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PRICKLY PEAR CACTUS AND PASTORALISM IN SOUTHWEST MADAGASCAR

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Madagascar's Mahafale cattle raisers have adopted several species of the prickly pear cactus (*Opuntia*) into their subsistence patterns. Their use of *Opuntia* has had the economic effects of both sedentary and transhumant intensification. It lengthens the stay of pastoralists at their villages and structures the timing of their seasonal migration to distant pastures. (Cactus-plant cattle fodder, pastoralism, sedentarization, Mahafale, Madagascar)

This article explains how several thousand Mahafale pastoralists in southwestern Madagascar have incorporated prickly pear (*Opuntia*) into their pastoral economy, which depends on assisting their cattle through the dry season, when grass and water are scarce. Rather than relying on nomadism in the pursuit of water and pasture for their livestock, the pastoralists have turned to cactus to keep stock alive. So pivotal is *Opuntia* in the cattle diet that they categorize it as *sakafon-drano* (water-food). This plant-human relationship, therefore, is central to an understanding of Mahafale economic life.

Prickly pear, a cactus of the genus *Opuntia*, recognized by its characteristic thorned, flattened segments, has thrived in places far from its original New World homelands. In the Mediterranean region, people have cooked with fresh, broad, flat, segmented *Opuntia* stems (called *nopalitos* in Spanish) and its ripe, fleshy pears (L'Allemand 1958:113). In Sicily, varieties of the tree-shaped *Opuntia ficus-indica*, which can grow to a height of twenty feet or more and forms a woody trunk at the base, have been valued for their fruit as well their hedging, foraging, and wind-breaking (Barbera, Inglese, and Pimienta-Barrios 1995:18). Cactus pears have been a principal fruit crop of North African nomads, who also boiled down the fruit juice, which is rich in vitamins, as a molasses substitute (Meyer and McLaughlin 1981:108). Outside of rice-growing areas in India, farmers have maintained large hedges of thorny *O. dillenii* (Donkin 1977:44). *O. hernandezii* has been grown in Senegal for hedging, opposing the expansion of sand, and for its fruit (Chevalier 1947:453). Agriculturalists in North Africa (Tunisia, Algeria, Morocco, Libya) have lined their cropped land, roads, and camel trails with cactus fencing (Monjauze and Le Houérou 1965). Sheep and cattle ranchers in Australia have colonized dry lands by feeding prickly pear to their stock (Commonwealth Prickly Pear Board 1925; Dodd 1940). Pastoralists have used cacti as cattle fodder in Sicily, Tunisia, South Africa, and Madagascar (Monjauze and Le Houérou 1965:104).



Map: The Cactus Region in Madagascar

THE CACTUS REGION IN MADAGASCAR

Prickly pear has affected the Mahafale pastoralist way of life, particularly in terms of mobility, diet, and gender relations. Women harvest cactus, collecting tuna, the prickly pear fruit, for their families to eat. They also sell the surplus as a cash crop. Male herders work cactus as a vegetable crop for cattle. They singe truncated cactus *nopales*, the fleshy leaf pads, over a fire to remove the thorns before feeding the succulent fodder to their cattle. For these benefits, pastoralists sow, prune, and shape prickly pear into living fences, plantations, enclosures, and even mazes of fences within fences, around their corrals, hamlets, and villages. In doing so, these herders have become cactus cultivators, and reduced their mobility. In addition to increasing sedentarization, *Opuntia* also has affected the timing of Mahafale transhumance.

Among the conditions affecting pastoralist peoples around the world, scholars have pointed to failures at the state level to keep mobile pastoralists viable as encapsulated groups (Ellwood 1995; Hiatt 1984; Mohamed Salih 1990; Olson 1990). Others have emphasized how some states have followed colonialist agendas by relocating, training, or pressuring pastoralists to sedentarize by implementing policies that favor farming rather than herding activities (Galaty and Johnson 1990; Hinderink and Sterkenburg 1987; Khogali 1981; Silitshena 1990). Some point to pastoralist societies torn apart by war (Hutchinson 1996), shrinking pastures (Salzman 1980), or shrinking territories (Rao 1992). But even before states existed, fortune sometimes turned against pastoralists in their relationships with sedentary groups (Khazanov 1994).

A major theoretical stance in the pastoralist literature, then, has been to bring out the victimization of pastoralists by more powerful agents. This has drawn attention from the agency of pastoralists to help themselves (Dahl 1979; Ingold 1986). For example, while enclosures and fencing are usually the enemies of pastoralists (Graham 1988; Little 1992), the living cactus fences of the Mahafale are the creation of pastoralists who are better stock raisers with them than without. This case study illustrates how the process of becoming more sedentary and less dependent on pasturing herds over great distances shows “sedentary” and “nomadic” to be interdependent, rather than opposing ends of the pastoralist continuum.

TRANSFERS

Opuntia is native to South America (Peru and Ecuador), Mesoamerica (northern Mexico and the Oaxaca Valley), and southwestern United States (Texas and Arizona). Its dispersal around the world is related to an insect, the cochineal *Dactylopius coccus*, also identified as *Coccus cacti*, which was prized as a cloth dye on several continents. Prickly pear are hosts for both wild and domesticated varieties of cochineal insects. For centuries, the bodies of the female insects, after being plucked from the plant, dried, and ground, provided the finest, most expensive natural

dyestuff known, rich in carminic acid for red dye, deep in carmine tone, and fast to light and water (Donkin 1977:6). Spanish, Dutch, English, French, and Italian entrepreneurs introduced these insects and their cacti hosts to many tropical and arid locales around the world. Transfers occurred, for example, in the Bahamas, Ceylon, China, Fiji, Galapagos Islands, Hawaii, India, Mauritius, New Caledonia, Réunion, and Sicily. Around 1860, the transfers diminished, when the invention of cheap synthetic aniline dyes surpassed the cochineal as a colorant (Meyer and McLaughlin 1981:107–12).

Nowadays, cochineal insects are still harvested in the Canary Islands and around Oaxaca, Mexico, from plantations of prickly pear hosts, set in the sun to dry, then pulverized into red powder and applied as a colorant to cloth (Nobel 1988). One cochineal species, *D. ceylonicus*, is regarded as the best biocontrol agent against prickly pear pest in the world (Crawley 1989; Brutsch and Zimmermann 1995:155).

Prickly pear arrived on Madagascar as defensive hedging. In 1769, a Frenchman, Count Dolisie de Maudave (or Modave), introduced *figuier de raquette* to Fort Dauphin, an outpost of the French East India Company on the southeast coast of Madagascar, to protect the seaward side from pirates and storms (Decary 1947:456). He imported cactus from either the Île de France (now Mauritius) or the Île Bourbon (now Réunion), where entrepreneurs had introduced this plant along with cochineal in the hopes of starting a natural-dye business (Petit 1929:164 n.1).

Malagasy pastoralists quickly appropriated the thorned, water-bearing plant into their pastoralist ecologies and political economies. At that time, Mahafale were struggling just to survive in the xerophytic landscape (Esoavelomandroso 1989). Sowing rows of cactus and nurturing them into living fencing around hamlets, cropped land, and corrals provided protection from raids, supplemented the region's grasses and other browse for their livestock, and supplied people with a sweet, juicy fare that served also as an emergency food in time of drought.

The species that Maudave imported to the island was *O. monacantha*, a favorite *Opuntia* cattle fodder in Africa, Australia, and India. The cactus naturalized ostensibly in the sandy soils, reproducing from its dispersed seeds. It had no cochineal parasites to contend with until they were introduced by the French in 1923 to combat the “impenetrable” prickly pear fortifications in southern Madagascar (Kaufmann 2001:108). By 1928, the virulent cochineal *Dactylopius tomentosus* had eradicated the Malagasy cactus which covered an area the size of Ohio (Frappa 1932). In the 1930s, in an effort to combat famine and forest destruction, French colonialists transferred diverse vegetable species to nurseries in the south. Malagasy were given bean plants and cuttings from new cacti transfers, thereby introducing the new *raketa* into the landscape (Decary 1932:196–97). The spread of *raketa gasy*—the original species—in southern Madagascar was due not only to the plant's adaptive qualities, seen in anthropocentric and ethnocentric (French colonial) terms as “aggressive” or “invasive.” Human and nonhuman agents also were involved in the spread of *O. monacantha*. According to a colonial officer who spent years in Madagascar's “cactus country,” the plant did not reproduce naturally but only after

cattle had eaten its fruit and excreted seeds in dung—in *gâteaux verts* (green cakes) (Decary 1965:345). Moving cattle substantial distances contributed to its taking root in such an expansive territory.

Yet prickly pear grows faster from cuttings than from seeds, even seeds that are waterborne or dispersed in animal dung (Griffiths 1928:9). It does best when humans want to make enclosures and sow cuttings where the natural vegetation has been disturbed or degraded (Crosby 1986; Russell and Felker 1987). The rapid spread of cactus, then, is always a sign of human agency. In return, these living fences provide food and shelter for pastoralists and their livestock, especially during the “thin” months (July–December) when grasses stop growing.

Although *raketa gasy* served primarily as an economic plant for Malagasy pastoralists, it had a secondary political function. Once these plants had been sown and shaped into ramparts around pastoralist places, they stood in other people’s way and distanced the pastoralists from a perceived menace. They were especially effective against people who were unaccustomed to them, and in the colonial context, the prickly pear helped pastoralists make the region unattractive to potential French settlers (Kaufmann 1999:148, 2001:88).

MAHAFALE

Mahafale number approximately 200,000 people in a territory about the size of the state of Maryland. Their territorial boundaries are roughly the Onilahy River on the north, the Menarandra River on the east, the Mozambique Channel on the west, and the Indian Ocean on the south. Neighboring ethnic groups include Masikoro, Tanosy, and Bara on the immediate north, Tandroy and Karembola on the east, and coastal-dwelling Vezo and Sara on the west and south.

In the area of southwest Madagascar where ethnographic research was conducted, pastoralists value *Opuntia* for its economic attributes.¹ Mahafale people inhabit one of Madagascar’s most challenging biophysical environments. Located in a rain-shadow effect where annual precipitation levels range from the minimum requirement for agriculture to well under it, the people see themselves as living in a place where a wrong turn in an unforgiving landscape can bring disaster to a household. A complex array of proscriptions and taboos, many of which have to do with water and animals associated with water, structure Mahafale social lives. Lemurs and radiated tortoises, for example, are two species forbidden to Mahafale people. Mahafale link their survival to being aware and respectful of the land’s special demands, which they interpret as taboos that serve as guides in a land of difficulty.

The country as a whole has approximately seventeen million people in an area the size of California and Oregon combined (226,658 square miles, or 587,041 square kilometers), which makes it the fourth-largest island in the world (after Greenland, New Guinea, and Borneo). Malagasy people are originally of Indonesian stock, but their gene pool now includes African, Arab, and European contributions. The preferred staple food throughout Madagascar is rice, and a single language,

Malagasy, is spoken throughout the island, though coastal dialects are understood with difficulty by users of the official language. Malagasy is not African but is of the Austronesian language family. Around 2,000 years ago, seafaring peoples brought languages of this family east to Hawaii and west to Madagascar. Malagasy has absorbed several language influences, the most notable being Arabic cosmological terms, Bantu loan words for domesticated animals, and European loan words for technological innovations; e.g., *boky* from the English "book," and *serety* from the French *charrette* (ox cart). Having been a French colony from 1896 to 1960, Malagasy's biggest linguistic influence has been French.

Three ecological zones delineate the Mahafale area. The zones are parallel to the southwest coastline at three elevations. The coastal zone, ranging from sea level to 100 meters above it, receives the least amount of rainfall, on average 300 millimeters per annum. This coastal plain is a mix of sand and limestone that sustains only limited cultivation, primarily in alluvial soils around water courses. The second zone, dominated by water-saving xerophytic plants, many of which are endemic to the island, is the inland limestone plateau at 100-300 meters above sea level. It consists of limestone soils that are pocketed by little sinks where rainwater collects in "water rocks" (*rano-vato*). The landscape is forested and shrubby. Last is the inland steppe zone at elevations above 300 meters, and at the northern edge of the rain-shadow effect. It is the most humid of the three zones and, with its taller grass and longer wet season, best suited for grazing.

Droughts, locusts, and cattle diseases are too common in the region for an agricultural economy to be anything but high risk. Substantial effort goes into trying to eke out a living from gardening, farming small cropped lands, and pastoralism. Of secondary importance are hunting and gathering, swidden horticulture (the opening of small parcels of forest and shrub land, *tetik'ala*, for garden plots, cattle byres, and new hamlets), the occasional co-operative venture (mainly in handicrafts), and mining and trading of precious and semiprecious stones. Market-oriented activities involving ethnic groups bordering the Mahafale, and which feed into the local economy, include irrigated rice farming by Tanosy occupying a well-watered alluvial plain on the northern banks of the Onilahy River, and fishing by Vezo and Sara along the coast.

PASTORALISM

Despite the hardships, pastoralism allows humans to live in this semiarid environment. Mobility is the main requirement for nurturing the herd on good pasture and water. An ideal landscape for cattle, sheep, and horse pastoralists is savanna or steppe, where grass blankets the earth. In Madagascar, there are regions that satisfy this ideal: the Horombe and Ambongo savanna regions in Bara (south-central) and Sakalava (northwest) territories, the latter lying 600 miles north of the Mahafale. The earliest known evidence of herding activities in Madagascar was discovered on the hot, dry, southern coast, with radiocarbon dates on cattle bones to

the twelfth century (Dewar and Wright 1993:425). Oral history sources indicate that before the cactus transfer of the eighteenth century, early Malagasy pastoralists supplemented the limited grass in the southwest by feeding a native succulent tree as fodder and browse to their stock. The tree is one of the few nontoxic members of the *Euphorbia* family (*E. stenoclada*), known locally as *samata*, or *samata foty* and *famata foty* in other Mahafale locations (Charles et al. 1991:94) and *arahaka* in Tandroy (Decorse 1901:106). Nowadays, pastoralists still favor this tree. They use it as supplemental fodder after the grass season is over and before the rainy season begins. It grows in the first and second ecological zones. Herders have turned some areas into a *samata* landscape in which most other trees have been cut, giving this succulent more space to grow. This landscape is particularly noticeable in the coastal zone from Androka to Itampolo, 50 kilometers north, where *samata* is the main tree in sight. The *samata* are shaped into bushy-topped trees, a result of cutting the lower branches for their stock and slicing them into pieces at the feet of their cattle, or, in the case of young trees, letting cattle and goats pull the lower branches off themselves.

Herding was considered less laborious before the task of laying-in prickly pear fodder for cattle began. The data at hand do not appear to support the claim that in the driest parts of the extreme south, in areas of heavily concentrated cacti, "pastoralism notably cannot be practiced without *Opuntia*" (Decary 1925:771). This claim implies that there was no pastoralism before prickly pear came on the scene and supposedly opened previously uninhabited frontiers. Oral history accounts indicate that in precactus days, herders were more mobile in searching for adequate pasture, water, and *samata* for their stock, and less sedentary.

Although pastoralism existed in the hot, dry southwest without *Opuntia*, pastoralists became dependent on it for increasing the carrying capacity of the land. Griffiths' extensive studies on cactus as stock feed demonstrated that an acre of prickly pear in southern Texas, which yielded conservatively around 50 tons per year of cactus fodder, supported three cows (Griffiths 1906:20, 1928:14).² In Madagascar, the production may have been higher, since the pastoralists pruned the cactus to stimulate growth over the year instead of clear-cutting daily fodder with machines, as was done at the Texas experimental station.

The famine of the late 1920s and early 1930s, caused by the sudden removal of *O. monacantha* from the ecosystem, suggests that the tracts of land planted with *Opuntia* supported a much higher number of animals than land without. People memorialize the time "when raketa gasy had become the main food. It was juicy and sweet and could feed everybody. Then it was all gone and we had to plant other food like manioc, corn, and sweet potato. When raketa gasy died, famine came." Approximate numbers of dead from the famine are under 1,000 people and just over 10,000 head of cattle (Kaufmann 2000:149, 151), though some authors factor a figure as much as 30 times higher to dramatize the victimization of Malagasy peasants (Guillermo 1955:29).

Nowadays, a cactus-based pastoralism has recovered from the colonial-era famine. It is one part mobile and another part sedentary, a form of semisedentary pastoralism. Although Mahafale pastoralists around Androka Vaovao considered themselves stock raisers, garden and cropped foods (including corn, sorghum, manioc, and prickly pear) and some wild foods made up over one-third of their diet, with about another third coming from livestock, mostly from curdled milk, and a final third from regional systems of exchange that provided rice and fish. With the infusion of cactus into the diet, mobility became less diffuse and more concentrated into transhumance.

WATER-FOOD

Raketa accounts for the pastoralists' ability to raise hundreds of thousands of cattle in a largely waterless part of Madagascar. In the far southwest, water is so scarce during the dry season that cactus is a major source of water for cattle and humans. Cactus also presents hundreds of tons of juicy fibrous sustenance to livestock and to people if severe famine strikes. That this plant helps to resolve the region's ecological constraints has earned it the fitting description of "water-food." A skilled cactus cultivator at Androka pointed at a cactus grove in his garden and said, "Raketa attracts water and other edible plants seeking water." The *Opuntia* species favored by the Mahafale absorb large quantities of water through their network of roots that spread close to ground surface, storing water in their fleshy bodies above ground and in the soil held by their thickened mass of roots. When the rains come, these plants hold rainwater both below and above ground, which brings a sudden flowering in the cactus plant and in other plants around it. Monjauze and Le Houérou (1965:102) noted that cactus "increases the aeration of the ground, its permeability, the infiltration of rainwater, the availability of water, etc."

Most Mahafale people prefer to see farming practices in terms of their cattle; they farm to feed their cattle. A middle-aged Mahafale herder stated this prevalent sentiment when he said, "We have to plant many kinds of garden crops because the cattle need those crops too." Incorporating *Opuntia* into their farming practices only made them better pastoralists in their eyes. It was natural for people to intercrop with cactus, to not just plant cactus around but also inside their cropped land in many of their gardens and small fields. *Opuntia* "drew water" around itself, so they planted corn next to it. Tall prickly pear that fenced the cropped land also acted to limit wind damage to plants and soil. In Malagasy, this hedging is called *valan-draketa* (cactus fencing or cactus enclosures).

A typical mature hedge of *Opuntia* is three to four meters in height, at least two meters thick, and up to several hundred meters long. The cactus hedging can be divided into three zones: the lower zone (up to one meter) consists mainly of the trunk of the plant in the center and also newly rooted plants that have grown out of fallen pads that have taken root; the middle zone (from one to three meters high) is where most of the fodder harvesting is done; and the top zone (from three to four

meters) yields fruit harvested for human consumption. Men and boy cowherds manipulate the middle zone; women use the top zone.

WORKING WITH CACTI: MALES

During the fodder season that I witnessed, cowherds daily pruned only a portion from numerous plants in the plantation. They left in place both the tallest and the oldest cladodes, the latter being those segmented or jointed pads that had grown thick with arteries feeding other jointed pads above and which were no longer very palatable. Over the years cacti segments become woody and hard for cattle to chew, and contain little water (Griffiths and Thompson 1929:13). The pastoralists cut and served up the freshest-looking limbs that had grown out of an earlier cutting. This stimulated regrowth and new fruit, with a fresh pad growing out of the spot vacated by the fallen seed pod (fruit) in just a few months.

Mahafale called the process of working with cactus *mandotse raketa* (singeing cactus), a choice of words indicating that the work is directed toward feeding cattle rather than cultivating the plants. Pastoralists claimed that they put minimal effort into rooting cacti, which was true in drought-free years. When they needed to add a line of fencing to an existing plantation or to landscape an area with a cactus enclosure, they simply dug shallow trenches and stood halved cactus pads in them. The pads took root in a matter of days. After the plants are well rooted, the pastoralists must labor intensely with the adult plant and sculpt, prune, and maintain their hedge while feeding cuttings to their cattle. After a drought, however, which occurs once or twice a decade, they have to replant the cactus that had been pruned to the ground and fed to their hungry cows. In 1996, a drought resulted in intense replanting of cactus groves and fencing. A severe drought struck the south again in 2003 (Ravoavy 2003). Singeing cactus takes just three main steps: cutting cladodes from the plants (pruning the living fences), singeing off the thorns in a fire, and feeding the singed limbs to cattle. Boys grow up doing this work, and a seasoned hand makes it look easy. Some boys and young men do these tasks barefoot, relying on calloused feet and experience to protect them. Older men, on the other hand, usually can afford hard, thick, handmade leather sandals (*holits'aombe*), which makes working around thorns considerably less dangerous. Cheap rubber sandals, imported from China, were considered a waste of money.

At an early age boys become skilled with the *jia*, a hardwood lance two to three meters long, capped with a long iron spike or spear at one end and a sharp iron cutter at the other. The cowherd slices off one cladode after another, piling them in an open area, then singes three or four cladodes at a time over a fire made from a bush called *avoa*. The technique involves singeing the cladodes so that the thorns on both sides of the cladode are singed simultaneously. A practiced person can do these maneuvers for each set of cladodes in about two minutes, leaving the speared cladodes completely naked of all thorns. Experienced cowherds singe off the thorns without burning or blackening the green, fleshy joints. Singeing, if it is done right,

leaves the cactus "sweating." The heat softens the cactus, bringing sticky, sugary fluids to the surface, and mildly cooking it. American scientists, experimenting with cacti as food for stock after several severe droughts struck in the first quarter of the twentieth century, abandoned their experimental singeing method because the team failed to find a way to scorch the thorns without overheating the plant, too many thorns remained on the cladodes, and "it was entirely too tedious a process" (Griffiths and Hare 1906:11).

Holding a singed cladode in one hand and the sharp iron long knife or machete (*antse be*) in the other, one then slices each joint into fat, cigar-like strips. The cattle can easily manipulate these slices with their tongues, moving them to the chewing teeth and masticating them quickly. If a cow picks up with its dull incisor teeth an unsliced whole pad the size of a tennis racket, it will try to break the pad by slapping it on the ground. This is wasteful because the sticky cactus pad will become covered with sand and will not be eaten. Cutting the pads into strips also gives one the chance to knock off any remaining thorns. Ingested prickly pear spines can puncture the respiratory tract, leading sometimes to lung infections and even bovine tuberculosis (Migaki et al. 1969:1489).

Herds of Malagasy zebu in the dead of the austral winter wait for ox carts full of cactus cladodes. Herders without carts move their animals near the fodder and prepare it for them next to cacti fences. Malagasy cattle stand eerily still for hours watching the familiar routine of cactus being processed into fodder. The herder makes sure that each cow gets its share of around 100 pounds of cactus fodder, an amount which would also supply about eight gallons of water (Thornber 1911:479). They do this twice a day over a period of four to six months of the year, depending on the timing of the rains and the amount of available cactus (Table 1).

Table 1: Fodder and Graze by Month (1996-1997)

Season	Malagasy Name	Month	Food
hot moist (transhumance)	<i>lohatao</i>	November	cactus
		December	cactus/grass
		January	grass/cactus
(calving)	<i>asara</i>	February	grass
		March	grass
		April	grass
cool dry (harvest)	<i>asotry</i>	May	grass
		June	grass
		July	grass/cactus
warm dry (planting)	<i>faosa</i>	August	cactus/grass
		September	cactus
		October	cactus

In October and November, cowherds strained to keep the animals in their charge fed. A typical day consisted of three hours preparing the morning cactus feeding, collecting an ox-cart load of avoa brush or a load of samata, then three hours more preparing the evening cactus feeding. At times, the men and strongest boys accelerated the process by spearing three to four large cladodes on the spiked end of their cactus spear and hanging an equal number and weight from the cutting end, then carrying that heavy load numerous times 100 meters or more from the cactus fence to the herd.

WORKING WITH CACTI: FEMALES

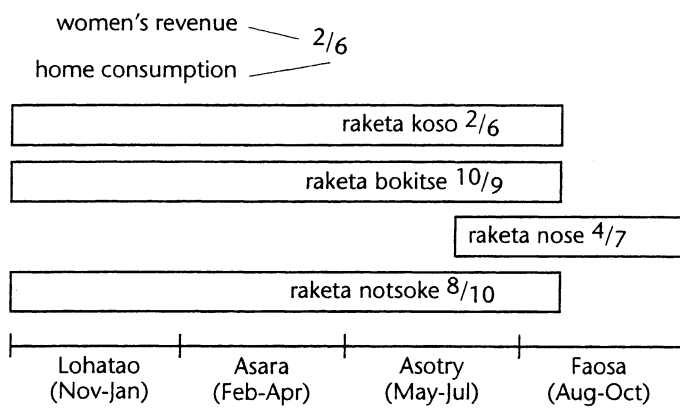
Mahafale ate substantial amounts of cactus fruit (*voan-draketa*) for several months of the year. Elderly women, often widows, collected and sold many basketloads of ripe pear as different species came into fruit over the year. Selling cactus fruit was one way to supplement their income. A small basket of around 30 pears, carried easily on the head, fetched the equivalent of about 25 cents, enough to buy, for example, a half-liter of the beloved curdled cow's milk (*abobo*). This was not a bad price, relatively speaking, for the short time (less than an hour) it took to fill the basket. But the work is not easy. The woman needs to be skilled with a pear picker, a long lance over four meters long with a nail in the end. If she has poor eyesight, it will be difficult to spear the fruit growing at the top of the cactus hedges. She must astutely guide the nail to the fruit, avoid knocking it off and losing it in the maze of thorns below, and pierce it true enough to remain on the skewer until she points the tip of the lance at her feet and with a knife or small stick slide the attached pear into a basket.

Around Androka Vaovao, cactus fruits were more plentiful than apples, bananas, and mangos, although some species are insipid (e.g., *O. vulgaris*) and good for little more than feeding pigs. The edible varieties, great quantities of which these pastoralists cultivate, are not what some French colonial scientists considered as mere famine or emergency food, by which they meant a food eaten only out of desperation. People snacked on them day after day, week after week, and the year had been fairly normal in terms of ample rain and scant locusts. At the home I stayed in, the daily pile was shared as an afternoon snack and consumed within minutes.

As in the case of using thorned cacti as a vegetable crop for livestock, Mahafale also have no problem removing the thorns on the fruit crop. After first rolling the pear on the ground to clean it of its annoying glochids (the minuscule hair-like needles on the surface of the fruit that lodge easily in human skin, causing irritation), it is opened with the fingers to get at the sweet fruit. The water alone in one of these pears is refreshing. People do not have to drink extra water if they eat a half dozen or so prickly pear every day. The downside of eating a lot of cactus fruit is that the seeds of certain species have a way of gathering in the digestive tract and causing constipation. The trick is to eat baked sweet potatoes, the prunes of Madagascar, with the cactus. Table 2 shows the four main kinds of prickly pear cactus in the vicinity

of Androka Vaovao and their fruiting seasons, which spanned the entire year. Two of the four (*koso* and *nose*) caused constipation in humans (*mampafira*), and one was a thornless species (*koso*). This table also shows that *raketa* was only slightly more important as a food resource to the household than as a source of revenue for women.

Table 2: Cactus Pear Collection Schedule



Women did most of the gardening, and they also collected fruits, berries, and nuts from the xerophytic vegetation. There were two main kinds of large fruit (banana [*kida*] and cactus [*raketa*]), several kinds of small fruit or berries (*somangy*, *tsinefo*, *filofilo*, *kile*, *longetse*, and *sasavy*), and one nut (*sakoa*). At any time throughout the year, there was some kind of root, seed, or fruit that women collected for household consumption. Though women generated some revenue from forest products, they considered these foods far more important for home use.

Both males and females, old and young, have incorporated prickly pear into the local economy. While males were responsible for sustaining cattle with *Opuntia*, they could not have done so without females who worked equally hard at feeding their households. Mahafale used prickly pear to help them “plant” their villages because the plants provide a source of water and sustenance, allowing herders to move less often in search of water and forage for their stock. In doing so, this plant has become a condition for mobility.

MOBILITY

Cactus stabilized the transhumant pattern, essentially affecting the timing of Mahafale seasonal migrations. In nondrought years, when large cactus plantations thrived in and around human places, most herders stayed near home and fed their cattle this fodder until new grass in their spring northern pastures was sufficient for

the cattle herds. Only then did they migrate to cattle pastures and camps (*toets'aombe* and *kialo*) approximately 120 kilometers north, in a relatively humid inland steppe ecological zone. Two small towns have emerged in this pasture reserve with appropriate place names: Beahitse (much grass) and Beombe (many cattle).

The character of herd mobility was based on dry vs. wet conditions: cattle were kept closest to Androka during the dry season, farther away during the wet season. Over the course of the year, Mahafale used three types of herd movements: dry-season daily rotations from the corral to nearby pastures, early wet-season transhumance, and late wet-season grazing around temporary cattle camps in forest pastures.

During the cool, dry season, from May to November, herders kept their cattle fairly close to home, feeding them mostly grass but also some greens from the gardens, and brought them back to the village corral each evening. August to October, the middle of the dry season, marked a transition when stock were turned into pastures closer to home. They grazed whatever grass remained and their diets were supplemented with cactus and samata. In the lean months, from November until the rains came, when the transhumant migrations began, the herds stayed near the cactus plantations. As long as they consumed enough raketa, they did not have to water at a waterhole.

Cactus contributed to the timing of the transhumant migration by allowing the herds to eat cactus fodder at a time when the pastures were unproductive and until the rainy season started. About a week after the rains had begun in the north, herds and families moved there to stay from one to four months. If the rains proved insufficient, then the herds ate cactus fodder at home until it gave out. If the cactus was depleted, Mahafale felled trees for their stock or migrated to the east, across the Menarandra River, where there were more cacti than at Androka.

The annual transhumant migration was considered a necessary discomfort, except by young men wishing to prove themselves in courage and diligence. Families too poor to own an ox cart made the five-day trek north by carrying their supplies on their heads and shoulders. When they arrived at the pastures, they built small grass lean-tos. A wealthier family lived out of its ox cart, with room for the parents to sleep in its covered bed and the children underneath on the ground. Women have recently begun to plant corn in gardens staked out of the seasonal pastures their husbands were too busy tending the cattle to cultivate. Mahafale women were accustomed to migrating and did not suffer as long as the rains came. One woman described transhumance without any hint of romanticism:

Only people who want to go to Beahitse go there. Some men take their whole household, others do not go at all but they just send their cattle there with someone else. The cattle have to migrate. The raketa cannot support all of them for too long when it gets dry here. They need grass.

Most men must go to Beahitse with the herds when the grass gets so dry around here, during *lohatao*. The cactus is plentiful but it cannot support all the cattle. . . . Even now family herds, not just the working steers (*konda*), are eating cactus. There is not enough of the good kind of raketa to support all the cattle when it gets dry. Plus it's a worse problem if people are eating cactus too. Cactus is

plentiful, but many kinds are not good for cattle or people—like the yellow thorned cactus (*mavozoloke*). So they have to migrate to Beahitse and stay awhile.

When we go to Beahitse, we need a group of people including many strong-bodied men (*vata lahy maro*), because it is a lot of work. Moreover, sometimes there are thieves (*dahalo*) who rob the owners of their cattle (*mandroba*). So the herders have to carry their spears and other weapons to protect themselves and the cattle.

Some families stayed four months at the seasonal pastures, some three months, some just half a month, while a few others remained there the whole year. A man described the conditions there as dangerous for the livestock.

We can not stay at Beahitse for long because the cattle are not accustomed to the cool, wet weather when it rains there. After the rains start, the herds have to return. If they stay too long, it might devastate the herd. We just stay long enough to make the *aombe* strong again. Then we come home. Even if it does not rain here near the coast, we have to come back anyway. The weather is too contrary at Beahitse for the cattle from Androka.

Men more than women described the transhumance as difficult and dangerous work, as this typical account testifies:

Going to Beahitse is a lot of work. On the way, the herders must stay awake for several days. If they slept, the cattle might get damaged, so they cannot sleep on the way. By November, a few people have already gone to the northern pastures, but most people leave here at the end of December. Two, three, or four brothers take turns guarding the herd. They take turns sleeping in shifts: for example, one does not sleep Wednesday night, the next stays awake Thursday night, and so on. It is a lot of work and dangerous because rustlers are about. We take all our livestock: cattle, goats, and sheep. We herd the cattle and sheep together on grass and shepherd the goats to browse in the forest. If a couple has just two, three, or four children, they are considered poor. People are well off if they have ten children or more. I have twenty children and three wives.

That the timing of the transhumance did not occur in the dry season, as one might expect, but at the beginning of the wet season, is due to the availability of cactus fodder and the fact that the three ecological zones in the mahafale are more alike than different. The northern pastures receive more rain and have more grass than the cactus zone closer to the sea, but they are still dry. The rainy-season herd mobility gives the cactus and nearby grass zones time to recover, and allows the stock to regain some of the bulk lost during the dry season.

CONCLUSIONS

Opuntia provides economic advantages in a risky environment. It brings more reliability and security into a region that receives less rainfall than is required for agriculture. But cactus cannot provide the material base for the entire pastoralist economy. The pastoralists must use several ecological zones and trade with neighboring people involved in complementary economies such as fishing and rice production. Prickly pear has most influenced the pastoralist economy in terms of moving it toward further sedentarization.

There are two general pastoralist strategies for adapting to an arid or semiarid ecology susceptible to environmental change, decline, overuse, and climatic cycles. Either they move to greener pastures or they adapt their pastoralist practices to the heterogeneous conditions. The arrival and dispersal of prickly pear allowed Mahafale pastoralists to remain longer during the year in their coastal homeland. Armed with *Opuntia*, they created a new set of pastoralist practices based on feeding cacti fodder to their cattle. They found that prickly pear did well in the soils of the coast, especially in degraded areas where people concentrated.

Prickly pear brought improvements, which goes against Spooner's (1973:3-4) remark that nomadism, from a cultural ecology perspective, depends on an "unimproved natural environment . . . [which] generates a characteristic nomadic ideology in all nomadic populations." Pastoralists changed their environment with cactus, improved the natural environment, and improved their life chances with a powerful plant resource.

The prickly pear in southwest Madagascar has long been a condition of both a sedentary life and a mobile pastoralist life. These two categories should not be thought of as mutually exclusive, but part of a continuum of mobility. Pastoralism is a method of doing business, of staying alive, and raising children that uses many resources and techniques to keep stock alive. There are, in this subsistence technology, many kinds of mobility: from nomadic at one end of the continuum to intensive changes in the landscape at the other. *Opuntia* is a condition for both.

NOTES

1. Field research was conducted in the Androka Vaovao District, Ampanihy Division of Toliara Province, Republique de Madagascar, from March 1997 to December 1997. Research was assisted by grants from the U.S. Department of Education, the Vilas Fund, the University of Wisconsin-Madison Graduate School, the University of Wisconsin African Studies Program, the University of Wisconsin Department of Anthropology, and the Milwaukee County Zoological Society. Institutional affiliation was arranged by Dr. Manassé Esoavelomandroso at the Université d'Antananarivo and the Ministre de l'Energie et des Mines.
2. This is a general estimate. Productivity figures for prickly pear as stock feed are highly variable and depend on the cactus variety, the soil conditions (including moisture content), and whether the stock are habituated to eating this feed.

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