

Socio-economic implications of the Oussudu lake (Pondicherry, India)

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Abstract Lake Oussudu, which is the largest wetland in the Union Territory of Pondicherry, is one of the most important bird sanctuaries in India. Apart from being an important water resource and a heritage site, Oussudu watershed also caters to the other needs of the people living around the lake: notably fishing, grazing of the domestic livestock, and harvesting of reeds. But this utilisation is now increasing rapidly with the increase in demographic pressure in the lake watershed. It is now feared that if this trend is not checked, the hitherto sustainable utilisation of Oussudu may soon turn to exploitation and then over-exploitation. In this context, a socio economic study on Oussudu has been done to assess the human interaction with the lake and its likely implications.

INTRODUCTION

Oussudu lake, which is commonly called *Ousteri* due to the colloquialization of the words '*Oussudu eri*' (*eri* means 'lake' in Tamil), is situated about 110 km south of southwest Chennai. The lake is identified with the Union Territory of Pondicherry even though close to half of the water-spread lies within the boundary of Tamil Nadu.

The Oussudu receives its water from the sparse south-west monsoon and the much more profuse north-east monsoon. It also, at times, receives water which is diverted from the Suthukenni check dam through a channel to the lake. When full, the lake spans 700 ha with an average depth of 3 ft (Chari and Abbasi 2002 a). The winter months, accompanying, and following, the south-west monsoon find the Oussudu abuzz with migratory birds. Indeed such is the richness and diversity of avifauna visiting the Oussudu every year that the lake has come to be recognized as one of the most important host wetlands of peninsular India (Chari *et al* 2003). The plankton and fisheries have a role to play in attracting the waterfowl (Chari and Abbasi 2003, 2005).

In this paper, a socio-economic study of the impact of the Oussudu on the people living in the its Oussudu catchment has been presented in the context of the lake as a resource base. The study is built on the primary data collected from concerned governmental and non-governmental agencies. A wide crosssection of the population living around the lake, and the officials associated with the lake have also been interviewed to complete the socio-economic picture. Those interviewed include the local farmers who depend on the lake for irrigation, the officials of the Public Works Department (Pathukannu), the Chief Wild Life

Warden (Pondicherry) and the locals who make their livelihood from the various resources of the Oussudu.

UTILISATION OF OUSSUDU WATERSHED

Agriculture

Before 1990s, Koodapakkam, Agaram, Olavaizkal, Konerikuppam, Poraiyur, Sedanatham, Oussudu and Vazipettapalayam farmers of 18 villages used to depend on Oussudu lake for irrigation. Now only 9 villages depend on it directly for irrigation: The effective command area served by the Oussudu lake covers a mere 2000 acres of land, while the total area cultivated within the lake watershed is about 5000 acres. The remaining 3000 acres are irrigated not with the Oussudu water but with the help of bore-wells sunk within the lake watershed. Unfortunately, the heavy reliance on bore wells, rather than surface water bodies, for irrigation is a malaise afflicting the entire region (Table 1).

The farmers have been increasingly shifting to bore well based irrigation for two reasons. Firstly, the government has been subsidizing the cost of sinking of bore wells and the electrical power used in drawing bore well water. Secondly, it is more convenient for the farmers to pump up water from their bore wells at will, instead of having to adjust their work to the convenience of government staff employed to operate sluices which release the Oussudu water.

Cropping Pattern

The major crops grown around Oussudu lake are paddy (75%) and sugarcane (20%). The rest comprises of casuarina and other plantations, usually found along the banks of the lake and amidst the rice fields (Chari and Abbasi 2002 a, b).

Agricultural Inputs

It was a pleasant surprise to find that the farmers at Oussudu are using mostly dried cow dung, compost, azolla, phosphobacteria and azospirillum, instead of synthetic fertilizers. Farmers say that the practice of using cultured manure was prevalent during the French regime; and is now regaining popularity after 50 years. Also the use of pesticides has been reduced by 60% in the past 5 years on the advice of the Agriculture Department, Pondicherry. Due to the efforts of the department farmers have realized that it is in their larger interest to suffer some damage caused by the pests rather than risk the pests becoming resistant to pesticides.

Farmers do use pesticides, but more sparingly than is the norm elsewhere; *Democran* or *Nuvan* are used when the paddy crop is 20 to 30 days old; *endosulphan* and *monocrotophos* are used on when the crop is 30 to 45 days old crops.

These aspects of agricultural practices in the Oussudu watershed are important as these have direct implications *vis a vis* pollution of Oussudu by run-off.

Table 1. Area under irrigation in Pondicherry over the years

Year	Area under canal irrigation (ha)	Area under tank irrigation (ha)	Area under tubewell irrigation (ha)
1957	10780	5497	-
1958	11319	5430	2974
1959	11308	6103	3288
1960	11319	5883	4216
1961	11295	6229	4494
1962	11377	6355	4974
1963	11468	6034	7626
1964	11266	6328	7697
1965	11908	5825	8636
1966	11066	5464	8249
1967	11064	4770	9165
1968	11010	4894	8908
1969	10659	2742	11830
1970	10875	5046	9915
1971	11143	5516	9716
1972	11026	5490	9611
1973	11048	4835	10404
1974	10949	5048	10164
1975	10852	1548	13179
1976	10886	2954	11831
1977	10724	4498	10376
1978	10889	4902	10594
1979	11017	5168	10280
1980	11033	5191	10067
1981	15960	-	14897
1982	10872	3563	11064
1983	10696	100	13818
1984	10671	1241	12871
1985	10569	940	13721
1986	9254	1071	13639
1987	9587	214	14093
1988	8818	69	13804
1989	9586	5	13545
1990	9316	6	12520

Recharging of aquifers

The geology of the Oussudu area reveals the presence of alluvium underlain by Cuddalore sandstone formations. Below this is the *manaveli* formation and a good deal of ground water. According to the hydrogeology of the region, Oussudu lake recharges the aquifers of *Vanur - Ramanathapuram sandstone* formation. The farmers around the lake are aware that the Oussudu lake plays a major role in recharging the ground water. During the period from 1967 to 1974, when the lake had dried up, there was a significant ground water depletion. Similarly during the

period 1985-89, the groundwater level had decreased drastically as the lake had dried up. Thus, Oussudu lake gains prominence as it recharges the ground water aquifers, more so now because the ground water remains the prime source of irrigation and drinking water for Pondicherry region. A special mention may be made of the fact that mostly Pondicherry town depends for its drinking water on the under ground aquifers of Muthirapalayam (Bose, 1998). And Muthirapalayam aquifer falls within the *Vanur-Ramanathapuram* aquifers which are recharged by the Oussudu lake.

Fisheries

Fishing is not the chief occupation of the people living around Oussudu lake, but it does provide a source of income to many. In the year 1988, Oussudu lake was managed by the Department of Fisheries, Pondicherry, which introduced the commercial fish common carp (*Cyprinus carpio*) in the lake. From 1989 till 1997, it was under the control of Villianur Commune Panchayat. During this period, fishing rights were auctioned annually for Rs 50000 - 60000. Since 1997, once the lake was declared a bird sanctuary, it came under the control of Department of Forestry and Wildlife, Pondicherry, and fishing has been totally prohibited. Over the years the Piscean species diversity has declined (Chari and Abbasi 2005).

Grazing of livestock, Reed Extraction, and Other Produce

The shallow banks of the lake sport rich and luxuriant grasses (Plate 1) A description of the flora has been presented elsewhere (Chari and Abbasi 2006 c). The local people feed their cattle on these grasses almost throughout the year. Also, they cut and use reeds and grasses that grow in-and-around the lake for the purpose of thatching the huts. Ipomoea, which grows profusely in the lake is used for fencing the houses and agriculture fields (Plate 2). Other than fish, some people harvest the snail *Georissa japonica* which thrive on the water supply channels and banks of the lake (Plate 3). These snails are known to have some medicinal benefits.

Recreation

Oussudu makes a pretty sight when it is full during the monsoons. It has a great potential for development as a picnic spot. Recently, there have been efforts from the government of India and the government of Pondicherry towards making Oussudu a centre for informal recreation. Restaurants, a boathouse, a water fountain, trekking facilities and other attractions are envisaged (Plate 4). These efforts may be helpful in securing the future of Oussudu by attracting investment, provided determined efforts are made to prevent recreational activities from becoming a source of pollution of the lake and disturbance of its wildlife. Indeed, the importance of lake quality and its ecosystem in attracting visitors should be built into the business plan of the centre.

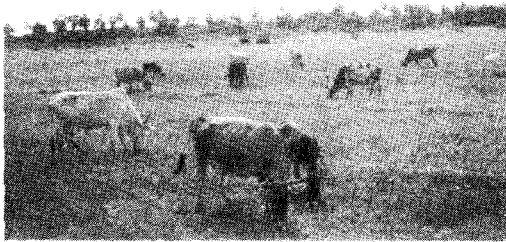
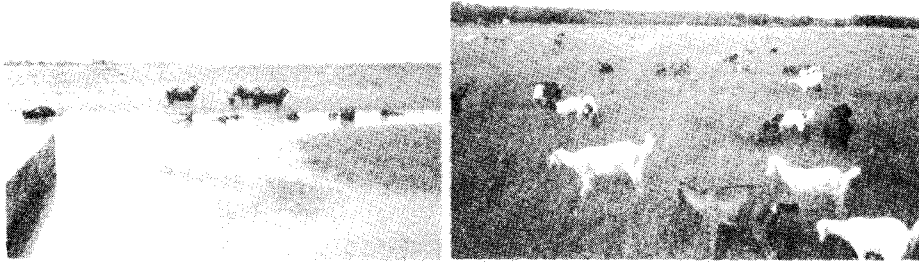


Plate 1. The shallow banks of the lake sporting various types of grasses (above), the cattle feeding on these grasses (below)



Plate 2. Ipomoea growing luxuriously inside the lake, which is used for thatching of huts, and fencing

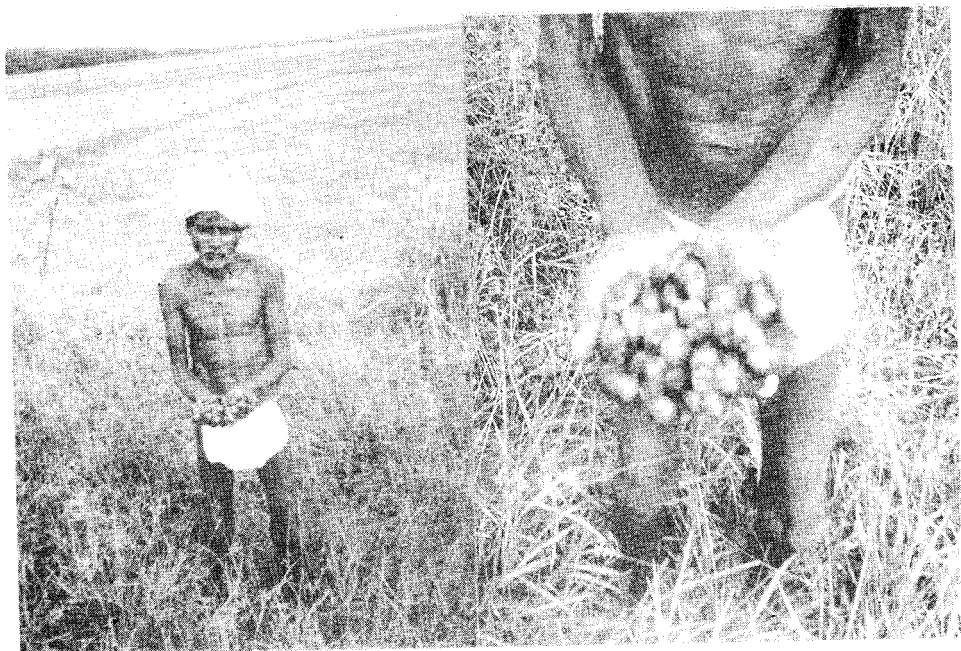


Plate 3. An old man harvesting a handful of snails, which are known to have medicinal benefits

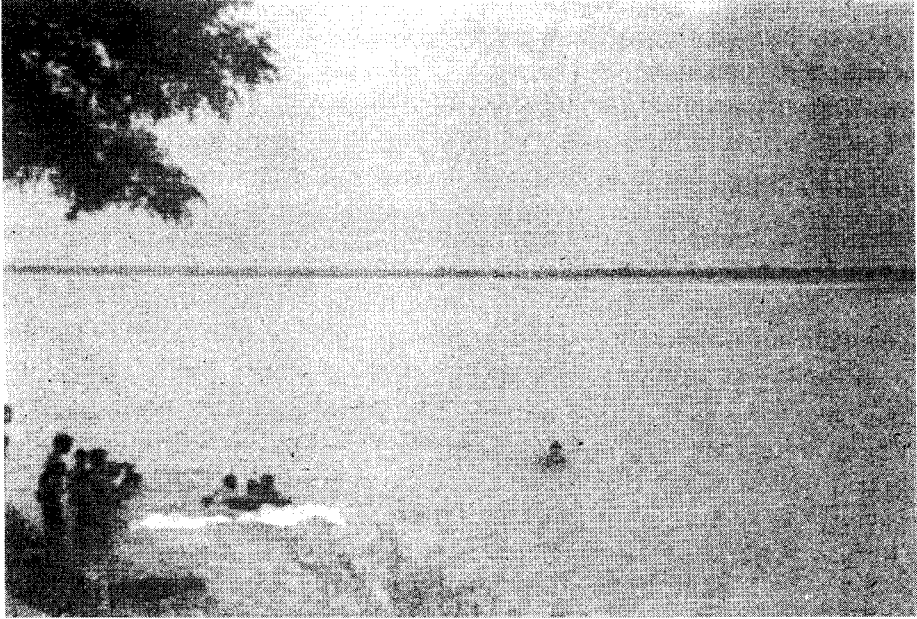


Plate 4. Oussudu lake is now more a recreation centre than a bird sanctuary

THE POTENTIAL THREATS

Encroachment

The lake is deeper in its southeast portion and shallower towards northwest. It sports grasses and a variety of reeds towards north; and hence is an ideal ground for the spawning of fish, and roosting of birds. Unfortunately, these shallow portions of the lake are the ones that are being encroached by agricultural fields as soon as water level in the lake recedes during summer months (Plate 5).

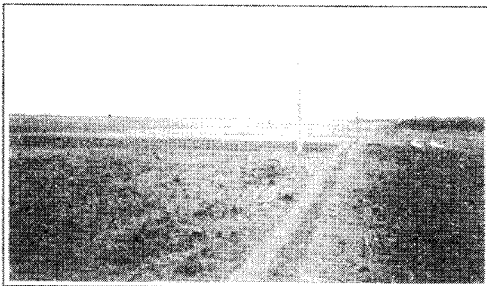


Plate 5. Encroachment of agriculture fields in the shallow portions of the lake

The practice of agriculture inside the lake can contribute fertilizers and pesticides to the water body; and this may be one of the factors responsible for the hyper-eutrophic condition of the lake (Chari and Abbasi 2005, 2006a, b). Agricultural encroachment may also be interfering with the habitat of migratory birds.

Industrial Pollution

Oussudu is now under great demographic and extractive pressure. The farmers of the region, encouraged by subsidies and loans, have taken to bore-well irrigation in a big way. The drastic reduction in the area irrigated by the surface water bodies and simultaneous increase in the area irrigated by bore-wells has led to the disuse of surface water bodies and over exploitation of the ground water (Table 1).

With the increase in bore-wells, more ground water is withdrawn, threatening the ground water table in terms of loss of height, salinity intrusion and pollution (Chari and Abbasi, 2002; Biswas, 1999). It was noticed that bore-wells were sunk even within Oussudu lake for irrigating the crops (Plate 6). In the past few years the surroundings of Oussudu lake have changed quite a lot. The rapid industrialisation and urbanisation over the years in Pondicherry has caught up with Oussudu also. Now, there are well established industrial sectors flanking Oussudu - Mettupalayam in the east, and Thondamanatham in the northwest (Plate 7).



Plate 6. Bore-wells are sunk even inside the lake for irrigating the agriculture fields

In the past, there were incidents of dumping of industrial effluents around and inside the lake. One such incident was reported by Mr. Prakash Patel of Sri. Aurobindo Ashram who first noticed the presence of huge piles of obnoxious substance dumped at the periphery of Oussudu lake during the summer of 1993

(Abbasi, 1997). The matter was brought to the notice of the Government of Pondicherry which could only promise to look into the matter but did not. Mr. Patel then approached INTECH, who in turn, referred samples of the waste to us for analysis. The foul smelling waste was highly acidic and toxic - it devastated the flora and fauna that came in contact with it, killing them instantly (Plate 8). The stones and pebbles on which the waste fell, lost their colour and texture (Plate 9).

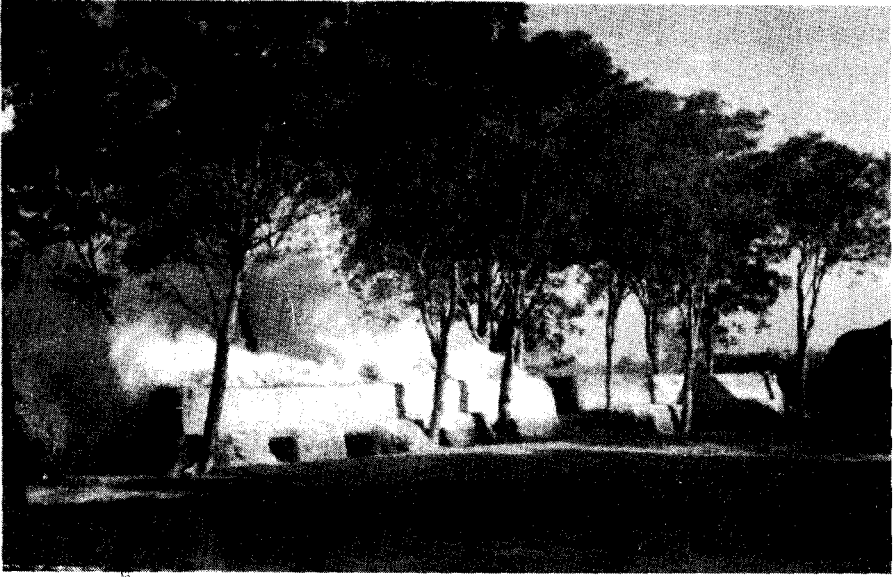


Plate 7. This brick kiln, located just a few meters away from the lake, can cause serious air pollution and subsequently, the water pollution



Plate 8. The site where the noxious waste was dumped at Oussudu, devastating the flora and fauna that came in contact

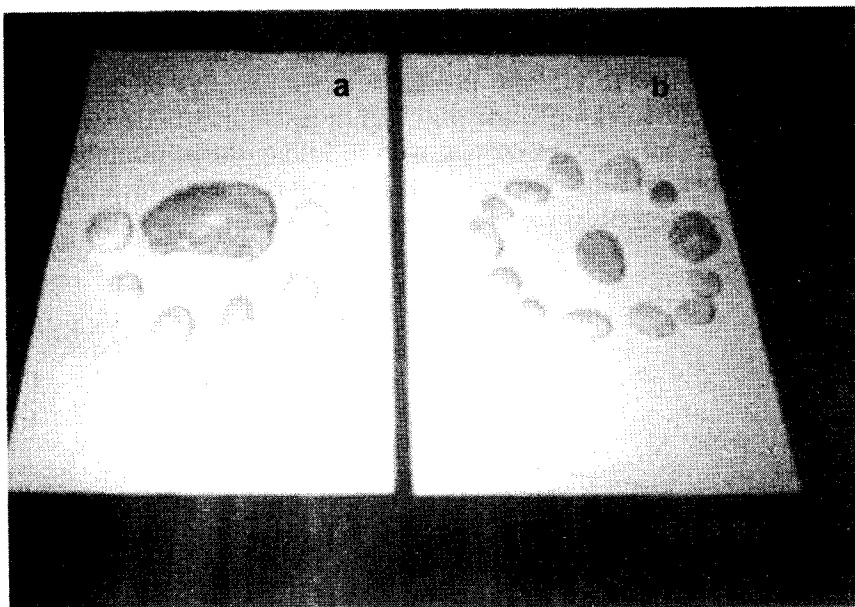


Plate 9. On contact, the acidic and foul smelling waste discoloured the pebbles (a); the normal pebbles (b)

In another incident, in June 1998, the South India Sugar Mills, dumped its effluent into the lake. The mill is located 20 - 25 km from Pathukannu in Mundiypakkam. Death of a few birds was noticed. There was a public interest petition made to the Lieutenant Governor of Pondicherry, who in turn directed the issue to the Deputy Conservator of Forestry and Wildlife (Vallavan, 2005).

So far no light has been thrown on the incident. Now a 300-bed hospital and a medical college is coming up right opposite to the southern flank of the Oussudu. This has raised apprehensions that Oussudu may be exposed to highly hazardous hospital wastes – not to speak of other forms of pollutants.

As Oussudu lake has already become hyper-eutrophic due to the inflow of fertilisers and pesticides it hardly has the resilience to survive the onslaught of industrial pollution. The increased vehicular traffic around the Oussudu disturbs the birds; and may also contribute to the atmospheric pollution. Though Oussudu lake has been declared a bird sanctuary, still illegal hunting of birds continues. Nets are spread across the lake to trap the wading ducks. The patrolling of the forest guards does help in curbing this illegal practice, but only to a limited extent.

VIEWS OF VILLAGERS ON OUSSUDU

A large number of villagers living on the Oussudu lake catchment were contacted; and their views sought for 15 specific questions. The questions, in italics, and the gists of the response against each question are presented below:

1. *How many villages depend on Ousteri (Oussudu lake) for irrigation?*

Earlier 18 villages (around 5000 acres) were dependent on Ousteri directly for irrigation. But now, only 8 villages depend on the Ousteri water directly for irrigation. There are nearly 500-700 bore-wells around Ousteri. Dug-wells are few in number and they are not used for irrigation.

2. *What are the crops grown around Ousteri?*

Paddy is the major crop grown throughout the year in all seasons. It constitutes 75% of the crops grown. Sugarcane is the next crop grown which constitutes around 20%. The remaining 5% comprises of casuarina and other crops.

3. *Are fertilizers and pesticides used?*

Use of fertilizers has been reduced. 70% of the farmers use manure. Manure comprises mostly the compost, phosphobacteria, Azospirillum, Azolla. The remaining 30% of the fertilizers comprise the *complex, urea, Potash, Bactumpas, Vijay Complex, and DAP*.

Use of pesticides has been reduced by 60% from the past five years. It is used only when it is essential such as for paddy, when it is 20-30 days old Democron or Nuvon is used; and when it becomes 30-45 days old endosulfon or monocrotophos is used.

4. *Why is this change from fertilizers to manure and less use of pesticides?*

The people from agriculture department, Pondicherry, has explained us how pests develop resistance when pesticides are used on long-term basis; and the hazards caused by the commercial fertilizers on a long-term basis. Once the pesticides, are used, the number of pests increases; and, therefore, the cost to kill these pests also increases.

5. *Is there any subsidy for electricity?*

Yes, there is subsidy for electricity to small farmers, but large farmers pay Rs 75 per horsepower (The distinction of small farmers and large farmers is determined by the Revenue Department).

6. *Is ground water depletion felt when the lake dries?*

From 1967, when the lake has dried up for 7 years, there was ground water depletion. Again the same happened during 1985-89. The level of ground water was very less during 1989-90; but now the ground water had increased because of consistent rains and water that is present in the Ousteri.

7. *Is there any co-operative society which helps the farmers?*

For every village, there is a co-operative society for the welfare of the farmers.

8. *Do you feel Ousteri is important ?*

There were mixed reactions to this question:

(a) The Ousteri is very important for Pondicherry as such for it is the source of drinking water of Pondicherry. Realising the importance of Ousteri, the

World Bank, when approached by State Govt. has allotted use as million or (or in multiplies of 10^x), one and a half year back.

(b) No, Ousteri is of no use to us. We use the lake water for irrigation no more; and we depend only on the ground water.

9. *In which way do you feel the lake must be conserved?*

The lake must be deepened; should be cleaned; bridges and bunds to be built and taken care of.

10. *Is there fish catch in the lake? What types of fishes are found?*

There is no fishing in the lake. But there is some illegal fishing done.

11. *Do they practice aquaculture or agriculture when the lake dries?*

No, such practice is not found.

12. *How / what do you feel about Ousteri being declared as a bird sanctuary?*

Ousteri has lots of birds. During November, many birds come from other places and stay here.

13. *Is there any problem regarding Ousteri being partly in Tamil Nadu and partly in Pondicherry?*

Till now no such problem has been observed.

14. *Is French type of agriculture practiced?*

As such it is not practiced, but now use of compost is coming up after 50 years, this was so during the French period.

15. *Were there any incidents of the industrial effluents and solid wastes being dumped nearby or inside the Oussudu lake?*

Two years back, we have seen containers, filled with effluents of industries, discharging the waste in the eastern side and south-eastern side of Ousteri. Previously we used to drink the water from Ousteri, but after this episode, we use the Ousteri water only for the purposes like washing clothes.

SUMMARY AND CONCLUSIONS

The studies reported in this paper, and some of the studies on the limnology of the Oussudu reported by us earlier (Abbasi 1997, Chari and Abbasi 2002 a, b ; 2003; 2005; Chari *et al* 2003) lead to the following conclusions:

1. In the recent past, the farmers around Oussudu have been shifting to bore-well based irrigation rather than depending on the surface water resources. This would very soon lead to drastic loss of groundwater table.
2. During the course of the study we spoke to a wide cross section of villagers living close to the lake. Most of them were aware of the likely benefits they derive from the lake and the likely enhancement in the benefits if the lake is managed better.

3. There was an element of bitterness in the people's attitude towards the Oussudu and a lack of a sense of belonging to the lake. We believe that these feelings have their origin in the governmental initiatives to prohibit the villagers' traditional mode of interaction with the Oussudu for fishing, wood, and occasional poaching of wildlife. The initiative was well meant but perhaps implemented in a bureaucratic and top-down fashion, without consulting the people or telling the people how best they (the people) can help in conserving the lake; in general without taking them into confidence.
4. The management plans for the Oussudu should take into account the diverse uses made by villagers of this lake. Traditional activities such as fishing, reed cutting, grazing, desilting, etc; if left under the care of village cooperative with periodic monitoring to safeguard against overuse, can cause little disturbance to the lake. Indeed, ecosystems like the Oussudu have adapted to moderate disturbances that humans have been causing over the centuries, reaching a new equilibrium or stabilization (Abbasi, 1997).
5. The ever-increasing pressure on groundwater for irrigation and industrial uses can have adverse effect on the hydrological regime of Oussudu, as is observed globally. For example, the Tablas de Daimal National Park (Spain) has an acute shortage of water caused largely by the use of groundwater for irrigation (Abbasi, 1997).
6. Given the increasing awareness of people towards the long-term benefits of environmental conservation, it appears possible that a governmental initiative supported by people, or *vice versa*, may be effective in reversing the present trend of the Oussudu. Such an initiative must aim at integrated watershed management. The present levels of pesticide and fertilizer use, which are often more than is essential (Kumar, 2000), may be regulated or managed by informal agreement. Seasonal encroachment into shallow or dried areas of the lake by farmers may be discouraged; instead, controlled fishing may be permitted. People's participation can also enable large masses of *Ipomoea sp.* and other weeds to be removed from the lake and turned into compost / vermicompost using recently developed knowledge (Ramasami et. al., 2002). A few areas of the lake, such as those supporting stands of weed species, may be dredged to control their spread.
7. The recent plans of making Oussudu a recreation centre should be treaded with caution. It would be in the long-term interest of the lake to promote eco-tourism.

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