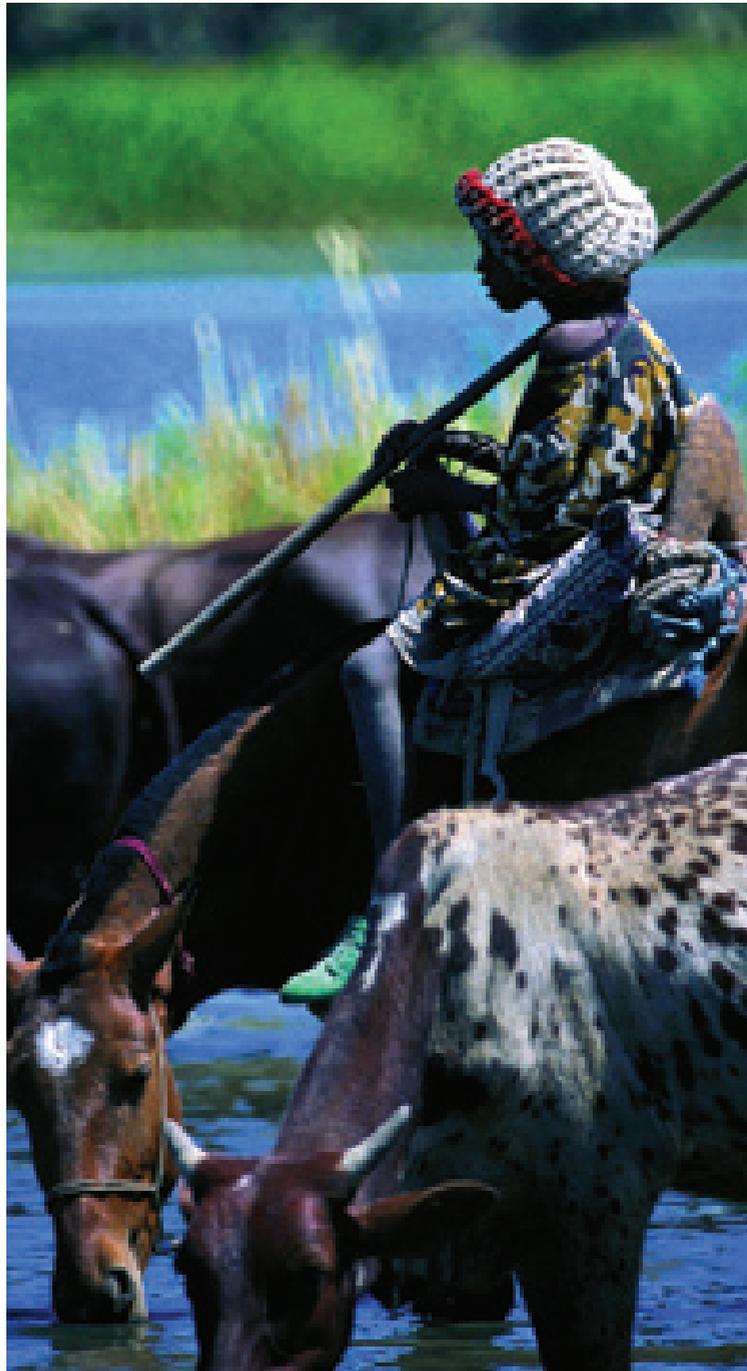


## PONDS

Ponds are permanent, semi-permanent or temporary sources of freshwater used by villagers in their daily lives. They vary very much in size, depth and water quality. They are used for drinking-water, irrigating vegetables, watering animals and for fishing. Use of water from ponds is regulated at village level and agreements are established with pastoralists from outside the village who need water for their livestock.

KINASSEROM ISLAND (BOL), CHAD



NEAR GUITTE (INDJAMENA), CHAD

PONDS ARE SMALL FRESHWATER BASINS USED BY VILLAGERS FOR THEIR DAILY NEEDS



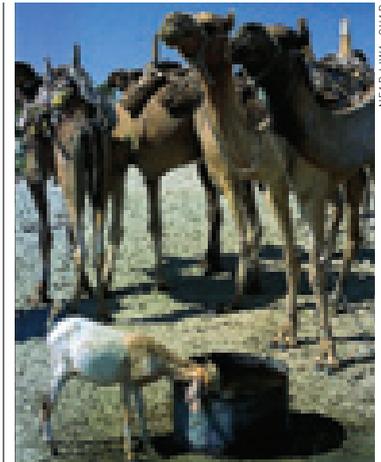
THE WELL NEAR LOWA, (TALA DESERT), THE NIGER

GENERATIONS OF HERDERS HAVE LEARNED HOW TO FIND WATER, DIG WELLS AND MAINTAIN THEM

## PASTORAL WELLS

The ability to find water, to move, to follow the rains – seeking the presence of water in wells and pools – is absolutely vital for the region’s pastoralists. Generations of herders have learned how to find water, how to sink wells and how to maintain them. Likewise, the region’s pastoralists have long experience in deciding who uses the water from traditional wells and what contribution should be exacted for the service. These rules have never been written down but are part of a long oral tradition and are essential for the smooth running of the system.

The use of grasslands is inextricably linked to water supply and management. Animals cannot survive unless there is a source of water within at least 20 km, or 30 km in the case of camels. The average daily requirement of cattle is 20–30 litres of water and 5–10 litres for small ruminants. However, it is also crucial to balance the quantity of livestock with the grasslands and water available in a given area. Local herders know that water that is too freely available attracts more livestock, which in turn destroys the pastureland, making it difficult to feed them in the future. The



NEAR LIWA, CHAD

THERE MUST BE A BALANCE BETWEEN THE NUMBERS OF ANIMALS AND THE AVAILABILITY OF WATER AND GRASSLAND

answer lies in balancing the number of animals with the potential grassland and water available.

Traditional wells are usually located in a depression and have a mouth with an average diameter of 1 m, depending on the composition of the surrounding soil. The well shaft is generally square in shape and is reinforced with criss-crossed tree trunks. *Acacia raddiana*, *Commiphora africana* and *Balanites aegyptiaca* are most commonly used for this purpose. In the spaces between the trunks, grass (*Cyperus conglomeratus*) is used to prevent sand from seeping into the water. The lip of the well is slightly raised to prevent it from filling with mud and polluted water.

The lifespan of a traditional well depends on a range of factors, including the stability of the soil, the speed at which the chemical composition and humidity of the soil cause the wooden supports to rot, and the well's capacity to survive during the rains. Some wells collapse during the rainy season as a result of being located in the lowest parts of depressions, which makes them prone to flooding.

Communities decide who digs the wells and who can use them. Water is never refused to other pastoralists because, according to a local saying, "refusing water is to refuse life". However, a strict code dictates the order in which people may use the well and the compensation that should be made for the service. Outsiders are generally allowed access to a well on condition that their animals are free from disease. If a herder reaches a well when it is sanding up, he may be expected to help rebuild it or clear the sand. Often, he will leave a ram or ewe in thanks when he and his animals move on.



NEAR LIWA, CHAD

THE COMMUNITIES DECIDE WHO DIGS THE WELLS AND WHO CAN USE THEM



NEAR DIFFA, THE NIGER

WOMEN OR CHILDREN LOOK AFTER THE ANIMALS USED TO LIFT THE WATER

### LIFTING THE WATER

Since most traditional wells are between 10 and 50 m deep, animals are used to extract the water. The animal – generally a camel or two donkeys – is harnessed to a rope made of palm fibre or nylon, at the end of which is a scoop either made of leather or fashioned from the inner tube of an old truck tyre.

Water extraction is a regimented routine, around which most of the other daily activities revolve. Lifting begins at 09.00

hours and finishes at around 18.00 hours, although it may continue late into the night when the need arises.

The herders take turns at watering their animals, with the first to arrive moving on so that they leave enough space for the newcomers.

Women generally take charge of the camel or donkeys used to lift the water, although young boys may also help. As well as drawing water for the cattle, women also have the task of storing the

water in plastic or rubber gourds made of inner tubes, which are subsequently transported by donkeys. Water for human consumption is carried in bags made of goatskin or sheepskin. These leather waterskins keep the water fresh because of rapid evaporation from the surface by the wind. Today many waterskins have been replaced by containers made of old truck tyres.

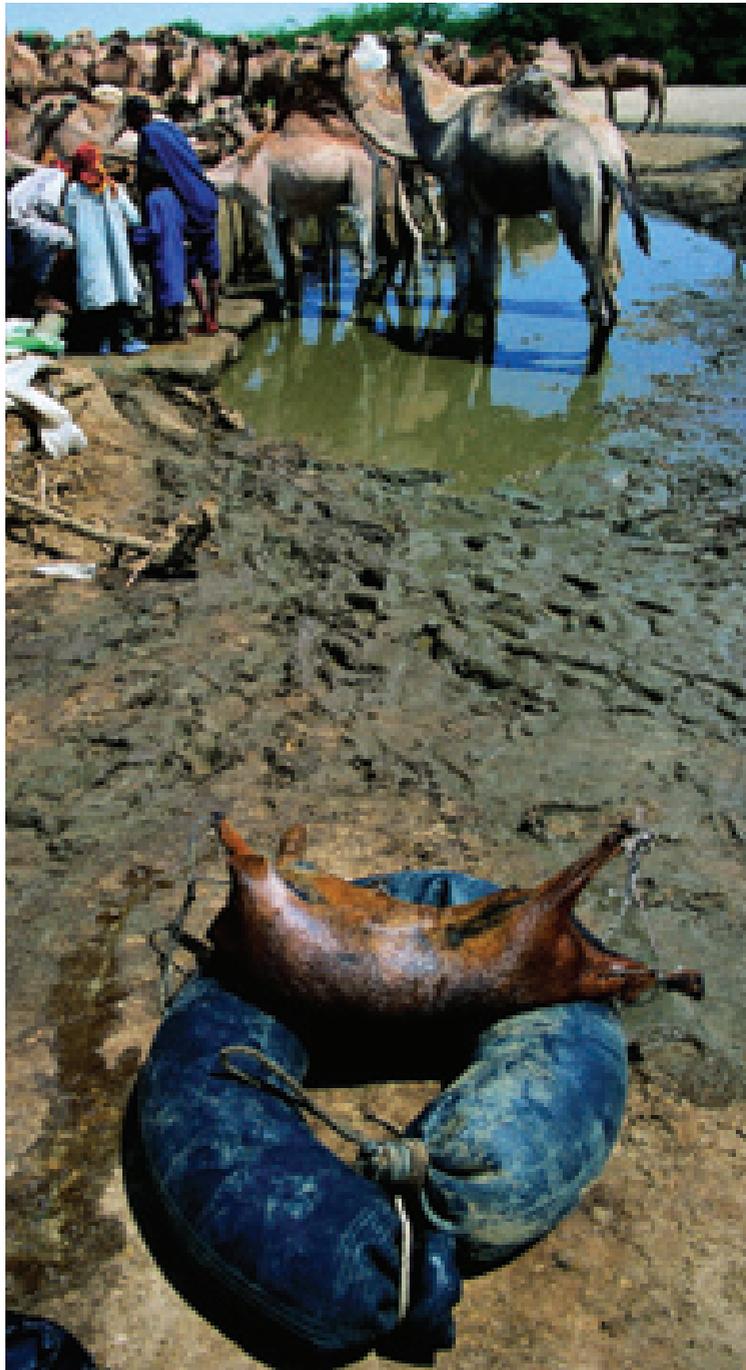
## ARTESIAN WELLS

The artesian aquifer from the Pleistocene extends beneath the whole of the Lake Chad Basin and is located within sands and silts at a depth of about 250–400 m. The geographic limits of this system – its depth and its lateral extent – are not yet known exactly. A number of deep boreholes to tap the artesian resources have been drilled since the early 1960s, when the average artesian discharge was about 8 m<sup>3</sup> per hour. The discharge has progressively diminished to zero in a number of these wells. There is no exhaustive inventory of the wells and the original logs have been lost. All the original water control superstructures have been disrupted so that the wells now discharge without control.

### Traditional saying

**The Fulbe say:**

“If you want to know how many animals a Peul has, and the height of his straw at the end of the dry season, just look at the depth of his well. If his water is not far from the lip and there is plenty of it, he will draw more scoops out than you in one day, and will be able to water more animals. But the grasses around the well will be eaten more quickly and the cattle will grow thin. The well in the depression and the grassland around it are like the heart and the stomach: they must live in harmony, otherwise a man is sick.”



THE WELL NEAR KABELWA (NIGER), THE NIGER

OLD TRUCK TYRES ARE REPLACING THE TRADITIONAL ANIMAL SKIN BAGS USED TO TRANSPORT WATER



THE WELL NEAR KABELWA, N'GUIGMI, THE NIGER

ABOVE AND BELOW: ACTIVITIES ARE HECTIC AROUND WELLS



THE WELL NEAR KABELWA, N'GUIGMI, THE NIGER

## IRRIGATION

Until the 1970s the irrigation strategy favoured the development of large projects with a view to higher productivity of the irrigated land. However, because of maintenance problems and periods of low rainfall, this strategy did not produce adequate results.

At present, out of an estimated potential of over 1.1 million ha of irrigated land in the area of the conventional basin, around 100 000 ha are actually irrigated <sup>[6.4]</sup>, and the maximum sustainable development should not exceed 400 000 ha according to a study financed by the United Nations Development Programme (UNDP) <sup>[6.9]</sup>. These data for the four riparian countries are shown in Table 12.

NEAR MALAM FATORI, NIGERIA



SMALL PUMPS ENABLE THE PRODUCTION OF 1-2 ADDITIONAL CROPS PER YEAR



NEAR WAMOURI (BOSSO), THE NIGER

IRRIGATION SHOULD BE A SERVICE TO AGRICULTURE, NOT AN END IN ITSELF



NEAR MALAM FATORI, NIGERIA

CURRENTLY, IRRIGATED AREAS REPRESENT ONLY A SMALL PERCENTAGE OF THE ESTIMATED IRRIGATION POTENTIAL

**TABLE 12 COMPARISON OF POTENTIAL AND ACTUAL IRRIGATED AREAS IN THE FOUR RIPARIAN COUNTRIES OF THE LAKE CHAD BASIN**

COUNTRY	Irrigation potential			Reduced irrigation potential (UNDP study)			Actual irrigated area
	Within conventional basin (ha)	Outside conventional basin (ha)	Within the whole basin (ha)	Within conventional basin (ha)	Outside conventional basin (ha)	Within the whole basin (ha)	Within the whole basin (ha)
Cameroon	80 000	20 000	100 000	46 700	20 000	66 700	13 820
Chad	700 000	135 000	835 000	142 500	135 000	277 500	14 020
Nigeria	300 000	202 000	502 000	204 000	100 000	304 000	82 821
The Niger	40 000	8 000	48 000	3 000	8 000	11 000	2 000
<b>TOTAL</b>	<b>1 120 000</b>	<b>365 000</b>	<b>1 485 000</b>	<b>396 200</b>	<b>263 000</b>	<b>659 200</b>	<b>112 661</b>

Source: FAO, 1997<sup>[6.4]</sup>





NEAR N'DJAMENA, CHAD

CONSIDERABLE INCREASE IN HARVESTS CAN BE ACHIEVED BY COMBINING MODERN WATER MANAGEMENT TECHNIQUES WITH TRADITIONAL FARMING PRACTICES

## ENVIRONMENTAL CONSIDERATIONS IN IRRIGATION DEVELOPMENT

Irrigation has contributed significantly to the alleviation of poverty and food insecurity, and to improving the quality of life for rural populations. However, the sustainability of irrigated agriculture is being questioned, both economically and environmentally. Inadequate attention to factors other than the technical engineering and projected economic implications of large-scale irrigation or drainage schemes in Africa has all too frequently led to great difficulties.

The sustainability of irrigation projects is dependent on the consideration of environmental effects, as well as on the availability of funds for the maintenance of the implemented schemes.

It is essential for irrigation projects to be planned and managed in the context of overall river basin and regional development plans, including both the upstream and downstream catchment areas.

The expansion and intensification of agriculture made possible by irrigation have the potential for causing the following.

- Increased erosion.
- Pollution of surface water and groundwater from agricultural biocides.
- Deterioration of water quality.
- Increased levels of nutrients in the irrigation and drainage water, resulting in algal blooms, proliferation of aquatic weeds and eutrophication in irrigation canals and downstream waterways.

Large irrigation projects that impound or divert river water have the potential to cause major environmental disturbances as a result of changes in the hydrology and limnology of river basins. Reducing the

river flow changes the land use and ecology of the floodplain and can cause saltwater intrusion into the rivers and groundwater of adjacent lands. Diversion of water through irrigation further reduces the water supply for downstream users, including municipalities, industries and agriculture. A reduction in river base flow also decreases the dilution of the municipal and industrial wastes that are added downstream, posing pollution and health hazards.

The potential negative environmental impacts of most large irrigation projects include the following.

- Waterlogging and salinization of soils.
- Increased incidence of water-borne and water-related diseases (for example malaria and bilharzia).
- Negative impacts of dams on natural flooding, fisheries and wildlife.
- Reduced farming flexibility – irrigation may only be viable with high-value crops, thus reducing extensive activities such as grazing animals, operating woodlots, cultivation of crops for self-consumption.
- Changing labour patterns that make labour-intensive irrigation unattractive.
- Problems of resettlement or changes in the lifestyle of local populations.

User participation at the planning and design stages of new schemes and of the rehabilitation of existing schemes, as well as the provision of extension, marketing and credit services, can minimize negative impacts and maximize positive ones <sup>(6.4)</sup>.

### WAYS TO MITIGATE THE NEGATIVE IMPACTS OF IRRIGATION PROJECTS

There are ways to mitigate adverse effects of irrigation development.

- Using locally available materials, tools and human capacities.

- Careful planning and monitoring of the effect of any new technology on the other components and functions of the ecosystem.
- Giving priority to demand and perceived needs, and adaptation to social and cultural models and consumption habits.
- Enabling low investment and access to microcredits in order to favour direct investments by farmers.
- Using sprinkler irrigation and micro-irrigation systems to decrease the risk of waterlogging, erosion and inefficient water use.
- Using treated wastewater, where appropriate, to make more water available to other users.
- Maintaining flood flows downstream of the dams to ensure that an adequate area is flooded each year, for example for fishery activities.

### WATER HARVESTING AND CROP MANAGEMENT

Increasing water productivity, improving water management methods, harvesting water in structures such as furrows, building microdams and improving drainage systems to control soil salinization all allow farmers to conserve rainwater and direct it towards their crops. Considerable increase in harvests can be achieved by combining modern water management techniques with traditional farming practices, including the following.

- Managing water to maximize crop/livestock systems.
- Selection of appropriate seeds and cultivars resistant to drought.
- Cultural and agronomic practices that reduce water evaporation, for example variable row-spacing and application of mulches.
- Adopting biological pest control practices.
- Boosting soil fertility and improving nutrient management to raise the yield.



IRRIGATION SCHEMES SHOULD BE ADAPTED TO SOCIAL AND CULTURAL MODELS AND CONSUMPTION HABITS

GADUI VILLAGE (NDJAMENA), CHAD



TER BOULET POLDER (BOUL), CHAD

>> RIGHT: WISE WATER MANAGEMENT IS A COMMITMENT TO FUTURE GENERATIONS



KINASSEROMI ISLAND (80), CHAD

## Traditional water management

12 October 2001  
Kabelewa, the Niger

We make a stop near the village of Kabelewa, a few kilometres from N'Guigmi. Here, as a result of a project of international cooperation, an artesian well was dug a few years ago. We want to see the well in order to document its impact on the life of the people around it.

We are greeted by chaos: the sudden abundance of water in an area of previous scarcity has created a dangerous attraction. Not only does the land around the well not offer pasture for all the thousands of animals brought there for watering, but also the forced coexistence of unrelated ethnic groups has created some tension. Arabs with camels, Peul with zebu and goats, Mobber and Kanouri with zebu and sheep, Wodaabe with M'Bororo cattle: they all crowd in and push at the borders of the large space around the well and, after a reasonable wait, demand access to the water. But the number of animals is great, the waiting lasts into the next day, and the nervousness increases. It is not clear who organizes the turns, nor what criteria are used. We will ask the people responsible for the project how they intend to proceed.



THE WELL NEAR KABELEWA (IN GUIGMI), THE NIGER

ABOVE AND BELOW: PEOPLE AND ANIMALS CROWD AROUND A RECENTLY DUG ARTESIAN WELL



THE WELL NEAR KABELEWA (IN GUIGMI), THE NIGER

### 13 October 2001 Tal Desert, the Niger

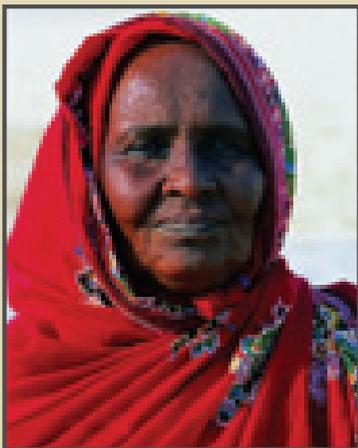
From N'Guigmi we proceed southwest for 15 km, towards the Tal Desert. Issufa Gumayé, a well-known guide of the area, is at the wheel of the ancient four-wheel-drive vehicle. With no track to follow, nor any sign that we can detect, he tackles the trip with enthusiasm and skill. We are accompanied by Madame Ragatà, a woman of Arab origin, who arrived as a child at the shores of Lake Chad with her nomad family of cattle breeders. Over the years, Madame Ragatà has earned the trust and respect of the local community to the point of becoming a town councilwoman of N'Guigmi. In addition, she has become a specialist in the management of this area's rarest and most precious resource: water. With great intelligence, she uses it to create lush oases in the middle of the desert.

Madame Ragatà takes us to the Lowa well, a traditional well still animal-powered: a camel

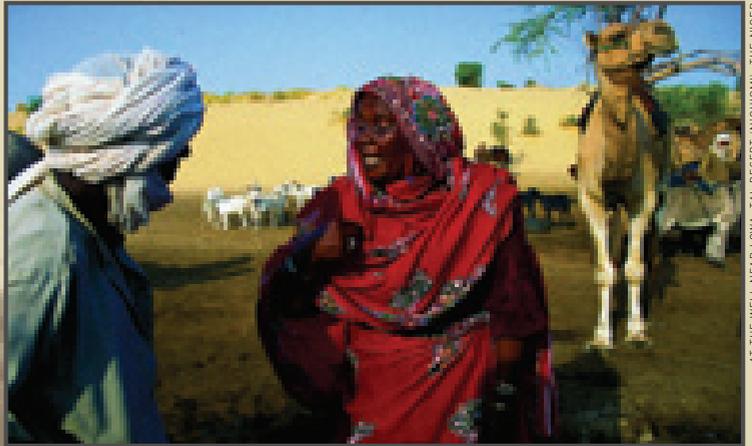
pulls a rope to bring to the surface a leather bag overflowing with water. At a phreatic stratum 50 m deep runs perennial water. Since it is so close to the desert, it is mostly Arab nomads who go there daily to water their camels.

Madame Ragatà is a woman with an iron hand and acknowledged authority. With booming voice, she settles any controversy among the Arab nomads, the Peul and the cattle breeders of the area; in fact, she knows the needs, rights and obligations of each and is respected by everyone. Issufa Gumayé says that, so far, there has not been a problem she has not solved; smiling slyly, he translates for us a Peul song about how women "seem subordinate, but in reality ...". Looking at Madame Ragatà, there can be no doubt: she is in charge, both within the family and outside of it. But apart from the personal qualities of Madame Ragatà, the situation at the Lowa well seems to confirm the importance of the involvement of the local community and local experts in the management of problems related to the ecosystem.

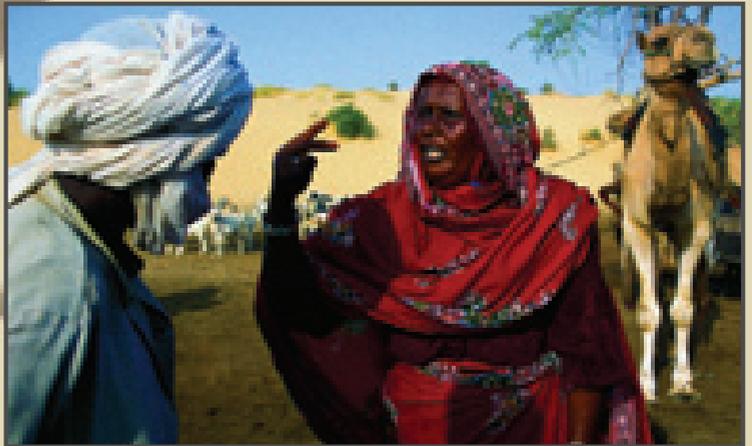
AT THE WELL NEAR LOWA (TAL DESERT), THE NIGER



MADAME RAGATÀ, TOWN COUNCILWOMAN OF N'GUIGMI



AT THE WELL NEAR LOWA, TAL DESERT (N'GOUBNI), THE NIGER



MADAME RAGATÀ IS AN ACKNOWLEDGED AUTHORITY IN SETTLING THE DISPUTES AROUND THE WELL