

LIVESTOCK ECONOMY AND ECOLOGY IN EL KALA, ALGERIA

Evaluating ecological and economic costs and benefits in pastoralist systems

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This paper draws attention to some of the problems that arise in understanding the cost and benefit flows in pastoralist systems. These difficulties arise as a result not just of the ecological variability but also as a result of social and political complexities common to the regional contexts of many pastoralist systems. With many such systems, rangelands straddle international borders and are continuous with conservation estate. Livestock management and marketing must be seen in the context of their interplay with conservation values and their involvement with cross-border factors whether economic, political or military. This complicates understanding of the economics of such systems, and forces a different weighting of their costs and benefits. Alongside ways of evaluating potential environmental problems arising from pastoralist use, we need methods to evaluate both the benefits of coexistence of pastoralist land use with highly-rated conservation values, and the economic implications of the access to the free services that use of conservation-estate grazing and water may represent. In addressing the problems of livestock marketing in a fluctuating system, we need to take note of the economic opportunities as well as the constraints. Many if not most pastoralist systems have the possibility of unofficial cross-border trade, whose direction will depend on relative prices. Security issues influence production and marketing and pastoralists' own evaluation of costs and benefits. It is not just the ecological environment that fluctuates in an unpredictable way. The shifting economic and political context creates these less visible opportunities and constraints that make economic analysis problematic and interventions often ill-judged.

The present paper is based on a participatory survey (Homewood 1991) carried out in order to establish baseline information on a little known livestock production system and its role in local ecology and economy. This paper does three things. First it outlines the history of land use in El Kala, the present livestock system and official views on its performance. The paper then sets out a method of successive approximation which works on trade and census figures of dubious validity to derive a better estimate of the real scale and importance of a largely invisible pastoralist economy, with major implications for range and livestock management. This re-evaluation of census and trade figures supports the view that, contrary to official perceptions, pastoralism in El Kala is an economically robust and ecologically sustainable form of land use. Finally, the discussion ties the El Kala case study into a broader network of economic and political complexities. Many pastoralist systems operate within a nexus of

constraints that simple technical fixes cannot overcome. In particular, many pastoralist livestock production systems may be barely viable in the broader context of other political interests, despite the fact that they are internally vigorous enterprises continuing successfully to adapt to the opportunities and constraints of present-day African economies while minimising environmental costs. Analyses of ecological and economic sustainability, and technical interventions, may play into the hands of other interests seeking to expropriate the underlying resource.

EL KALA: CLIMATE, VEGETATION AND LAND USE

El Kala is a National Park of around 800km², situated in the extreme north-east of Algeria, in a triangle of coastal plains and hills bounded by the Mediterranean sea and the Tunisian border (Fig. 1). Most of Algeria is arid, but in El Kala the Kroumerian Mountains rising to the south east trap the prevailing wet NNW winter winds to give an unusually moist climate (900mm on the coast, rising to 2000mm on the mountain slopes), and easily accessible ground and surface water. El Kala is of considerable conservation importance, both for its natural fauna and flora, and for its migrant birds attracted and maintained by the wetlands (Stevenson, Skinner and Hollis 1988). Some 100 000 people also live in the Park, mostly in its urban enclaves. The forests, lakes and grasslands of the El Kala area support large numbers of cattle as well as the small stock common in other Algerian pastoralist systems. Current conservation and development plans for El Kala are based on the conventional wisdom associating traditional pastoralist use with low productivity, overgrazing and environmental degradation (World Bank 1991, Stevenson, Skinner and Hollis 1988, Homewood 1991, Sandford 1983, Homewood and Rodgers 1987, Behnke and Scoones 1992). Government planners are aiming for strict controls on grazing together with a transition to a much more restricted and greatly intensified livestock system, despite the fact that pilot projects along these lines have had little success in the area (Homewood 1991). Rainfall records 1927-1977 show the post-1960s downturn widely recognised for sub-Saharan Africa, though local awareness centres on the 1987-1990 drought. Local conflicts over water, land use and conservation values have grown as rainfall has declined.

Pastoralism goes back a long way in El Kala (Aouadi 1989, de Bélair 1990). Goats and sheep had spread throughout the Maghreb by 5000 BC. Cattle are known in parts of North Africa from 5000 BC and were definitely in the Maghreb by 2500 BC. Prehistoric Berber land-use regimes involved mixed farming centred on livestock (de Bélair 1990). The Berber rural economy remained much the same through centuries of Roman, Arab and French rule. The Roman period brought widespread clearance associated with olive

1Fig. 1. El Kala National Park

¹Modified from Skinner et al. (...)

cultivation, and much of the present-day cork-oak forest may represent a mosaic of secondarily regenerated natural vegetation. Vandal (450-534 AD) and Byzantine (534-647 AD) periods left little trace in the area. Waves of Arab invasion swept the area from the seventh century on, and ultimately conquered Berber resistance. During this time of Ottoman rule, the Berber population inland continued to pursue a set of complementary forms of land use which persist through to the present. Cereal cultivation, stock rearing, fruit trees, exploitation of wood, charcoal and other forest resource uses were and are widespread throughout the area. The western part of the El Kala/Annaba area was settled primarily by cultivators of the Beni Urgine, Ouled Sebaa and Beni Amar groups (de Bélair 1990, Tomas 1977). The central part was inhabited by the agropastoralist Ouled Dieb, Ouled Ali, Sbeta and Ouled Amar ben Ali. Finally the eastern part was occupied by four groups belonging to the large Nehed tribe: the Brabtia, Ouled Arid, Souarekh, and the Lakhdar – these last being primarily nomadic or transhumant herders. Current place names reflect these roots: Brabtia, Souarekh (Oum Tebboul).

The French conquest and colonisation of 1836 brought major changes (de Bélair 1990). Contemporary censuses in the El Kala area show cereal fields expanded from a total of around 6000ha in 1856 to around 14 000ha in 1955 (Table 1). During this 100 years of colonial rule, the human population trebled, small stock doubled, and cattle increased to half as many again as in 1856. The rural population underwent a relative impoverishment (de Bélair 1990): acreage of cereals per person declined to three quarters of the former total; mean number of small stock per capita was nearly halved; mean number of cattle per person was more than halved (Table 1).

Table 1: El Kala census figures for 1856-1987

	1856 ²	1955 ²	1987 ²
Approximate area (ha)	80 000	80 000	80 000
Population	11 299	37 351	80 000
Cultivation (ha)	5 869	14 087	15 200
Cattle	33 981	50 399	20 000
Small stock	31 565	60 331	9 000

² Approximate figures, based on the 1987 census as reported by officials from Planning and Agriculture, El Tarf (*Wilaya* Headquarters) and El Kala

The growing local population, its relative impoverishment, the expropriation of good agricultural land and the curtailment of forest grazing rights in many parts of the area

combined to exert a spiralling pressure on environmental and natural resources. The colonial period saw increased exploitation of the cork-oak forests, and malaria control programmes involving both the partial drainage of Lake Tonga and the plantation of extensive Eucalyptus stands around Lakes Mellah and Oubeira. At Independence there was a period of rapid clearance which peaked in the mid 1970s. Clearance was partly because of the desire to put as much land as possible into useful production, and partly through a desire to stake individual claims.

Land tenure systems have changed along with changing regimes. The pre-colonial system of land tenure involved *beylik* (land belonging to the Bey), *melk* or private land, *arch* or collectively-owned tribal land (often communal pastureland) and small areas of *habous* or land deeded to Islamic religious foundations. Place names reveal traces of this system e.g. Arch Lahmar (= Forêt de l'Oubeira). The French expropriated large areas of land for colonial estates and forestry operations. The post-Independence Marxist state brought new waves of rapid land clearance and Algeria has seen four periods of land reform in as many decades (de Bélair 1990). In 1983, El Kala National Park was gazetted to protect the main watershed forest and coastal lakes. The National Park does not own any of the land, but is charged with its conservation so as to prevent forms of exploitation which might damage conservation values or affect the long-term status of the natural resources of the area. The park allows for graded intensity of human use in different zones. According to 1987 figures, the Forestry Service controls around 73% of the Park (588km² of forest land including stands of cork oak, chêne zéen, maquis and plantations of exotic conifer and eucalyptus). 10% of Park land is privately owned and 9% is state-owned agricultural land leased in a variety of ways to individual farmers or small groups. These categories together include 50km² of cereal and other food and cash crops, 20km² of fodder crops and 100km² of grazing land (fallow or uncultivated). 7% (50km²) of the Park area is open water, which comes directly under the control of the Service Hydraulique. The banks and drawdown areas of Lake Tonga and Lake Oubeira, much used for cultivation and grazing, are under the control of service Hydraulique, and are classed by the National Park as Zone 1 (Integrale), which in theory excludes human land use (Stevenson, Skinner and Hollis 1988). A programme of dam building and canalisation is now underway within the National Park which will capture and divert water for industrial and domestic use in Annaba, and drain marshy areas adjacent to the Park. Cultivation of irrigated fodder crops is planned to support intensified livestock production outside the Park in place of the current extensive system.

LIVESTOCK SYSTEMS IN EL KALA

Most El Kala livestock (95-99%) are local breeds managed on largely traditional lines. There are only a few hundred intensively managed animals of 'improved' breeds. The non-intensive livestock systems operating in El Kala form a continuum between extremes that are associated with the lowland coastal plains and lake margins with their surrounding low hills on the one hand, and with the highlands to the south and east on the other (Fig. 2). The lakes/plains zone extends westward beyond the National Park boundaries across the Plaine de Mafragh, the Garaet Mekhada and Lake Fetzara. The mountain region extends south and east into Tunisian Kroumeria. These regional linkages, together with the linkages between plains and mountain systems, mean that interventions in any one of the associated livestock regimes are likely to have repercussions throughout other units.

Fig. 2. Livestock systems in El Kala

1. Lowlands mixed farming and herding on wetland margins: proceeds banked as livestock
2. Highland herding with seasonal transhumance
3. Offtake to national commercial markets

In the lowlands, livestock and cultivation are essentially complementary and seen as equally important (Homewood 1991). Smallholders farm cash crops on the drawdown zone of the lake margins, and maintain small herds of perhaps a dozen cattle and a score of sheep. The animals show a seasonal pattern of pasture use, moving down into the lakebed as the waters dry up, and back up the forested slopes as the rains come and the lakes fill. The animals are often unherded but return to the homestead each night. These herds are primarily a wealth store and an integral element of the mixed farming system. They graze fallows, use crop residues and manure fields. In a good year, the proceeds from cash crops are banked as cattle. In a bad year, animals are sold to cover household needs. In 1991 a cow sold for 15 000 Dinars on average (£500), a sheep for D6000 (£200). Overall though, livestock offtake rates are low. Grazing and manuring are seen as an essential part of the process of improving the agricultural quality of the land. Livestock are thus seen not only as an established part of the mixed farming system but also as a means of bringing back into useful production land recently returned to private owners. While most state-owned land is cultivated, 50% of private land is grazed fallow or natural pastureland. In some areas, hay is cut and exported from the region to as far south as Tebessa.

The highlands operate quite differently. With steep hillsides and long cold winters, cultivation possibilities are limited and subsistence centres on the sale of livestock reared on

natural forage. People here see their animals and particularly their cattle as their central or even their sole occupation (Homewood 1991). Livestock are closely herded to protect against predators and cross-border cattle thieves. The cattle transhume for three months of the winter to lowlying forest pastures several days' journey from the homestead, but small stock stay on the mountain. The long history of this transhumance or *achaba* system is indicated by such place names as Kef el Acheb. Herdowners grow some fodder crops (especially feed barley), and store hay and other natural forage such as acorns for small stock winter feed, as well as lopping olive and cork-oak branches for them. Urban migration has decimated the human population, and densities are still falling. Livestock numbers, however, are if anything rising, and the herdowners who are left are managing herds of up to several hundred cattle or small stock. Often urban migrants remit part of their income to be invested in livestock managed by their highland relatives. In the highlands livestock are sold direct to dealers year-round. There is a peak in the autumn before the winter sets in and there are also seasonal peaks linked to the religious calendar, especially around the time of Id-el-Kebir, in summer with the marriage season, at the time of the Hadj and during Ramadan.

Ain el Assel within the National Park has one of the top five livestock markets in Algeria (World Bank 1991). There are also smaller weekly markets at Oum Tebboul and Bouteldja. As well as the weekly markets, middlemen buy direct from herdowners in mountain areas such as Roum el Souk and Djebel Ghourra. The volume of livestock trade at Ain el Assel fluctuates by 10-15% or more depending on the season and on the religious calendar. The Ain el Assel market does not only deal in locally reared stock: sheep are brought 150-200km by road from the Tebessa area for consumption within the *Wilaya* (District). In addition to regular sales to the livestock markets, there is said to be thriving unofficial cross-border trade. Given the differential prices and availability of goods in Tunisia and Algeria, the long border winding through remote highland areas, the common origins of the populations on the two sides, and the ready availability of livestock as a mobile currency, this is not unlikely. According to one official, most cattle around Bougous are bought in Ain el Assel, brought to the Bougous area in transit and passed on into Tunisia (or vice versa). In this view, the hills above Bougous are not so much a stock rearing area as a middleman or staging post in a well established cross-border trade (Homewood 1991).

HOW TO TAKE DUBIOUS FIGURES AND DERIVE SOMETHING BETTER

Census figures (Homewood 1991; also Table 1) suggest that the human population in El Kala has grown steadily throughout the colonial and post-Independence periods, but that despite an initial increase, livestock populations have now fallen away to considerably less than their nineteenth century levels. Cultivated area has not changed much since the colonial period. Such figures have been used to suggest that a livestock enterprise based on local breeds and traditional pastoralism is dying out in the face of more productive and attractive alternatives. It has also been said that misuse of land by pastoralists has brought

about environmental degradation to the extent that the area can no longer support the numbers it carried in 1955, or even in 1856, despite the fact that cultivation has not continued to expand in a way that might compete with pastoralism (World Bank 1991). These views underpin the government and World Bank plans for water and livestock development in the El Kala area.

Several lines of evidence suggest that these livestock figures and the conclusions they invite are seriously misleading. Firstly, El Kala region is exceptional in Algeria both bioclimatically and for its related emphasis on cattle rather than small stock rearing. Annaba University staff (Pers. comm.) have estimated that 25% of the national cattle herd is to be found in the triangle of lakes, plains and forested hills from Skikda/Guerbes to the border. Perhaps 10% of the national herd is to be found in the *Wilaya* and 3-5% in the Park itself. Using Troin's 1985 estimate of 1.2 million cattle in Algeria in the 1980s (Troin 1985) this would place the National Park total at around 40-60 000, two to three times higher than the 1987 census, but not unrealistic. The 1955 census figure of 50 400 for La Calle, itself probably an underestimate, indicates that the cattle population has reached this level in the past.

Secondly, agriculture including livestock rearing accounted for some 50% of all jobs recorded in the 1987 census for the 3050km² *Wilaya* of El Tarf as a whole. Within the 800km² National Park, the emphasis is generally held to be 60:40 in favour of livestock as opposed to cultivation. Many jobs other than livestock rearing *per se* also revolve around livestock (butchers, traders, fodder sale etc). The rural economy within the National Park and to a lesser extent in surrounding areas has been tied to principles of environmentally sustainable development far more than elsewhere in Algeria. Intensive industrial enterprises have been held back, leaving agriculture (and livestock rearing in particular) central to the rural economy. Taking dependents into account, de Bélair estimates that around 40% of the total population of El Kala, including that of the urban enclaves, is supported by agriculture. In the mountain areas, dependence on agriculture and especially livestock rearing is as high as 80% or higher (de Bélair 1990). Thus farming and herding remain the most important means of subsistence in El Kala, despite the major post-Independence changes with rapid population growth and urbanisation.

Thirdly, Ain el Assel in the National Park has one of the largest livestock markets in Algeria. Demand for red meat in Algeria is high and growing. The country imports around 20% of all that it uses. The El Kala region is a net exporter of red meat. In 1991 red meat sold for 220 D/kg locally (250 D/kg or around £8/kg in Algiers). By comparison, freshwater fish for example sold for 40 D/Kg. Official records state that 4000 tons/year of red meat are exported from the *Wilaya*, with over one third of this coming from the National Park. Demand exceeds supply, and the National Park and the *Wilaya* export around 80% of all the red meat they produce. Although exact figures are not available,

Table 2: Assumptions

<ol style="list-style-type: none"> 1. Official export figures are either accurate or may underestimate export of El Kala livestock. 2. Some of the El Kala exports come from Tunisia, but this is countered by an at least equal movement of animals in the opposite direction. 3. Average meat exported per animal slaughtered is 100kg/cow; 20 kg/sheep.
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Note on assumptions

1. The official figures on red meat exported from the Wilaya are either an accurate representation of the trade or else an underestimate. The latter is likely: the trade is controlled and taxed and there is no incentive to inflate the figures. If anything there is an incentive to err on the low side.

2. Some (or even many) of the animals entering the market as meat for export from El Kala may be coming over the border from Tunisia. However, this is countered by an opposite trade in animals moving from El Kala to Tunisia. The relative flow depends on the relative prices and availability of different goods in the two countries. If anything, it is Algeria which suffers the greater shortages of basic necessities. The animals in the cross-border trade are therefore assumed to cancel out, in the knowledge that if anything this assumption errs on the side of underestimating livestock numbers and offtakes for El Kala as opposed to Tunisia.

3. The average weight of a slaughter cow is taken as 200kg. I do not have figures for the local breed, but this would be a generous average for the small east African zebu, which is rather larger (Pratt and Gwynne 1977). I also assume that the dressing out percentage for local extensively reared cattle in range condition is 50 per cent (ie. 100kg/cow), which again would be average (Williamson 1984). A generous average body weight for sheep would be 40kg; and a generous dressing out estimate is 50 per cent (Williamson 1984).

El Kala exports at least 1300 tons of red meat every year.

It is not generally accepted that two poor sets of data may be used to generate a better set. Nevertheless, it is possible to work back from the minimum estimates provided by the census and trade figures to a more realistic idea of the livestock population and of the productivity of pastoralism in the

Table 3: El Kala livestock populations estimated from exports

	Case A	Case B	
	Cattle only ¹	50% Cattle ¹	50% Small stock ¹
Kg. meat/year	1 300 000	650 000	650 000
Equivalent number of animals/year	13 000	6 500	32 500
Annual offtake % if total herd is as 1987 census	65	32.5	361
Estimated total herd size if offtake is 20% for cattle and 60% for smallstock ²	65 000	32 500	54 000

Note on estimates

¹ I do not have figures on the proportion of the exported meat coming from cattle versus small stock, but El Kala is widely acknowledged to be a beef-producing area, and sheep are said to be commonly *imported* from Tebessa area for *local* consumption (their meat therefore does not appear in meat export figures). Animals from Tebessa which are destined for the Annaba or other large national meat markets do not pass through Ain Assel. It seems likely therefore that the majority of meat exported from El Kala and the Wilaya is beef. I calculate herd numbers that would be necessary to provide the observed level of offtake for two extreme cases: the first with 100 per cent beef export and the second for 50 per cent beef and 50 per cent mutton. The real situation is likely to lie between these two extremes.

² Annual offtakes from traditional pastoralist cattle herds are commonly 8-10 per cent per annum (Sandford 1983, Williamson and Payne 1984, Dahl and Hjort 1976, Homewood and Rodgers 1991). Commercial systems using intensive husbandry, supplementation and veterinary care may achieve offtakes above 25 per cent (Pratt and Gwynne 1977). A 20 per cent offtake per year is a generous estimate for an extensive system, particularly as the lakes/plains herds are not managed for commercial offtake and should show a low rate by comparison with the highlands.

area. I have modified this technique from an analysis linking ivory trade and elephant offtake figures (Pilgram and Western 1986). Table 2 outlines the assumptions underlying the calculations, and Table 3 sets out the figures involved. Put briefly, the meat export figures can be translated into minimum numbers of animals represented by the annual export of meat. This is almost certainly an underestimate. The trade is controlled and taxed and there is no reason to declare more than the actual quantity sold (if anything, the incentive is to err on the low side). However, even the minimum estimate of animal numbers exported as meat represents a biologically impossible rate of offtake from the population of 20 000 cattle and 9000 small stock reported by the 1987 census. In the analysis of ivory trade figures from which this approach derives, the authors go on to suggest that excessive offtake is mining the resource to extinction (Pilgram and Western 1986). With El Kala livestock however, the offtake is maintained. The implication is not that they are being mined to extinction, but simply that the census figures are gross underestimates. The trade figures can be used to suggest a better minimum estimate of the actual population.

Some of the animals entering the market for export as meat may be coming over the border from Tunisia. However, this is countered by an opposite trade in animals moving from El Kala to Tunisia, depending on the relative price and availability of different goods in the two countries. Algeria suffers the greater shortages of basic household goods and spare parts. The animals in the cross-border trade are assumed to cancel out, but if anything, this assumption errs on the side of underestimating livestock numbers and offtakes for El Kala as distinct from Tunisia. As the annual export figures must be at best a minimum, and more probably an underestimate, they demonstrate that the 1987 population census figures for livestock cannot be correct. This is hardly surprising for an official census of a pastoralist system, particularly where rapidly changing policies on land tenure, private wealth and taxation make livestock a good investment, and herdowners cautious about disclosing their holdings. On the basis of the amount of meat recorded and taxed as officially exported, El Kala cattle numbers cannot be below 32 500, and may be as high as 65 000 (Table 3). They are at least of the same order as in the 1850s if not higher. Small stock numbers may be as high as 54 000 but are likely to lie between the 1850s and 1950s figures.

ECONOMY, ENVIRONMENT AND DEVELOPMENT IN EL KALA.

The revised livestock population estimates have interesting implications for the productivity of the pastoralist system and its importance in the economy of El Kala, as well as for ideas on environmental degradation and conservation

policies. They suggest that in the El Kala highlands, milk-based traditional pastoralism, geared to long-term self sufficiency, has given way to a meat-based commercial system. This transition has been described in detail for Libya (Behnke 1980), where oil revenues allowed a proliferation of jobs attractive enough to tempt many people, particularly those with the more marginal holdings, to leave the rural areas. Large herdowners came to control still larger herds. With fewer herders each looking after more animals, and a growing urban demand for meat, milk-based pastoralism became uneconomical and gave way to proto-ranching for commercial meat sale. Increased levels of offtake are made possible by the fact that with smaller numbers of herders and larger herds, less milk is used and more is left allowing better survival and growth rates in the flock. In the El Kala highlands this transition has meant modern marketing networks which extend from a regional to an international scale. A parallel transition in the plains has made farmers more cash crop oriented. Offtake in the lowland herds is much less than in the highlands, but livestock are more important than ever in terms of their wealth store function as well as their complementary use of land and resources.

What of the implications of the revised livestock population figures for environmental degradation and conservation in El Kala? It seems highly unlikely that there has been any dramatic increase in overall livestock numbers since the 1856-1955 period. Neither veterinary nor water developments have made much impact. Local herdowners report that some parts of the National Park have shown a relative increase in stocking density in the last decades and others a decrease. During the colonial period when Lake Tonga was drained, the lakebed supported excellent pastures and larger numbers of cattle. The current water levels and encroachment of reedbeds have caused a decline in cattle herds and local herdowners see the lake as 'dying' from the point of view of stockrearing. By contrast, the slopes of Djebel Ghourra are said by local herdowners to be more densely stocked than thirty or forty years ago. Herders in Khangt Aioun remember the colonial restrictions on forest grazing as affecting cattle numbers in the area at the time. Overall there has been no major change in the area of land available for livestock use. *Arch* or traditional communal grazing lands have tended to pass into the control of the Forêts or (where they are seasonally flooded) Hydraulique, but they continue to be grazed in the same way as before. There are one or two notable exceptions, such as the recently flooded Mexa dam basin, and the formerly drained Lake Tonga. In the highlands, older herdowners see the main changes as being a dwindling human population and increasing individual herd size, rather than any change in the appearance or productivity of the land (World Bank 1991). It seems unlikely that livestock numbers, densities, or soil and vegetation conditions have changed markedly from those that have acted over thousands of years to produce those aspects of the landscape so highly valued by conservationists. None of the preconditions

assumed to lead to overstocking and overgrazing operate in this system (Stevenson, Skinner and Hollis 1988, Sandford 1983, Homewood and Rodgers 1987).

Apart from general fears on overgrazing, there are three specific areas of conservation concern over pastoralism in the park. Forest fires are a problem, and are seen as often deliberately set by herders (World Bank 1991, Aouadi 1989). Secondly, in several parts of the highlands the impressive canopy of mature cork trees has a completely bare understorey (Homewood 1991). This complete dearth of regeneration may result from browsing, trampling and also from the practice of gathering all the acorns that fall to use for winter feed for small stock. Finally, grazing and trampling may affect the alder carrs important to nesting migrant birds. The scale and causality of each of these possible problems are poorly understood, let alone any method of costing them.

Other forms of land use and sources of livelihood in the El Kala area involve cultivation, cork oak exploitation, fishing, and quarrying. Local tourism operates on a limited scale. Woodpulp and paper production schemes set up to generate jobs and revenue in El Kala rapidly collapsed in the face of real costs and benefits. Other industries have been discouraged on the basis of the pollution they would bring, which is all too evident elsewhere in coastal Algeria. Encroachment of building on good agricultural land and rapid clearance of marginal land for cash crop speculation, are also problems. All these other forms of land use carry greater environmental burdens – clearance of natural vegetation, release of chemicals, stocking with exotic species, and landscape impacts. Methods exist to cost at least some of these land uses and their impacts.

Compared to the costs of the currently planned regulation of ground and surface waters, however, all these problems seem minor. The proposed water developments will capture a large part of the El Kala waters to supply Annaba, and aim to substitute intensive cattle rearing, using irrigated fodder crops, for the current extensive grazing system. Given the track record of trials here and elsewhere this is overoptimistic, but the first stage of the plan, the Mexa dam, is now under construction in the Park, and its effects are already apparent in the impoundment area. The lakes/plains zone extending from within the national park west to the Plaine de Mafragh, the Garaet Mekhada and Lake Fetzara are all fed by the same watershed whose runoff is to be captured in the planned dams. The Garaet Mekhada is said to hold half the cattle of the *Wilaya* on a seasonal basis. These regional linkages, together with the linkages between plains and mountain areas, mean that the interventions in surface and groundwater flow will have repercussions throughout the associated livestock systems. The full programme of dams, canalisation and irrigation, if carried out, will involve major environmental changes with water capture and diversion, drainage of productive marshes, and chemical pollution associated with the

intensification of livestock and crop systems. The water has hitherto sustained an effectively sub-humid production system in an otherwise semi-arid country. The impact of its diversion cannot be overemphasised. Capture of the El Kala waters to feed Annaba's industrial sprawl will undercut the whole production system for farmers, herders and conservation values alike. How does one begin to evaluate the economic and ecological costs and benefits of these planned changes?

CONCLUSIONS

Local livestock and mixed farming systems have evolved in this area over thousands of years. The forms of land and pasture use involved and even the numbers of livestock appear to have altered rather little over a considerable period. The local livestock systems are closely integrated with cultivation, with fodder storage and trade, with local, regional, national and international markets, and are of tremendous importance to the local economy. Regional linkages both ecological and economic extend past the Park and *Wilaya* boundaries to Annaba region and beyond, and even across international borders. Non-intensive livestock husbandry in this area clearly pays. Before attempting intensification or other interventions, it is important to understand more clearly the economics of the current system. The initial cross-checking of trade and census figures carried out in this paper make it clear that the productivity and efficiency of the system has been seriously underrated, as is frequently the case with pastoralists. A realistic valuation remains out of reach. Firstly it would be necessary to account for the fact that the production system is underpinned by conservation-compatible use of the 'free services' of the National Park grazing and water, making livestock production in El Kala a low-cost, high-return enterprise. Secondly, the unofficial nature of the cross-border trade means that only with intensive participant observation of producers and traders, and with monitoring of a large sample of individual animals, could the true scale of the livestock trade be established. In the evaluation of environmental costs and benefits, it would be necessary to include the fact that pastoralist land use in the National Park promotes natural vegetation formations and a pleasing 'natural' landscape compatible with maintaining wildlife populations, and avoids fencing, clearing and the introduction of exotic species or chemicals.

The environmental benefits of the El Kala livestock system lie in its complementary use of resources essential to wildlife survival and not least in its added justification of their continued maintenance. The economic costs of the El Kala system are low, and returns high, as is the case for the environmental aspects. The pastoralist system operates a flexible and mobile response not merely to patchiness in rangeland conditions but also to patches of political and

economic opportunity. Its economic strength lies in its ability to exploit the tenurial no-man's land and attendant free services of National Park grazing, together with a strong market backed up by the economic no man's land of the cross-border gradient in prices and availability of goods. Livestock here represent a moveable and easily-traded asset as well as an investment that grows at a reasonable rate of return. They provide not only a hedge against inflation but a potential bolthole in times of economic collapse. While individuals can migrate to work in the towns, they can invest their earnings in livestock. The indications are that when they can no longer find jobs in the weakening urban economy, they can return to the livestock production system. It has the potential to accommodate them by shifting to and fro along the continuum between milk-based, labour intensive, and largely self-sufficient production, to a more market-oriented, meat-exporting, relatively low-labour enterprise, without much change in external appearances.

Contrary to official views there is little indication that the pastoral production system of El Kala is deteriorating. On the contrary, it is hard to envisage a more robust and profitable form of land use in this area, where a traditional pastoralist system has made an apparently painless transition to a still non-intensive but in many ways modern commercial operation on a regional, national and international scale. Extensive pastoralism in El Kala is one of the few forms of land use in this area which is both economically and environmentally robust. Unlike many African pastoralist systems, the El Kala livestock production system needs no help in establishing crop-livestock linkages, fodder storage, or marketing mechanisms. In the context of Algeria's political, economic and environmental problems, the El Kala livestock system would be best left alone, but it may not be. It runs into trouble with national politics of resource use and with international power struggles. Current water development plans represent a serious threat to the environment and to livelihoods.

Ultimately the El Kala livestock system relies on water which is the vital limiting factor underpinning all production, industrial as well as agricultural, in this arid country. The herdowners do not have the political strength to defend El Kala's water against encroaching outside interests. Other political and military interests, with which pastoralists may not be averse to allying themselves, have become entangled with this issue. The considerable strength of the Islamic fundamentalist movement in this part of Algeria is in part bound up with the politics of water and of competing production systems contesting its control. The poorly guarded coast, and the mountainous hinterland rising to the Tunisian border, encourage clandestine movement of arms as well as livestock.

The National Park, its resident population, the international border with the relatively more prosperous Tunisia, the intense competition for the exceptional water resources the Park holds in an otherwise arid area, together with the power

struggle between Islamic fundamentalists and the government in the El Kala/Annaba region, make this area a classic example of the warring interests at work in the superficially apparently undeveloped areas used by pastoralist peoples. This combination of a borderland location, the opportunities such locations present for cross-border trade, the associated political marginalisation and inability to retain control over vital resources, and the potentially explosive political and military context, is a common state of affairs for pastoralists throughout Africa.

In most cases, ...pastoralist societies are divided between several neighbouring states – one outcome of the logic underpinning the imperialist subdivision of Africa into colonies which were formed around enclaves of agricultural, mineral or commercial resources separated by regions of lower value and productivity: rangeland and savanna... Within the emergent African nations, pastoralists have usually found themselves a minority... at odds with the state. Often demographically marginal and subjected to the power of larger ethnic groups over which they once exercised political and cultural hegemony, pastoralists now face the consequences of their political decline...

... we should focus on the geo-political and geo-economic stakes involved in ... the most militarily volatile areas of Africa, if we are to understand the underlying dynamics of these conflicts. For geographical reasons, regional conflicts such as those which have opposed Algeria and Morocco, Libya and Chad, or Ethiopia and Somalia often involve rangelands critical to pastoralists. When armed conflict does break out, pastoralists have often found themselves thrown to the forefront of an international scene where political relations have...been dictated by the displaced rationale of super-power confrontation...

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The problems of rangeland management have to be tackled on more levels than just local ecology or economy. Cross-checking of the type described in this paper can guard against the more obvious misconceptions as to the scale and importance of local livestock economies. However, the broader political and economic context comprises on the one hand a cross-border trade and an array of free services available on conservation estate, and on the other hand development interventions guaranteed to capture and divert the central resource, and international political tensions finding an outlet in the local struggle for control of resources. What approaches exist to deal with the ecological and economic costs and benefits of pastoralism in such situations? To be externally

as well as internally valid, any analysis must begin by recognising that the issue is often not whether a system is ecologically and economically sustainable, but rather who can corner the resource.

Acknowledgements

I am grateful to the Director, staff and local people of El Kala National Park, the Directors and staff of Planning, Agriculture and Forestry at El Tarf (Wilaya Headquarters) and at El Kala, the staff of the University of Annaba and the Director and staff of the Agence Nationale de la Conservation de la Nature (Algiers), for the information and assistance they provided in the course of this study. The opinions expressed here are those of the author.

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