grazed by camels but rarely by sheep and goats, and avoided by cattle. Its pith is used as tinder, hence its Latin name. Fishing lines are made from the fibres in its bark. In medicine, the sap of the plant is used as a friction against smallpox and its soaked seeds are used to make an eyewash. The young leaves are used in a sauce for couscous known as *mbumu cexet* in Wolof, and as a substitute for *Moringa oleifera* or *Crataeva religiosa* in other couscous dishes. *Leptadenia* is often planted to fix dunes in the Sahel.

SPECIES USED ON INLAND DUNES

***Prosopis juliflora* (Sw.) DC.***Prosopis juliflora* stand

Main sources. von Maydell, 1983; Jaouen, 1988; Centre Technique Forestier Tropical, 1989.

Other scientific name. *Mimosa juliflora* Swartz.

Common names. Hassaniya: groun lemhada; Pulaar: prosopis; Wolof: prosopis, dakhar, daqar u tubab; French: prosopis; English: honey mesquite.

Family. Leguminosae, Mimosaceae.

Characteristics. A tree reaching a height of 12 to 15 m, with a short bole that can reach 1 m in diameter. It has large numbers of thorns about 1 to 5 cm long. Its leaves are alternate and biparipinnate, with a rachis bearing two or three pairs of pinnules each with 8 to 15 pairs of folioles and no terminal foliole. The young branches are green. The golden yellow flowers grow in small, scented cylindrical spikes. The seedpods are 10 to 20 cm long, containing about 15 seeds, and there are roughly 15 000 seeds in 1 kg. Its root system is very deep, sometimes reaching a depth of 50 m, while its lateral roots grow very close to the surface and often reach a distance of 20 m from the trunk, trapping the morning moisture. In average environmental conditions, it grows between 50 and 60 cm in height per year for the first ten years, then progressively less, until it stops growing in about its fifteenth year. It often lives for more than one hundred years.

Distribution. It is a native of the coastal regions of Latin North America, Central America, Mexico and the West Indies. It is cultivated throughout the tropics and adapts very well to dry zones thanks to its tap-root system. It tolerates high temperatures, low rainfall, and poor, saline soil. It prefers sandy soil, but grows poorly on laterite ironstone and in poorly drained ground.

Multiplication. The species has a great capacity for putting out new shoots and suckers. In order to ensure good germination, prior to sowing in nurseries or directly on-site, seeds are treated by soaking them either in a 20 percent sulphuric acid mixture or in boiling and then cooled water. The species is also disseminated by domestic and wild animals after consumption of the ripe seedpods. Spacing at planting time varies depending on rainfall: from 10 × 10 where rainfall is low to 5 × 5 m where it is heavy. If *Prosopis juliflora* stands are not monitored and properly managed, the species can easily become invasive, especially in sandy zones where the water table is close to the surface.

Uses. The species is a good source of fodder in the form of both leaves and seedpods. When ground, the seedpods provide a flour for both human and livestock consumption. It provides excellent fuelwood and wood for charcoal, poles, floorboards, carpentry, seating, other rustic furniture and barrels. Bees particularly like its flowers and produce very good honey. It is often used to fix very mobile strip dunes, and in plantations to supply fuelwood, wood for charcoal and construction timber. It is also very useful for hedges and fences. However, if it is very densely planted, it prevents growth of the grassy layer because of competition from its spreading root system and the fact that it prevents enough light from reaching the ground. In traditional medicine, its steeped bark is used as an antiseptic in the treatment of ulcers.

SPECIES USED ON INLAND DUNES

***Panicum turgidum* Forsskal**

Panicum turgidum plant

Main source. FAO, 1977.

Other scientific names. -

Common names. Hassaniya: mrokba; English: desert grass.

Family. Graminaceae, Paniceae tribe.

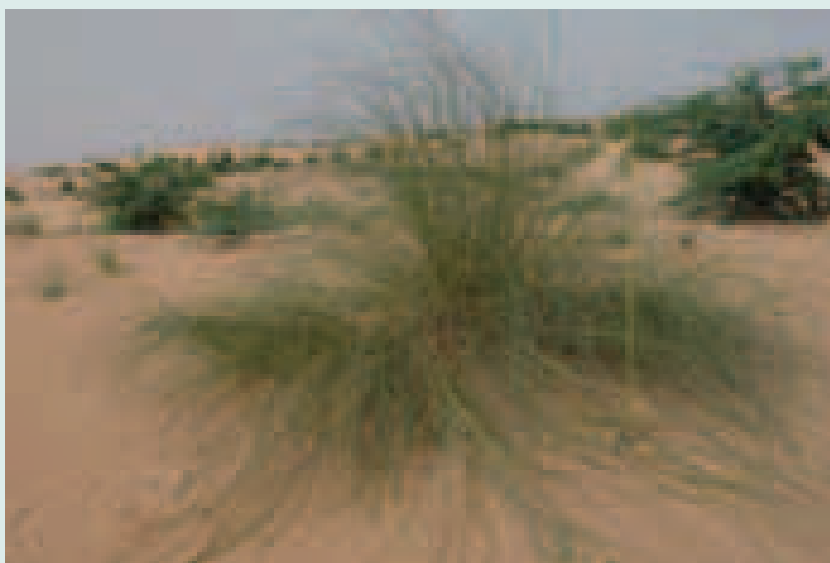
Characteristics. A ramified perennial grass, growing in large clumps, which can reach heights of 1 to 2 m.

Distribution. From Mauritania and northern Senegal to the Sudan and Ethiopia, northern Africa, Libya, Egypt, Iraq, Iran, Pakistan.

Multiplication. Through sowing in nurseries and on-site.

Uses. Like *Aristida pungens*, this fast-growing drought-resistant grass is widely used in the biological fixation of inland dunes in deflation or more stable zones in combination with *Leptadenia pyrotechnica*, *Aristida pungens* and various acacias. It is used in craftwork by the local inhabitants, and is greatly appreciated by livestock, particularly camels.

SPECIES USED ON INLAND DUNES

***Aristida pungens* (Desf.) de Winter**

Aristida pungens plant

Main source. FAO, 1977.

Other scientific name. *Stipagrostis pungens* Desf.

Common names. Hassaniya: sbot; Arabic: drinn; English: three-awn grass.

Family. Poaceae, Aristideae tribe.

Characteristics. A perennial grass with an elongated, oblique, ramified rhizome. Its roots are very hairy and spread widely. Its culms are often more than 1 m in height.

Distribution. North Africa from Mauritania (mainly in the Adrar *wilaya* at Erch Guible, Tenouchert, N'terguint and Touerga) to Egypt and the Arabian peninsula; also central Asia.

Multiplication. By sowing in nurseries and on-site, and also from root cuttings.

Uses. This grass is widely used in the biological fixation of inland dunes. It spreads easily over very mobile strip dunes and in deflation zones, in association with *Prosopis juliflora*.

SPECIES USED ON COASTAL DUNES

***Nitraria retusa* Forsskal Asch.**

M. OULD MOHAMMED

Nitraria retusa bush

Main source. Jaouen, 1988.

Other scientific name. *Nitraria tridentata* Forsskal.

Common names. Hassaniya: aguerzim; Pulaar: guiyel goti; English: salt tree.

Family. Zygophyllaceae.

Characteristics. An evergreen thorny bush reaching a height of 1.5 m, with roughly triangular, alternating, fleshy leaves of varying colours – green, yellow or red. The flowers are yellowish and the fruit red. It often accumulates sand in the form of *nebkas*, which are sometimes large. It is linked to gypseous or saline soil. The species also indicates a fairly shallow water table. Its root system is powerful, with a tap root. However, it is slow growing.

Distribution. Mediterranean in origin, in Mauritania *Nitraria retusa* is confined to coastal zones where the water table has become brackish. Thus it flourishes from Cap Blanc to the lower delta of the Senegal river. It is also found in Zemmour *wilaya*.

Multiplication. From seeds in nurseries and in the natural environment. It has a good germination capacity.

Uses. The species is much grazed by camels. Its fruit, which is watery and slightly sweet, is edible. It is used for the biological fixation of coastal dunes and the regeneration of saline grazing land.

SPECIES USED ON COASTAL DUNES

Tamarix aphylla

M. OULDI MOHAMED

Tamarix aphylla tree

Main source. Jaouen, 1988.

Other scientific names. -

Common names. Hassaniya: tharfa; Wolof: mburndu, ngedj; French: tamarix; English: tamarisk.

Family. Tamaricaceae.

Characteristics. Its habit is arborescent. The young branches are greyish green with a filamentous aspect and are often dust-covered because the leaves excrete mineral salts absorbed by the roots and then trap dust suspended in the air. It forms adventitious roots on its trunk and sand-covered branches. It is fast growing, especially when young.

Distribution. In Mauritania, tamarisk is found mainly along the sea coast between Rosso and Nouadhibou. It needs a great deal of water, but does tolerate high salinity – which is why it is found near *sebkhas* (salty swampland at the bottom of depressions), coastal dunes and brackish wadis. It is often found in urban parks.

Multiplication. It is regenerated mainly through cuttings in nurseries (with a height of 15 cm) or directly on dune soil (with heights of 140 cm on the tops of dunes, 120 cm on the sides and 80 cm in depressions). It is also multiplied through suckers, by covering down-curving stalks with damp sand.

Uses. Species used to fix sand and also to protect against sand-bearing winds. Its wood is a mediocre fuel, but can be used as construction timber (poles). Thanks to its capacity for vegetative regeneration, it can be coppiced with a three- to four-year cycle. Livestock tend not to graze tamarisk. Its fruit seems effective as an infusion against colds.

Annex 2

Administrative supervision and project management charts

The 10 tables in this annex are taken from the report “Bilan général des réalisations de la campagne 2007 et synthèse des activités 2000-2007”, undertaken by the Support for the Rehabilitation and Extension of the Nouakchott Green Belt Project (FAO, 2008). They serve as a model, but clearly may be improved upon by project leaders.

TABLE 1
Timetable of work

Objectives and activities	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Leaders
Maintenance and renewal of already established tree cover												
A.1 Review and evaluation of existing plantations												100% completed during the season
A.2 Establishment of a simple management plan												
<i>2.1 Intervention zone (location)</i>												
Silvicultural treatment and harvesting of plant matter for mechanical stabilization		xxxx	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx		National coordinator (supervision) and works coordinator
Ongoing training of staff		xxxx	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx		Forestry experts and harvesting staff
A.3 Field activities												
<i>3.1 Plant nursery (location)</i>												
Supply of new substratum		xx										National coordinator (supervision)
Seed acquisition mission		x										Works coordinator
General infrastructure, beds to store pouches and bare roots, substratum, filling pouches and bare-root raised beds		xxxx										Nursery worker, labourers and guard
Sowing for production of seedlings			xxxx	xxxx								
Daily maintenance: watering, root pruning, etc., guarding			xxxx	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx			
Ongoing training of staff		xxxx	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx			
<i>3.2 Village nursery (location)</i>												
General infrastructure, beds to store pouches, supply of substratum, filling of pouches, sowing, production of seedlings				xxxx	xxxx	xxxx						Authorities, community, technical support and hand tools organized by the project
Daily maintenance: watering, root pruning, etc., guarding			xxxx	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx			Community, technical support and hand tools organized by the project
Guidance and training of the community	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx	Technical support and hand tools organized by the project
<i>3.3 Mechanical stabilization and biological fixation of dunes</i>												
<i>3.3.1. Inland dune intervention zone (location)</i>												
Definition of area, topographical survey and mapping	xx											National coordinator (supervision), surveyor and cartographer
Cutting and transport of plant matter and installation of fences and wattling linear metres		xxxx	xxxx	xxxx	xxxx	xxxx			xxxx	xxxx		Works coordinator with guidance from forestry expert
Planting seedlings, watering if necessary, direct sowing							xxxx	xxxx				Workers with guidance from forestry expert
Ongoing training of field staff		xxxx	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx		Team leaders, field staff
Guarding	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx	Guards
<i>3.3.2. Inland dune intervention zone (location)</i>												
Completion of internal wattling ... linear metres		xxxx	xxxx									idem 3.3.1.
Restocking seedlings, direct sowing							xxxx	xxxx				
<i>3.3.3. Whole intervention zone (location)</i>												
Guarding	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx	Guards

(continues)

TABLE 1 (continued)

Objectives and activities	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Leaders
3.3.4. Village intervention zone participatory approach (location)												
Cutting and transport of plant matter, installation of wattling and reinforcement of boundary fence ... linear metres				xxxx								Community, technical support and hand tools organized by the project
Planting and restocking seedlings, watering, if necessary, within the intervention zone							xxxx	xxxx				Community, technical support and hand tools organized by the project
Guidance and training of the community	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx	Team leaders, field staff
Guarding	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx	Guards
Trials of coastal dune fixation techniques												
A.1 Production of halophytic species												
Plant nursery (location): production of seedlings, monitoring		xxxx	xxxx	xxxx	xxxx	xxxx						See 3.1. Plant nursery
A.2 Coastal dune intervention zone												
Strengthening and maintenance of existing infrastructure, mainly of seafront fencing linear metres						xxxx						National coordinator, works coordinator, forestry expert, field staff
Restocking seedlings, watering if necessary							xxxx	xxxx				Guard, national NGO
Guarding	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx	Guards
Project management activities												
A.1 Timetable of work and annual budget												
	xxx	x										International consultant, national coordinator
A.2 Monthly budget, annual balance sheet (expenditure, balance)												
	x	x	x	x	x	x	x	x	x	x	x	National coordinator, administration
A.3 Monthly compilation of climatic data, work progress records, staff attendance sheets, salaries, etc.												
	x	x	x	x	x	x	x	x	x	x	x	National coordinator, works coordinator, meteorological service
A.4 Programme and project management monitoring missions												
	xxx	x				xx				xx	xx	International consultant, national coordinator
A.5 Six-monthly reports on project progress												
					xx						xx	National coordinator, works coordinator
A.6 Annual financial report, wrap-up report and project completion report												
										xx	xx	National coordinator, works coordinator and international consultant
A.7 Drafting national-level project document												
						xxxx						Consultants, stakeholders
A.8 Leaflet, poster on project goals and achievements												
								xxxx				Project, NGO, others

TABLE 2
Contribution of the donor government

Code	Item	Staff	Budget (US\$)	Remarks
....	1. Administrative service staff salaries			Financial year
	Drivers	33 person-months	11 910	Salaries
	Drivers		300	Medical examination expenses
	Subtotal		12 210	
....	2. Consultants			
	International consultant	10 weeks	11 250	Period to be determined
	National consultant	12 person-months	18 000	National project coordinator's salary
	National consultant	12 person-months	12 000	Works coordinator's salary
	National consultants		200	Medical examination expenses
	Subtotal		41 450	
....	3. Contracts			
	Topographic survey, mapping, miscellaneous		1 000	Area
	Leaflet, photos, film, support workshop		2 000	Coordination with national NGO
	Subtotal		3 000	
....	4. Field staff costs			From march to end november 2007
	Plant nursery labour	2 694 person-days	9 543	
	Field labour	9 688 person-days	33 348	Mechanical stabilization, harvesting, biological fixation
	Guards	4 877 person-days	16 788	
	National staff allowances		7 317	2 technicians, 3 drivers, 1 guard, others
	Subtotal		66 996	
....	5. Travel			
	International consultant		18 000	Plane tickets, daily subsistence allowance
	Subtotal		18 000	
....	6. Training			
	Workshop on project benefits		5 000	2 days, period to be determined
	Subtotal		5 000	
....	7. Permanent equipment			Local purchase
	1 Power pump for plant nursery		600	
	Subtotal		600	
....	8. Expendable equipment			Local purchase
	Nursery		2 000	Pouches, seed, watering hoses, miscellaneous
	Stabilization and harvesting, dune fixation		1 500	Two 1000-litre cisterns, gloves, miscellaneous
	Subtotal		3 500	
....	9. Technical support for the project			
	Technical support mission, others		0	
	Subtotal		0	
....	10. Operating costs			
	Running and maintaining vehicles		8 691	+ 16 309 over 2006 budget balance; total US\$25 000
	Office supplies		500	
	Telephone, fax, e-mail, etc.		2 000	
	Subtotal		11 191	+ 16 309 over 2006 budget balance; total US\$27 500
	Total 1 to 10		161 947	
....	Agency fees		21 053	13%
	Overall total budget for current financial year		183 000	

TABLE 3
Staff requirements and budget estimate

3.1 Plant nursery (location)

	Person-days	No. of days	Total person-days	Person-day salary (UM)	Total salary (UM)	Total salary (US\$)
1. Team leader						
01.01 to 30.11	1	334	334	1 150	384 100	1 419
2. Labourers						
01.03 to 31.03	20	26	520	931.5	484 380	1 790
01.04 to 31.07	10	184	1 840	931.5	1 713 960	6 334
Total			2 360		2 198 340	8 124
3. Total (1+2)			2 694		2 582 440	9 543

Estimated average exchange rate: US\$1 = 270.61 UM.

Production: 45 000 seedlings.

3.2 Mechanical stabilization, harvesting and biological fixation (location)

	Person-days	No. of days	Total person-days	Person-day salary (UM)	Total salary (UM)	Total salary (US\$)
1. Team leader						
01.03 to 31.07*	2	141	282	931.5	262 683	971
01.10 to 30.11*	2	57	114	931.5	106 191	392
01.08 to 30.09**	2	56	112	931.5	104 328	386
Total		254	508	931.5	473 202	1 749
2. Labourers						
01.03 to 31.03*	30	26	780	931.5	726 570	2 685
01.04 to 31.07*	40	105	4 200	931.5	3 912 300	14 457
01.10 to 30.11*	40	53	2 120	931.5	1 974 780	7 298
01.08 to 30.09**	40	52	2 080	931.5	1 937 520	7 160
Total		236	9 180	931.5	8 551 170	31 600
3. Total (1+2)						
01.03 to 30.11			9 688		9 024 372	33 348

Estimated average exchange rate: US\$1 = 270.61 UM.

* Mechanical stabilization (cutting, transport and installation of plant matter) over ha.

+/- linear metres per hectare, i.e. a total of metres.

* Harvesting in mature stands.

** Biological fixation.

Item	Stabilization	Fixation	Total
No. of person-days	7 496	2 192	9 688
US\$	25 803	7 546	33 349

3.3 Guarding intervention zones

Areas	Person-days	No. of days	Total person-days	Person-day salary (UM)	Total salary (UM)	Total salary (US\$)
Inland dunes (location)						
01.01 to 28.02	8	59	472	931.5	439 668	1 625
01.03 to 31.12	12	306	3 672	931.5	3 420 468	12 640
01.07 to 31.12	2	184	368	931.5	342 792	1 267
Total			4 512	931.5	4 202 928	15 531
Coastal dunes (location)	1	365	365	931.5	339 998	1 257
Total			4 877		4 542 926	16 788

Estimated average exchange rate: US\$1 = 270.61 UM.

3.4 Administrative staff

	Person-days	No. of months	Total person-month	Person-month salary (UM)	Total salary (UM)	Total salary (US\$)
Drivers 1 & 2	2	11	22	111 000	2 442 000	9 024
Driver 3	1	11	11	71 000	781 000	2 886
Total			33		3 223 000	11 910

Estimated average exchange rate: US\$1 = 270.61 UM.

TABLE 4
Annual production of seedlings according to species and production method

Nursery seedling production (location)

No. of seed bed	Production method	No. of seedlings	Species	Date of sowing	Date of germination	No. of seedlings germinated
1	Pouch	1 000	<i>Panicum turgidum</i>	15 Apr	20 Apr	965
2	Pouch	1 000	<i>Panicum turgidum</i>	15 Apr	20 Apr	972
3	Pouch	1 000	<i>Acacia raddiana</i>	16 Apr	22 Apr	930
4	Pouch	1 000	<i>Acacia raddiana</i>	16 Apr	23 Apr	910
5	Pouch	1 000	<i>Acacia raddiana</i>	16 Apr	23 Apr	926
6	Pouch	1 000	<i>Acacia raddiana</i>	16 Apr	22 Apr	967
7 etc.	Pouch	1 000	<i>Acacia senegal</i>	17 Apr	24 Apr	935
11 etc.	Pouch	1 000	<i>Aristida pungens</i>	20 Apr	25 Apr	757
19 etc.	Bare roots		<i>Prosopis juliflora</i>	10 May	14 May	960
24 etc.	Pouch	1 000	<i>Panicum turgidum</i>	15 Apr	20 Apr	948
29 etc.	Pouch	1 000	<i>Prosopis juliflora</i>	10 May	13 May	984
41 etc.	Pouch	1 000	<i>Leptadenia pyrotechnica</i>	18 Apr	25 Apr	783
47 etc.	Pouch	1 000	<i>Aristida pungens</i>	20 Apr	26 Apr	856
50	Pouch	1 000	<i>Acacia senegal</i>	17 Apr	24 Apr	944
51	Pouch	1 000	<i>Acacia senegal</i>	17 Apr	25 Apr	928
52*	Cutting	800	<i>Tamarix aphylla</i>	Jun		500

* Last bed.

Total production for the season 44 250.

Acacia raddiana: 3 500 seedlings, polyethylene pouch, 8%.

Acacia senegal: 5 300 seedlings, polyethylene pouch, 12%.

Prosopis juliflora: 16 800 seedlings, polyethylene pouch, 38%.

Prosopis juliflora: 2 300 seedlings, bare roots, 5%.

Aristida pungens: 7 150 seedlings, polyethylene pouch, 16%.

Leptadenia pyrotechnica: 3 700 seedlings, polyethylene pouch, 9%.

Panicum turgidum: 4 950 seedlings, polyethylene pouch, 11%.

Tamarix aphylla: 500 seedlings, cutting in pouch, 1%.

TABLE 5
Number of person-days and progress of mechanical stabilization work (location)

Month	Boundary		Counter-dunes		Wattling		Total		Maintenance	
	Person-day	Linear m	Person-day	Linear m	Person-day	Linear m	Person-day	Linear m	Person-day	Linear m
January										
Subtotal	0	0	0	0	0	0	0	0	0	0
Cumulative subtotal	0	0	0	0	0	0	0	0	0	0
February										
Subtotal	0	0	0	0	0	0	0	0	0	0
Cumulative subtotal	0	0	0	0	0	0	0	0	0	0
March										
01 to 02	0	0	0	0	0	0	0	0	0	0
04 to 09	65	378	0	0	0	0	65	378	0	0
11 to 16	71	461	0	0	0	0	71	461	0	0
18 to 23	92	365	0	0	0	0	92	365	0	0
25 to 30	60	297	0	0	0	0	60	297	0	0
Subtotal	288	1 501	0	0	0	0	288	1 501	0	0
Cumulative subtotal	288	1 501	0	0	0	0	288	1 501	0	0
April										
01 to 06	80	517	0	0	0	0	80	517	0	0
08 to 13	96	655	0	0	0	0	96	655	0	0
15 to 20	88	545	0	0	0	0	88	545	0	0
22 to 27	114	576	0	0	0	0	114	576	0	0
29 to 30	38	183	0	0	0	0	38	183	0	0
Subtotal	416	2 476	0	0	0	0	416	2 476	0	0
Cumulative subtotal	704	3 977	0	0	0	0	704	3 977	0	0
May										
01 to 04	51	293	0	0	0	0	51	293	0	0
06 to 11	115	485	0	0	0	0	115	485	0	0
13 to 18	112	508	0	0	0	0	112	508	0	0
20 to 25	0	0	190	1 223	0	0	190	1 223	0	0
27 to 31	0	0	190	1 194	0	0	190	1 194	0	0
Subtotal	278	1 286	380	2 417	0	0	658	3 703	0	0
Cumulative subtotal	982	5 263	380	2 417	0	0	1 362	7 680	0	0
June										
01	0	0	0	0	0	0	0	0	0	0
03 to 08	0	0	203	1 317	0	0	203	1 317	0	0
10 to 15	0	0	224	1 336	0	0	224	1 336	0	0
17 to 22	0	0	185	932	0	0	185	932	0	0
24 to 29	0	0	230	1 409	0	0	230	1 409	0	0
Subtotal	0	0	842	4 994	0	0	842	4 994	0	0
Cumulative subtotal	982	5 263	1 222	7 411	0	0	2 204	12 674	0	0
July										
01 to 06	0	0	79	590	149	917	228	1 507	0	0
08 to 13	0	0	0	0	231	1,239	231	1 239	0	0
15 to 20	0	0	0	0	235	1,695	235	1 695	0	0
22 to 27	0	0	0	0	232	1,490	232	1 490	0	0
29 to 31	0	0	0	0	117	871	117	871	0	0
Subtotal	0	0	79	590	964	6 212	1 043	6 802	0	0
Cumulative subtotal	982	5 263	1 301	8 001	964	6 212	3 247	19 476	0	0
August										
01 to 03	0	0	0	0	58	275	58	275	0	0
05 to 10*	0	0	0	0	0	0	0	0	0	0
Subtotal	0	0	0	0	58	275	58	275	0	0
Cumulative subtotal	982	5 263	1 301	8 001	1 022	6 487	3 305	19 751	0	0

(continues)

TABLE 5 (continued)

Month	Boundary		Counter-dunes		Wattling		Total		Maintenance	
	Person-day	Linear m	Person-day	Linear m	Person-day	Linear m	Person-day	Linear m	Person-day	Linear m
Sept*										
Subtotal	0	0	0	0	0	0	0	0	0	0
Cumulative subtotal	982	5 263	1 301	8001	1 022	6 487	3 305	19 751	0	0
October										
01 to 05*	0	0	0	0	0	0	0	0	0	0
07 to 12	39	205	105	770	60	391	204	1 366	0	0
14 to 19	20	100	72	590	147	840	239	1 530	0	0
21 to 26	0	0	32	260	163	1 238	195	1 498	0	0
28 to 31	0	0	0	0	117	870	117	870	0	0
Subtotal	59	305	209	1 620	487	3 339	755	5 264	0	0
Cumulative subtotal	1 041	5 568	1 510	9 621	1 509	9 826	4 060	25 015	0	0
November										
Subtotal	0	0	0	0	0	0	0	0	0	0
Cumulative subtotal	1 041	5 568	1 510	9 621	1 509	9 826	4 060	25 015	0	0
December										
Subtotal	0	0	0	0	0	0	0	0	0	0
Cumulative subtotal	1 041	5 568	1 510	9 621	1 509	9 826	4 060	25 015	0	0
Overall total	1 041	5 568	1 510	9 621	1 509	9 826	4 060	25 015	0	0
Average/person/day		5.3		6.4		6.5		6.2		0.0

* Planting season.

TABLE 6
Balance sheet for the planting and restocking season

6.1 Planting area (.... ha)

Date	Acacia <i>raddiana</i> Pouch	Acacia <i>senegal</i> Pouch	Leptadenia <i>pyrotechnica</i> Pouch	Prosopis <i>juliflora</i>		Aristida <i>pungens</i> Pouch	Panicum <i>turgidum</i> Pouch	Total		No. of workers
				Pouch	Bare roots			Pouch	Bare roots	
1 Aug*	0	0	0	0	0	0	0	0	0	20
2 Aug	50	50	0	0	0	20	20	140	0	39
5 Aug	200	200	0	200	0	200	0	800	0	41
etc. until										
4 Oct	0	0	220	190	0	0	0	410	0	39
5 Oct**	0	10	210	0	0	0	0	220	0	40
Total 1	3 020	2 040	4 365	8 795	0	5 700	3 535	27 455	0	2 187

* Start of season.

** End of season.

6.2 Restocking area

Date	Acacia <i>raddiana</i> Pouch	Acacia <i>senegal</i> Pouch	Leptadenia <i>pyrotechnica</i> Pouch	Prosopis <i>juliflora</i>		Aristida <i>pungens</i> Pouch	Panicum <i>turgidum</i> Pouch	Total		No. of workers
				Pouch	Bare roots			Pouch	Bare roots	
28 Sept	0	0	0	200	0	0	0	200	0	42
30 Sept	375	125	0	0	0	0	0	500	0	41
Total 2	375	125	0	200	0	0	0	700	0	83

6.3 Overall performance: planting and restocking season

Status	Acacia <i>raddiana</i> Pouch	Acacia <i>senegal</i> Pouch	Leptadenia <i>pyrotechnica</i> Pouch	Prosopis <i>juliflora</i>		Aristida <i>pungens</i> Pouch	Panicum <i>turgidum</i> Pouch	Total		No. of workers
				Pouch	Bare roots			Pouch	Bare roots	
Total 1	3 020	2 040	4 365	8 795	0	5 700	3 535	27 455*	0	2 187**
Total 2	375	125	0	200	0	0	0	700	0	83
Total	3 395	2 165	4 365	8 995	0	5 700	3 535	28 155	0	2 270
Overall total									28 155	

* i.e. 177 seedlings per hectare (total ha).

** i.e. 12.5 seedlings per person-day.

TABLE 7
Workers' attendance and salary sheets

7.1 Plant nursery

Location:

Code:

Nature of work: **General maintenance**

* = Team leader

Year, month 1st to 15th

H = Holiday

Name of worker	Date															
		1	2	3	4	5	6	H 7	8	9	10	11	12	13	H 14	15
1. A *		1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
2. B		1	1	1	1	1	1		1	1	1	1	1	1		1
3. C		1	1	1	1	1	1		1	1	1	1	1	1		1
4. D		1	1	1	1	1	1		1	1	1	1	1	1		1
5. E		1	1	1	1	1	1		1	1	1	1	1	1		1
6. F		1	1	1	1	1	1		1	1	1	1	1	1		1
7. G		1	1	1	1	1	1		1	1	1	1	1	1		1
8. H		1	1	1	1	1	1		1	1	1	1	1	1		1
9. I		1	1	1	1	1	1		1		1	1	1	1		1
10. J		1	1	1	1	1	1		1	1	1	1	1	1		1
11. K		1	1	1	1	1	1		1	1	1	1	1	1		1
12. L		1	1	1	1	1	1		1	1	1	1	1	1		1
13. M		1	1	1	1	1	1		1	1	1	1	1	1		1
14. N		1	1	1	1	1	1		1	1	1	1	1	1		1
Total person-days		14	14	14	14	14	14	1	14	13	14	14	14	14	1	14
Total UM																
Employer's contribution 15%																
Overall total UM																
UM/US\$ exchange rate																
Total US\$																

Date and signature of Works Coordinator:

Date and signature of Project Coordinator:

7.2 Field team 1

Location:

Code:

Nature of work: **Mechanical dune stabilization**

* = Leader of team 1

Year, month 1st to 15th

H = Holiday

Name of worker	Date															
		1	2	3	4	5	6	H 7	8	9	10	11	12	13	H 14	15
1. A*		2	1	1	1	1	1		1	1	1	1	1	1		1
2. B		1	1	1	1	1	1		1	1	1	1	1	1		1
3. C		1	1	1	1	1	1		1	1	1	1	1	1		1
4. D		1	1	1	1	1	1		1	1	1	1	1	1		1
5. E		1	1	1	1	1	1		1	1	1	1	1	1		1
etc. up to 20. T																
20. T		1	1	1	1	1	1		1	1	1	1	1	1		1
Total person-days		19	20	20	20	20	20	0	18	20	20	20	20	20	0	19
Total UM																
Employer's contribution 15%																
Overall total UM																
UM/US\$ exchange rate																
Total US\$																

Date and signature of Works Coordinator:

Date and signature of Project Coordinator:

Total days present	Daily salary (UM)	Gross salary (UM)	Leave 1 month/yr	Salary 15 days (UM)	Social Security Fund 1%	Net salary (UM)	Worker's signature
15	1 000	15 000	1 250	16 250	163	16 088	
13	810	10 530	878	11 408	114	11 293	
13	810	10 530	878	11 408	114	11 293	
13	810	10 530	878	11 408	114	11 293	
13	810	10 530	878	11 408	114	11 293	
13	810	10 530	878	11 408	114	11 293	
13	810	10 530	878	11 408	114	11 293	
13	810	10 530	878	11 408	114	11 293	
13	810	10 530	878	11 408	114	11 293	
12	810	9 720	810	10 530	105	10 425	
13	810	10 530	878	11 408	114	11 293	
13	810	10 530	878	11 408	114	11 293	
13	810	10 530	878	11 408	114	11 293	
13	810	10 530	878	11 408	114	11 293	
13	810	10 530	878	11 408	114	11 293	
13	810	10 530	878	11 408	114	11 293	
183							
				163 670	1 637	162 033	
				24 551	26 187		
				188 221		188 221	
				260.00			
				723.93			

Total days present	Daily salary (UM)	Gross salary (UM)	Leave 1 month/yr	Salary 15 days (UM)	Social Security Fund 1%	Net salary (UM)	Worker's signature
14	810	11 340	945	12 285	123	12 162	
13	810	10 530	878	11 408	114	11 293	
13	810	10 530	878	11 408	114	11 293	
13	810	10 530	878	11 408	114	11 293	
13	810	10 530	878	11 408	114	11 293	
13	810	10 530	878	11 408	114	11 293	
13	810	10 530	878	11 408	114	11 293	
256							
				224 640	2 246	222 394	
				33 696	35 942		
				258 336		258 336	
				260.00			
				993.60			

(continues)

TABLE 7 (continued)

7.3 Field team 2

Location:

Code:

Nature of work: **Mechanical dune stabilization**

* = Leader of team 2

Year, month 1st to 15th

H = Holiday

Name of worker	Date	H														
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1. A*		2	1	1	1	1	1		1	1	1	1	1	1	1	
etc. up to 19.S																
19.S		1	1	1	1	1	1		1	1	1	1	1	1	1	
Total person-days		16	19	19	19	19	19	0	18	19	19	19	19	19	0	19
Total UM																
Employer's contribution 15%																
Overall total UM																
UM/US\$ exchange rate																
Total US\$																

Date and signature of Works Coordinator:

Date and signature of Project Coordinator:

7.4 Field teams 1 and 2

Location:

Code:

Nature of work: **Biological dune fixation**

* = leader of team 1 (idem for leader of team 2)

Year, month 1st to 15th

H = Holiday

Note: No planting during this period

7.5 Guards

Location:

Nature of work: **Guarding**

2007: 1-15 July

H = Holiday

Name of worker	Date	H														
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1. A (Toujounine)		1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
etc. up to 11 K																
11. K (Toujounine)		1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
12. L (coastal dune)		1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Total person-days		12	12	12	12	12	12	12	12	12	12	12	12	12	12	12
Total UM																
Employer's contribution 15%																
Overall total UM																
UM/US\$ exchange rate																
Total US\$																

Date and signature of Works Coordinator:

Date and signature of Project Coordinator:

Total days present	Daily salary (UM)	Gross salary (UM)	Leave 1 month/yr	Salary 15 days (UM)	Social Security Fund 1%	Net salary (UM)	Worker's signature
14	810	11 340	945	12 285	123	12 162	
13	810	10 530	878	11 408	114	11 293	
243				213 233	2 132	211 100	
				31 985	34 117		
				245 217		245 217	
				260.00			
				943.14			

Total days present	Daily salary (UM)	Gross salary (UM)	Leave 1 month/yr	Salary 15 days (UM)	Social Security Fund 1%	Net salary (UM)	Worker's signature
15	810	12 150	1 013	13 163	132	13 031	
15	810	12 150	1 013	13 163	132	13 031	
15	810	12 150	1 013	13 163	132	13 031	
180					0	0	
				157 950	1 580	156 371	
				23 693	25 272		
				181 643		181 643	
				260.00			
				698.63			

(continues)

TABLE 7 (continued)

7.6 Summary of expenditure on staff

Year 1–15 July

Nature of work	No. of person-days	Cost (UM)	Exchange rate	Cost (US\$)
Plant nursery	183	188 221	260	723.93
	0	0	260	0.00
	0	0	260	0.00
Subtotal	183	188 221	260	723.93
Mechanical stabilization	256	258 336	260	993.60
	243	245 217	260	943.14
	0	0	260	0.00
Subtotal	499	503 553	260	1 936.74
Biological fixation	0	0	260	0.00
(planting and restocking)	0	0	260	0.00
	0	0	260	0.00
Subtotal	0	0	260	0.00
Guarding				
Toujounine (11)	165	166 506	260	640.41
Coastal dunes (1)	15	15 137	260	58.22
Subtotal	180	181 643	260	698.63
Total*	862	873 417	260	3 359.30

* These figures are found in Table 8 for the period 1–15 July....

TABLE 8
Number of person-days and monthly costs for nursery and fieldwork

Real staff costs in US\$ (nursery, mechanical stabilization and forest harvesting, biological fixation, guarding)

Jan-Dec	Nursery		Mechanical stabilization* and forest harvesting		Biological fixation**		Guarding***		Total	
	Person-days	Cost (US\$)	Person-days	Cost (US\$)	Person-days	Cost (US\$)	Person-days	Cost (US\$)	Person-days	Cost (US\$)
01-15 January	15	69.06	0	0.00	0	0.00	135	503.43	150	572.49
16-31 January	16	71.33	0	0.00	0	0.00	128	478.81	144	550.14
	31	140.39	0	0.00	0	0.00	263	982.24	294	1 122.63
01-15 February	15	68.95	0	0.00	0	0.00	120	446.81	135	515.76
16-28 February	13	59.75	0	0.00	0	0.00	104	387.24	117	446.99
	28	128.70	0	0.00	0	0.00	224	834.05	252	962.75
01-15 March	225	851.09	270	1 039.11	0	0.00	120	446.93	615	2 337.13
16-31 March	278	1 049.36	365	1 359.41	0	0.00	128	476.72	771	2 885.49
	503	1 900.45	635	2 398.52	0	0	248	923.65	1 386	5 222.62
01-15 April	247	931.11	410	1 526.72	0	0.00	105	390.99	762	2 848.82
16-30 April	182	690.82	505	1 880.47	0	0.00	105	390.99	792	2 962.28
	429	1 621.93	915	3 407.19	0	0.00	210	781.98	1 554	5 811.10
01-15 May	183	694.54	481	1 791.10	0	0.00	145	539.94	809	3 025.58
16-31 May	198	777.07	535	2 060.62	0	0.00	176	677.88	909	3 515.57
	381	1 471.61	1 016	3 851.72	0	0.00	321	1 217.82	1 718	6 541.15
01-15 June	243	949.50	427	1 644.64	0	0.00	150	577.74	820	3 171.88
16-30 June	171	673.50	466	1 808.66	0	0.00	237	919.86	874	3 402.02
	414	1 623.00	893	3 453.30	0	0.00	387	1 497.60	1 694	6 573.90
01-15 July	183	723.93	499	1 936.74	0	0.00	180	698.63	862	3 359.30
16-31 July	196	775.29	548	2 126.93	0	0.00	192	745.20	936	3 647.42
	379	1 499.22	1 047	4 063.67	0	0.00	372	1 443.83	1 798	7 006.72
01-15 August	184	734.39	0	0.00	520	2 036.50	195	763.69	899	3 534.58
16-31 August	197	786.22	0	0.00	587	2 298.90	208	814.60	992	3 899.72
	381	1 520.61	0	0.00	1 107	4 335.40	403	1 578.29	1 891	7 434.30
01-15 September	169	675.64	0	0.00	495	1 938.59	195	763.69	859	3 377.92
16-30 September	184	734.39	0	0.00	537	2 103.08	195	763.69	916	3 601.16
	353	1 410.03	0	0.00	1 032	4 041.67	390	1 527.38	1 775	6 979.08
01-15 October	184	734.39	327	1 280.65	199	779.35	195	763.69	905	3 558.08
16-31 October	198	790.13	549	2 150.08	0	0.00	208	814.60	955	3 754.81
	382	1 524.52	876	3 430.73	199	779.35	403	1 578.29	1 860	7 312.89
01-15 November	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
16-30 November	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
01-15 December	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
16-31 December	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Total staff	3 281		5 382		2 338		3 221		14 222	
Total staff anticipated	2 694		7 496		2 192		4 877		17 259	
Staff balance	-587		2 114		-146		1 656		3 037	
Expenditure US\$	12 840.46		20 605.13		9 156.42		12 365.13		54 967.14	
Budget US\$	9 543.00		25 802.00		7 546.00		16 788.00		59 679.00	
Balance US\$	-3 297.46		5 197.87		-1 610.42		4 422.87		4 711.86	

* Cutting and transport of plant matter and installation of fences and internal wattling in the intervention zone....

** Planting ha, season, restocking, watering of seedlings if necessary, on-site sowing.

*** person-days for inland dunes and person-days for coastal dunes.

TABLE 9
Local expenditure in US\$ for financial year

Costs of international consultations, national experts, drivers, mission reports and agency fees are not included in this table.

Budget line	Jan	Feb	Mar	Apr	May	Jun	Jul
Exchange rate	270.61	271.02	270.95	271.00	271.00	262.00	260.00
01-01	69.06	200.05	1 900.45	931.11	1 385.35	1 726.58	2 172.72
01-02			2 398.51	1 526.72	3 671.57	3 705.26	5 872.33
01-03			870.12	259.77			270.76
01-04	503.43	1 312.87	923.65	390.98	930.93	1 255.63	2 363.68
01-05		1 328.31	664.33		664.21	687.02	1 384.61
Subtotal	572.49	2 841.23	6 757.06	3 108.58	6 652.06	7 374.49	12 064.10
02						575.38	
03-01		2 213.86	3 482.93	242.43	4 347.91	152.67	5 830.77
03-02		90.71	243.63	131.38	144.57	238.85	383.69
03-03			333.25			152.67	207.69
Subtotal	0.00	2 304.57	4 059.81	373.81	4 492.48	544.19	6 422.15
04-01					215.87		743.85
04-02			2 483.85				692.31
04-03			479.79				1 153.85
Subtotal	0.00	0.00	2 963.64	0.00	215.87	0.00	2 590.01
05			627.42				388.46
06			597.89				
07			129.17		147.60		
08					7 458.11		
Total US\$	572.49	5 145.80	15 134.99	3 482.39	18 966.12	8 494.06	21 464.72
Cumulative total	572.49	5 718.29	20 853.28	24 335.67	43 301.79	51 795.85	73 260.57

01-01: nursery staff; 01-02: field staff; 01-03: drivers; 01-04: guards; 01-05: staff allowances; 02: local contracts; 03-01: running of vehicles; 03-02: operation of office; 03-03: contingencies; 04-01: office supplies; 04-02: expendable nursery equipment; 04-03: expendable field equipment; 05: computer unit; 06: purchase of non-expendable equipment (local and external); 07: medical examinations of technical staff; 08: national consultant.

* There was no expenditure in November and December

Aug	Sep	Oct	Nov*	Dec*	Total expenditure (US\$)	Total available (US\$)	Balance (US\$)
257.67	257.67	257.67	257.72	257.72			
734.39	1 461.86	2 258.91			12 840.46	9 543	-3 297.46
2 036.50	4 237.49	6 313.15			29 761.53	33 348	3 586.47
273.21		546.43			2 220.29	2 104	-116.29
763.69	1 578.29	2 341.97			12 365.12	16 788	4 422.88
	698.57	1 397.14			6 824.19	7 317	492.81
3 807.79	7 976.21	12 857.60	0.00	0.00	64 011.59	69 100	5 088.41
					575.38	3 000	2 424.62
4 028.02	712.86	7 611.67			28 623.12	25 000	-3 623.12
		177.72			1 410.55	2 000	589.45
					693.61	1 500	806.39
4 028.02	712.86	7 789.39	0.00	0.00	30 727.28	28 500	-2 227.28
					959.72	500	-459.72
					3 176.16	2 500	-676.16
					1 633.64	1 500	-133.64
0.00	0.00	0.00	0.00	0.00	5 769.52	4 500	-1 269.52
					1 015.88	1 500	484.12
					597.89	600	2.11
					276.77	300	23.23
					7 458.11	7 500	41.89
7 835.81	8 689.07	20 646.99	0.00	0.00	110 432.44	115 000.00	4 567.56
81 096.38	89 785.45	110 432.44	110 432.44	110 432.44		115 000.00	4 567.56

TABLE 10
Requirements for expendable and non-expendable equipment

10.1 Non-expendable equipment and available material acquired during previous seasons

Non-expendable equipment	
1 vehicle Toyota Land Cruiser Pick-Up, registration	
1 vehicle Toyota Land Cruiser Pick-Up, registration	
1 vehicle Toyota Hilux 2.8 D double cabin, registration	
1 vehicle Toyota Land Cruiser Pick-Up, registration	
1 computer Compaq Pentium IV	
1 computer HP L1706	
1 external hard disk 80 G	
1 printer Laserjet Canon LBP 810	
Etc.	
Expendable equipment (stored)	
200-litre drum, 12 units	Machete, 20 units
Secateurs Felco 8, 8 units	Lopping shears, 3 units
Planting cylinder, 10 units	Bow saw, 765 mm long, 7 units
Wheelbarrow, 36 units	Bow saw, 530 mm long, 7 units
Watering can, 66 units	Blade saw (large model), 30 units
Etc.	

10.2 Local purchase of non-expendable equipment

1 power pump G200 5.0	US\$600
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10.3 Local purchase of expendable equipment (nursery, dune fixation, forest harvesting)

Item	Quantity	Unit cost (UM)	Total	Cost (US\$)	Notes
Watering hose (m)	150	300	45 000	166	per 50-m roll
Leather gloves (pair)	100	3 000	300 000	1 109	
Cistern 1 000 litres (unit)	2	50 000	100 000	370	
Seed (kg):					
<i>Acacia raddiana</i>	3	6 000	18 000	67	
<i>Acacia senegal</i>	3	9 000	27 000	100	
<i>Prosopis juliflora</i>	8	12 000	96 000	355	
<i>Leptadenia pyrotechnica</i>	8	8 000	64 000	237	
<i>Aristida pungens</i>	8	10 000	80 000	296	
<i>Panicum turgidum</i>	10	8 000	80 000	296	
<i>Nitraria retusa</i>	1	5 000	5 000	18	
<i>Tamarix aphylla</i> (cutting)					to be noted
<i>Colocynthus vulgaris</i>	10	4 000	40 000	148	
Miscellaneous			92 007	340	
Total			947 007	3 500	Exchange rate: US\$1 = 270.61 UM
Total available				3 500	(January)

Fighting sand encroachment Lessons from Mauritania

One of the main challenges of desertification is encroachment of moving sands, which has devastating environmental and socio-economic impacts. It reduces arable land, grazing land and availability of water resources, threatening agricultural productivity and yields and the food security and standard of living of local populations. Other impacts include large-scale migration of people, infrastructure damage and substantial economic losses. Mauritania, as one of the most severely affected countries in sub-Saharan Africa, has accumulated a great deal of experience in combating sand encroachment over the past several decades. This publication synthesizes the lessons learned, particularly in the implementation of a recently concluded and highly successful project for rehabilitation and extension of the Nouakchott Green Belt, carried out by FAO and the Government of Mauritania with support from the Walloon Region of Belgium. It describes sand encroachment processes and control techniques from preliminary studies to nursery methods to dune fixation and protection of reforested areas. Project management and institutional aspects are also addressed, with an emphasis on the use of a participatory approach. Annexes include profiles of local woody and grassy species used in sand dune fixation, and tables used to manage activities and budgets and monitor progress, which can serve as a model for future efforts. These lessons can be adapted to other countries facing similar challenges. The publication will be of interest to technicians, project managers, local communities and indeed all stakeholders engaged in combating desertification.

