Gender, Pastoralism, and Intensification: Changing Environmental Resource Use in Morocco

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ABSTRACT
Through a study of the sedentarization of the Beni Guil pastoral nomads of eastern Morocco, this paper examines how gender interacts with environmental and socio-economic change. Based on extensive fieldwork with the Beni Guil, this paper demonstrates how gendered resource exploitation—in particular, the collection of mushrooms, medicinal plants, and fuelwood—is recast through sedentarization, urbanization, and commercialization. The case of the Beni Guil suggests that certain accepted theories of the consequences of settlement for nomad women and their local environments should be re-examined in order to understand better the past and present, and to plan for the future.

INTRODUCTION
Nomadic pastoralism was once a dominant feature on the North African landscape. Since the end of World War II, however, extensive nomadic herding has steadily shifted toward more intensive agro-pastoral production on marginal grazing lands (Bencherifa and Johnson 1990). This trend raises concerns about the social consequences of cumulative land-cover change, particularly land-use intensification, land degradation and declining species diversity, and challenges researchers and policy makers to address the complexities of local scale land-use systems (Turner et al. 1990). Studies that explore the interaction between cultural change, economic development and environmental sustainability have generally recognized the importance of understanding the socio-political contexts within which land-users make resource decisions (Blaikie 1985). Yet, questions about how gender relations affect intra-household environmental management remain unclear, particularly in the Middle East and North Africa.1 Identifying the constraints and opportunities that shape gendered land-use behavior assures a more accurate assessment of environmental change at the scale where decisions are made.

Understanding the human dynamics of environmental change is important in semi-arid rangelands of North Africa, which cover approximately 385,000 square kilometers and represent 25% of the region’s productive food raising area (Abbab 1994). More than 15 million people, or one quarter of the region’s population, derive their livelihoods directly from land-based activities of mixed farming and herding (Abbab 1994; Le Houerou 1993). Such an understanding is particularly important to Morocco, where 64% of the land area is classified as rangeland, pasture, woodland or forest and where almost half of the working population derives its livelihood from agriculture or livestock raising (UNEP 1993).

1 Despite the prolific literature on gender, resources and sustainable development, in Asia, Latin America and sub-Saharan Africa, geographical literature on women and the environment still ignores these nature-society questions in the Middle East and North Africa (e.g., Momsen and Townsend 1987; Momsen and Kinnaird 1993; Rocheleau, Thomas-Slayter and Wangari, eds. 1996).
Central to the broad discourse on sustainable natural resource use in developing countries is whether change results in positive or negative social and ecological outcomes (Blaikie and Brookfield 1987). In North Africa, as elsewhere, more intensive herding and farming practices help sustain a growing human population. But overgrazing, soil erosion, expansion of cultivation, and irrigated agriculture threaten the long-term productivity of these rangelands and the livelihoods that depend on them (Swearingen 1994). These problems persist in part because the perceptions and interests of land users are neglected in environmental change analysis and conservation planning (Blaikie 1985).

In the Middle East, and in Morocco specifically, researchers have generally addressed the causes of nomadic sedentarization and associated environmental consequences at the community or regional scales. Their literature generally approaches the problem of landscape change through an analysis of demographic, historical and political economic factors, or transformations of regulatory institutions and land tenure systems (Abbab 1994; Artz, Norton and O’Rourke 1986; Bencherifa 1996; Bencherifa and Johnson 1991; Mendes and Nargisse 1992; Tozy 1994; Trautmann 1989). However, these analyses obscure the changing production decisions at the household level where broader economic and environmental consequences are felt.

The paucity of intra-household environmental research in the region also results from cultural values that limit contact between male researchers and local women. With few exceptions, male researchers have predominated field work in pastoral and agro-pastoral communities in North Africa. Furthermore, conservation and development projects in Morocco are generally implemented and managed by men who work with male, but not female, land users. However, women are quite visible across the rural landscape collecting water, fuelwood and other plant resources, herding animals and working in fields.

Using gender as the entry point for understanding household natural resource management could lead to more accurate information about how gender-specific tasks shift in response to ecological and socio-economic changes. The research and findings of this article are, therefore, gender-based. This article hopes to contribute to more effective range conservation projects that solicit input from the appropriate land-user groups while, at the same time, challenging assumptions and myths about who manages what.
resource uses respond to ecological and socio-economic change? And, how do shifting gendered land-use patterns affect environmental change at the local scale?

Based on data collected during 10 months of field research among the Beni Guil pastoral nomads, findings suggest that:

- in mobile tents, women and men operate with separate sets of resource management tasks, but these tasks are increasingly shared as households become settled;
- sedentarization and female seclusion reduce women’s opportunities to collect natural rangeland resources and is most acute in villages where (unlike larger towns) few alternative points of access exist; therefore,
- the gender ratio for who collects wild mushrooms, truffles, medicinal plants and fuelwood is most equal in villages and suggests that control shifts from women to men; and truck transportation and the weekly market (souk) in towns provide alternative opportunities that women use to regain control over resources that contribute to their household responsibilities.

GENDER THEORIES AND RELEVANCE TO THE BENI GUIL CASE

The rationale for a gender analysis of land-use practices is that women and men have different, vested sets of interests in the natural resources they manage depending on their responsibilities in maintaining the household (Fortmann 1996; Rocheleau 1991). Men and women, particularly in sex-segregated societies, face different constraints and opportunities in meeting rapidly changing livelihood responsibilities. In contrast to the scanty research on women and the environment in the Middle East and North Africa, a large literature exists in anthropology, sociology, and history analyzing how urban Muslim women’s status and political power change in response to development (e.g. Ahmed 1992; Keddie and Baron 1991; Lazreg 1994; Saadawi 1986; Tucker 1993). The literature on “la condition Feminine” in rural Morocco is also dominated by anthropological (e.g. Hilse-Dwyer, Maher and Rosen, in Beck and Keddie 1978; Schaefer-Davis 1993) and sociological research (e.g. Belarbi 1995; Mernissi 1984; 1997). These studies attempt to understand how development affects women’s economic, social or political gains and losses and provide useful insights for development projects that target women’s needs. But, their research agenda does not address the flexibility of household gender roles and the implication, if any, for environmental change if those roles shift. Although largely absent from the Muslim Arab regions, the importance of gender

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2 Field research was conducted in eastern Morocco from September 1996 to June 1997. The project was sponsored by the Social Science Research Council’s Near and Middle East Program and the National Science Foundation. The research contributes to the completion of a doctoral degree in geography at Clark University.
analysis in explaining environmental change is demonstrated in the case-study literature from rural communities in Asia (Agarwal 1994; Joekes 1995), Sub-Saharan Africa (Carney and Watts 1991; Fortmann 1996; Jackson 1993; Schroeder 1997; Thomas-Slayter and Rocheleau 1995), and Latin America (Rocheleau et al. 1996; Townsend 1993).

The literature on gender, environment and sustainable development is inspired to varying degrees by two dominant approaches: (1) gender and environment and, (2) ecofeminism. The first grew out of the WID (women in development) approach to project and development planning interventions. This perspective emphasized the importance of women as managers of environmental resources, their vulnerability to diminishing natural resources, and the need to direct conservation programs toward assisting women (parallel or separately from men). The practice of adding women on without considering fundamental inequities in class and gender relations eventually led some socialist-feminists to adopt alternative gender and development (GAD) or gender and environment (GED) approaches.

The ecofeminist approach is ideologically driven. It rests on the philosophy that women have an inherent affinity with nature, as opposed to men’s desire to control and dominate nature through science, technology and development (see Merchant 1989; Mies and Shiva 1993; Plumwood 1993; Shiva 1987). Although both of these approaches draw attention to women’s interests in environmental resources they often have rigid conceptualizations of gender relations (Agarwal 1995; Jackson 1995; Joekes et al. 1994) I agree with those who propose an alternative approach that analyzes the flexibility of social, economic and ecological contexts that either maintain or transform traditionally male and female resource management tasks (Braidotti et al. 1994; Rocheleau, Thomas-Slayter and Wangari 1996; Jackson 1993).

These theoretical advances in gender and environment studies have been supported primarily by case studies in agricultural communities and still need to be examined within livestock-based livelihood systems. To date, gender-based research among pastoral nomads has examined the links between economic development, commercialization, sedentarization, over-exploitation of nature and women’s poverty (see Horowitz and Jowkar 1992).

One such study has assessed the role of technology in encouraging settlement and the consequent gender-based resource losses or gains. Dawn Chatty’s work among nomads in Syria (1976) analyzed the gender-specific consequences of the introduction and rapid adoption of trucks. Chatty found that trucks deepened gender-based inequalities over household resources. More recent research in Oman showed that women utilized a variety of informal institutions 

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3 The currently on-going range conservation project in eastern Morocco is an example of this approach.
and networks to reclaim their interests within the realm of male decisions, including adoption and use of new technologies (Chatty 1996). Similarly, in her detailed ethnography of pastoral nomads in Iran, Lois Beck argues that women acknowledged the benefits of new technologies and encouraged their adoption (Beck 1991; 1997). These anthropological studies, however, do not address the environmental outcomes of gendered interests and control of new technologies.

For example, during the late 1970s and early 1980s, the Moroccan government installed motor-driven deep wells in drought-prone rangelands. These technologies secured permanent water resources and encouraged more intensive land use (Bartel 1985). Greater availability of truck transportation today also facilitates access to commercial town markets where animal feed is sold. Beni Guil men use trucks to haul water and fodder to remote tent sites and villages, a practice that allows rural households to support more animals on smaller parcels of land. This practice has encouraged sedentarization and over-exploitation of rangeland resources. Moreover, since men spend more time in town securing feed resources, women increasingly assume men’s herding responsibilities. But women herd only close to home, a practice that further denudes vegetation cover near fixed settlements (Steinmann, in press).

Among the Beni Guil, trucks facilitate access to commercial opportunities in towns and increase women’s dependency on male income earners. Women, however, are not passive agents. Older women, particularly those in tents and villages, find ways to access truck transportation into town where they take advantage of commercial opportunities. The author often observed older women—who are less constrained by the cultural norm of seclusion—successfully negotiate rides with male truck drivers. This observation points to a weakness in feminist development theories that ignore the diversity in women’s abilities to secure their interests within broader structural constraints.

Throughout the Middle East and Africa, case studies from livestock-dependent households suggest that pastoral women lose economic and political power as a consequence of economic development and environmental degradation (Abu-Lughod 1993; Carr 1977; Horowitz and Jowkar 1992). This literature argues that in geographically isolated mobile tents pastoral women’s roles as providers of subsistence foods, medical resources and fuelwood gave them status and power. But, as nomadic households become integrated into a cash economy women lose control over those resources thereby becoming more dependent on male income earners (Horowitz and Jowkar 1992; Talle 1988). These approaches address the social implications of settlement and commercialization, but they do not consider the environmental consequences.
The Beni Guil case suggests that the effect of settlement on women’s access to natural rangeland resources is more nuanced. For example, with the exception of poor women in towns, Beni Guil women’s collection of natural resources declined linearly and significantly from mobile tent to village to town households. Corresponding to this change, men’s collection activities increased. However, access to rangeland products (such as wild mushrooms, truffles and medicinal plants) and knowledge about them declined only for women in villages and not among women living in town.

Furthermore, many Beni Guil households divided their livelihood activities between two locations: mobile tents and fixed homes. In this way they took advantage of diverse commercial and natural resources. This represents a strategy that alleviates pressure on those resources and requires flexible intra-household labor roles. The Beni Guil example therefore suggests that theories that do not question the simplistic dualism of nomadic versus settled households need reassessment.

The differences in gendered resource management across locations from tent to village and larger commercial towns also demand moving beyond static gender analyses to more complex analysis of flexible gender roles. Both a ‘developmentalist’ view (see Joekes 1994) and feminist political ecology (see Rocheleau, Thomas-Slayter and Wangar 1996) provide alternative and corrective approaches. While acknowledging gender differentiated resource control and management tasks, these perspectives argue that gender roles are not ascribed but are “merely part of general entitlements and capabilities” (Joekes 1994). They posit that understanding local-scale environmental change requires attention to class, ethnic and gender relations among land managers (Carney and Watts 1991; Rocheleau 1991; Schroeder 1993). These approaches address both the social and environmental consequences of changing livelihood systems.

In an attempt to better understand the complexity of household land-use decision making, academics and development practitioners have also recognized the value of incorporating indigenous environmental knowledge systems and gender analysis into conservation planning (Bebbington 1990; Carney and Watts 1991; Chambers 1983; Davis 1995; McCorkle 1989; Richards 1985; Rocheleau 1991; Thrupp 1989). In eastern Morocco, growing concern about land degradation in the 1970s led to a series of studies, including one on traditional range management institutions and indigenous knowledge systems.

These land-user perspectives provided guidelines for the implementation of one of Morocco’s most costly and extensive range conservation projects (hereon after referred to as the PDPEO...
Project). Project extension workers solicited input from local herd- ers concerning their use and knowledge about rangelands. The project’s gender component, however, focused only on women’s income generating opportunities - not on their resource use. The project design also conceptualizes women’s and men’s activities as operating in entirely separate spheres. This WID approach of “adding women on” obscures the ways gender relations within households meet changing livelihood responsibilities.

Settlement and commercialization’s impact on gendered management of range resources remains unclear. This fieldwork is particularly problematic in more conservative pastoral societies, such as the Beni Guil and other bedouin, where female seclusion and gender segregation has prevented male researchers from gathering gender-specific information. Only a few recent studies in Morocco (e.g., Alaoui 1995; Davis 1996; Steinmann 1993) and one edited volume (Belarbi 1995) have analyzed how socio-economic and environmental change affect gendered management of natural resources. The Beni Guil case provides a new empirical study that focuses specifically on flexible intra-household resource strategies and how these adjust to and shape environmental change.

BACKGROUND AND ECOLOGY OF THE BENI GUIL STUDY AREA

Much like other pastoral nomads across the region, the Beni Guil represent a large community whose livelihoods are rapidly shifting from extensive large-scale animal herding to intensive and sedentary agro-pastoral activities (Bencherifa 1996). Although the Beni Guil’s population is small (54,000 based on the 1994 CENSUS) their territory covers 25,000 km² of the semi-arid steppe of Morocco’s Eastern High Plateau region. This represents a significant portion of Morocco’s rangeland resources. And while large scale nomadic movements of the past represented a sustainable adaptation to the ecology of arid environments, demographic and economic pressure has resulted in more intensive land-use practices. Some evidence suggests that the long-term sustainability of agricultural and pastoral livelihoods in this region are threatened (Le Houerou 1993; Sidahmed 1992). Others have found that the social and human benefits outweigh the environmental costs (Bencherifa 1996). Findings here suggest that these environmental and socio-economic changes also carry different implications for gendered land-use practices.

Until the middle of this century, Beni Guil livelihoods depended on raising their livestock by utilizing seasonally available grazing and water resources throughout their territory. Seasonal climate change prompted the Beni Guil to move their tents on camels and herd

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4 The “Project de Developpement des Parcours et de L’Elevage dans L’Oriental” (PDPEO Project) is a State and internationally funded range conservation project at a cost of $10 million (Department of Agriculture, Bouarfa 1996). The 10-year project began in 1990 and covers some 3.2 million hectares of Morocco’s eastern High Plateau region. The objectives of the project are to curb land degradation and increase living standards for the 76,000 inhabitants in the project zone. The project goals are met through: (1) diversification of fodder resources through government subsidized feed supplements, veterinary services, and transportation services; (2) placing 750,000 hectares of key rangeland into grazing fallow; (3) restoration of range cover through planting of fruit, fuelwood trees and fodder shrubs; (4) setting up wind barriers to curb dune accumulation; (5) better management of water points; (6) establishment of local pastoral cooperatives to manage distribution of new inputs and assume range-management responsibility, and; (7) income generating projects for women. The PDPEO Project is funded by the African Development Bank, International Fund for Agricultural Development, and the Moroccan Government.

5 Benjelloun (1996) conducted an extensive study among Beni Guil women evaluating their constraints in accessing natural and commercial resources. The results of the research identified appropriate income generating activities for women. Three female extension workers currently manage women’s extension services. These include: wool and rug weaving cooperatives; chicken and rabbit raising; health care education, and; sewing lessons for girls.

6 As a foreign and formally educated woman, I was able to engage in participant observation and conduct research among both men and women.
Figure 1  Research area of author. Map: Steinmann.
their sheep and goats over distances of some 250 km to take advantage of resources in diverse ecological zones. Although there are several ecological niches within this area, two dominant environments define the territory: the northern high plateau (Dahara) and the more arid southern pre-saharan environment (Sahara). These two landscapes are separated by a small mountain chain with elevations of up to 1,800 meters.

Rainfall diminishes from north to south with a maximum of 450 mm in the Dahara and 150 mm in the Sahara. Corresponding to the aridity index, vegetation cover varies between the two regions. In the Dahara, perennial grass (Stipa tenacissma) and the woody shrub (Artemisia herba alba) dominate. In more arid conditions of the Sahara, a greater variety of woody shrubs and succulents (Arthrophytum scoparium, Festuca algeriensis, Retama retam, Ziziphus lotus) replace perennial grasses. Annual plants (valued for their fodder and human medicinal properties) thrive in moist ecological niches such as low lying depressions (dayas) where rainfall run-off water collects, and at higher elevations in the mountains that divide the Dahara and Sahara. Wild mushrooms (Agaricaceae) and large ground truffles (Terfezia, Tirmania) are found in areas where soils maintain moisture, such as in the daya Chott Tigri.

Large-scale migrations were well adapted to these ecological and climatic variations (Bencherifa 1996; Johnson 1993). Threat of winter snowfall encouraged the tribes on the Dahara’s high plateau (1600 m) to move their herds to lower elevations and warmer climates in the Sahara. On their migration, the Beni Guil crossed alluvial plains, the Chott Tigri daya and several small mountains (Jabel El Ourark; Jabel Lakdar; Jabel Dakh). Along the way, men herded animals to diverse grazing resources and women stopped to collect a variety of wild foods, medicinal plants and fuelwood. Similar reverse migrations from the Sahara to the Dahara occurred in the spring.

Until the late 1960s almost all Beni Guil households were fully mobile tent units. But, over the last thirty years, 35% of the Beni Guil families have settled permanently, and almost 80% of the households have shifted production to mixed farming, herding and other commercial activities.
interruption of long-distance migrations for settled households has had variable effects on intra-household resource uses.

METHODOLOGICAL APPROACH AND DISCUSSION OF FINDINGS

Gender analysis, as an entry point to this research, sheds light on hidden male–female power dynamics that affect access to and management of natural resources. It uncovers complexities of land-use decisions at the household scale and helps explain emerging land-cover patterns associated with pastoral settlement. Identifying gender-specific resource management roles has important implications for development and range conservation programs, particularly where culturally prescribed gender roles influence the range of acceptable strategies for dealing with changing social, economic and natural environments.

Both quantitative and qualitative methods were used to examine the two research questions:

- How does gendered access to and management of natural rangeland resources change in response to sedentarization and commercialization of pastoral livelihoods in eastern Morocco?
- How does gendered resource use affect the environment?

This discussion presents data concerning three types of vegetation resources: wild mushrooms and truffles, medicinal plants and fuelwood. The author selected these resources because they represent important food and health resources to the household and because their collection has variable environmental consequences. As stated earlier, primary data was collected during ten months of participant observation in 159 Beni Guil households. These households represented various points on the continuum from mobile to settled (tent, village, town). Because Beni Guil migration patterns have essentially ceased between the ecologically distinct areas of the Sahara and Dahara, research was carried out in three geographic locations of the Beni Guil territory:

- among fully nomadic mobile tent households in the Dahara and Sahara areas;
- in two small rural villages (Maatarka and Mengoub Gare); and
- in the two larger commercial towns: Tendrara and Bouarfa.7

7 According to the 1994 national census, human population numbers in villages were 286 in Mengoub Gare; 520 in Maatarka. As for towns, the population of Tendrara was 5,633 and Bouarfa 19,616.
PRELIMINARY RESEARCH AND QUESTIONNAIRE SURVEY DESIGN

After a two month period of preliminary research and participant observation, the author confirmed that the degree of household mobility and socio-economic class constituted important variables determining gendered resource collection patterns. Since household wealth is culturally specific, five local informants from a cross-section of the settled Beni Guil communities helped define the class categories and compiled a list of households within each strata. This participatory wealth ranking exercise provided the author with local definitions of class (Grandin 1988).

Long distances between tent households prevented gathering a group of informants for the wealth ranking exercise. Instead, the author asked local Beni Guil political representatives (Sheiks and Mukkadems) from each tribal lineage to rank tent households. The author then re-confirmed the classifications with key indicators including: tent size; approximate number of animals; types of animals owned; transportation resources (e.g. mule-drawn carts or trucks); and, the number of non-pastoral wage earners contributing to the household. Households were then randomly selected for formal interviews. In the selected households, 159 women and 70 men answered formal survey questions about mushroom, truffle, medicinal plant and fuelwood collection.

In order to identify gender-specific management of these resources, the survey asked male and female interviewees to:

- indicate what rangeland resources they collect for the household;
- identify locations and distances to these resources;
- identify other household members who provide this resource to the household;
- note whether the quantity and quality of the resource had gone up or down;
- identify the number of medicinal plants they knew; and
- indicate whether they bought or sold any of these resources at town markets.

Data gathered in formal survey questionnaires was analyzed using the SPSS 6.1 statistical program. The author analyzed categorical variables using chi-square tests and logistical regressions. For interval data, t-tests and multi-variate regression tests were employed. However, formal questionnaires failed to capture the full range of insights needed for the study; therefore, several qualitative methods supplemented survey data.
QUALITATIVE AND PARTICIPATORY METHODS

In order to understand how settlement affected resource management and landscape change, men, women, boys and girls from each research site were asked to participate in gender resource mapping. This technique helped elicit input from women and men about their land-use practices, degrees of accessibility to the resource and knowledge about the diversity of plant species and their locations in the landscape.

The maps revealed that men and women have very different ideas about the relative importance of natural resources. These differences were related to gender-based responsibilities for providing the resource to the household. While men’s maps identified and located almost all of the dayas and water wells (sites where men take animals to graze and water), women’s maps included many mountains (where medicinal plants grow) and sites where they collect fuelwood and mushrooms. The scale of the maps also varied significantly by age and gender, reflecting mobility constraints associated with settlement and female seclusion. Strict surveillance of women and their infrequent interaction with outsiders sometimes led women to answer survey questions that matched culturally prescribed gender myths rather than current activities. Consequently, participant observation verified that more flexible gender roles existed than revealed by the formal survey.

In order to measure environmental changes associated with changing gendered collection patterns the author measured land cover and species diversity rates using 100 meter intercepts. These land cover intercepts were carried out in several key locations: on remote portions of uninhabited rangelands, near mobile tent sites, near villages, and near larger towns. The author measured the height and the width of each plant along the intercept line and catalogued its name for information about species diversity in a given area. Several 10 meter by 10 meter square transects were laid out to measure the frequency and diversity of plant species at given locations. The author also solicited local input in these exercises in order to catalogue land user’s knowledge about various plant species.

FINDINGS AND DISCUSSION

KNOWLEDGE ABOUT AND LOCATION OF MUSHROOMS AND TRUFFLES

The disappearance of large-scale migrations in the Beni Guil territory has had a disparate impact on households settled in the Dahara and Sahara. Only 46% of interviewees in Dahara households said they collected mushrooms, compared to 85% in the Sahara.
Wild mushrooms and truffles do not grow on the Dahara plateau, and since few Dahara households still move their animals and tents across the Chott Tigri to the dayas in the Sahara, most have lost access to these resources. A closer analysis of those Dahara households still collecting mushrooms showed that they all had fixed homes and owned tents which they moved to the Sahara. The loss of access to these food resources, therefore, affects primarily fully settled Dahara households.

Diminishing access to wild mushrooms also corresponded to a loss in knowledge about the locations of these resources. Respondents in the Dahara knew, on average, 5.5 mushroom locations, compared to 10 known by Sahara respondents. Further loss of this environmental knowledge may eliminate opportunities for mushroom and truffle collection in the Dahara’s younger generation, especially if more households become permanently settled.

The recently established commercial value of mushrooms and truffles ($4 per kilo for mushrooms and $7-10 per kilo for truffles) provided women with a new income generating opportunity. Moreover, 85% of land-users who collected mushrooms were women (see Figure 2). The commercial and food value of wild mushrooms and truffles explains why almost 70% of all surveyed households collected these resources. Figures 2 and 3 illustrate that for mushroom and truffle collecting class and location were key variables that determined gendered mushroom and truffle collection.

Figures 2 and 3 show that compared to men, women in all locations and class categories assumed primary roles for providing the resource to the household. This represents the continuation of a
traditionally female activity. Data revealed, however, that among women, class and location influenced access. The most significant finding was the rapid decline of women collecting these resources from tents to villages and towns. This suggests that the mobility of the household to various locations on the rangelands was a key variable that determined access.

Another interesting pattern emerged from the data: the percentage of households that collected mushrooms was lowest in villages, not in towns. In villages the gender ratio of mushroom and truffle collection was almost equal, although rates were low for both groups. As mentioned earlier, land users in villages (particularly those in the Dahara) have lost access to wild mushrooms and truffles that grow in the Sahara. Furthermore, truck transportation to towns or to the sites where mushrooms and truffles grow was sporadic. Villagers therefore could not easily transport these goods home or to the town *souks*.

Truck transportation was more readily available in town, particularly around weekly market days. This explains why a greater percentage of poor women in town, not in villages, collected mushrooms and truffles. Poor women in town took advantage of this transport in order to secure these resources for home consumption or to sell at the market. The significant increase of mushroom and truffle collection among poor town women suggests that their husband’s income was insufficient to cover food costs, so they collected free range resources to meet livelihood needs.

In town households, class and mushroom/truffle collection showed a linear correlation for both men and women, though this was not immediately apparent among the women. The likelihood of
collecting mushrooms decreased as wealth increased. For example, only 8% of men in wealthy households collected mushrooms or truffles, compared to 13% in middle class and 16% in poor households. In town, 32% of women in wealthy households collected these fungi, compared to 30% in the middle class and 63 in poor households. The surprisingly high percentage of wealthy town women who collected mushrooms and truffles was explained by the fact that most wealthy Beni Guil have two households: a home in town and a tent on the rangeland. All respondents in this class category who said they collected wild foods lived in households that were both nomadic and settled and said that they collected only when spending time out at the tent. This important finding suggests the need to move beyond a dualistic conceptual model of the household as either nomadic or settled.

Class can also be an important variable depending on location of the household. For example, collection rates were universally high for women in tents. But class became an important variable in town, where mostly poor women collected mushrooms and truffles. The data suggest that the economic importance of mushrooms and truffles was linked to family food needs and the degree to which women could rely on male income earners. This case challenges conclusions which posit that commercialization and settlement diminish women’s control over natural resources and increase their dependence on male income earners. Among the Beni Guil, economic development, commercialization, and settlement did not uniformly diminish women’s control over resources. In fact, commercial opportunities and availability of truck transportation in town created opportunities for the poor to access locations for collecting mushrooms and to generate income by selling them. The settlement of households in towns and greater integration into a commercial economy did not create a homogeneous class of female dependents.

The Beni Guil case also suggests consequences for future generations. Data revealed that while only 10% of older women sold mushrooms they collected, 45% of women aged 20 to 45 and 70% of women under the age of 19 sold them. Older women were less accustomed to the cash economy and collected mushrooms and truffles primarily for consumption. But younger women, especially those not yet married or in female headed households, took advantage of commercial opportunities. Young men were also increasingly involved in the collection of these resources while their older counterparts rarely participated.

More research is needed to confirm these trends in the future, but the data suggest that increased dependency on cash incomes has
intensified searches for and extraction of these resources. The data presented here identifies which land users were most involved in the collection activity that could help target appropriate groups for participation in conservation efforts.

The impact of these activities on the environment, particularly soil and wind erosion, warrants further research. Observations in the field suggested that truffle collection (which creates a hole of up to six inches in diameter) loosened soil and contributed to wind erosion. Increased demand for and use of trucks to access collection sites has resulted in the rapid expansion of a network of dirt roads throughout the Beni Guil territory. The roads have degraded large tracts of vegetation and have encouraged rain run-off and gully erosion during the rainy season.

This example illustrates that both men and women have vested interests in commercial and technological change, regardless of negative environmental consequences. Findings also suggest the importance of moving beyond essentialist ideals of ecofeminism to more contextual analyses of gender roles and environmental management in relation to social and economic change.

CHANGING MEDICINAL PLANT COLLECTING ACTIVITIES AND SPECIES KNOWLEDGE

Medicinal plant collection patterns share both similarities and differences with the findings discussed above. One major difference is that the overall percentage of households that still collect medicinal plants (48%) was relatively low compared to households collecting mushrooms (70%). The decline in the collection of traditional
medicinal plants suggests that land-users rely on alternative resources to meet family health needs: they either buy medicinal plants at the town *souk* or use modern medical services.

As noted with mushroom and truffle collection, the interruption of nomadic migrations from Dahara and Sahara reduced access to medicinal plants. In households that still collected medicinal plants women accounted for approximately 80% and men for 20% of individuals who collected. Primarily women performed the task. The survey results show, however, that men also collected medicinal plants and that class and degree of settlement influenced gendered patterns of collection.

While overall collection rates were low, Figures 4 and 5 indicate that percentages were much higher for tent households than for those in villages or towns. Holding class constant, the percentage of women who collected medicinal plants declined as families became more settled. The exception, however, were wealthy women in town. As with mushrooms and truffles, these women came from households that had both house and tent and maintained access to range-land resources while at the tent.

For men, class more than location influenced collection patterns. For households in town, and to a lesser degree in villages, a higher percentage of poor men collected medicinal plants than middle class men, who collected more than wealthy men. The reverse was true for men in tents where a larger percentage of wealthy men collected medicinal plants compared to men in moderate and poor households. This pattern among men in tent households complemented the trend in women’s collection activities which were inversely related to class (40%). In tents, more poor women collected medicinal plants (70%) compared to moderate (53%) wealthy women.
The data suggests that medicinal plant collection is still important in tent households compared to villages and towns. Cultural values of female seclusion explain why men take over this activity as household wealth increases. However, because tent households move to diverse locations on range lands, women in these households retain proximity and access to medicinal plant resources. Class did not influence women’s collecting activities in villages and towns and suggests that location was the key obstacle for accessing the plants.

Access to (and knowledge about) medicinal plants declined most significantly for village households due to several reasons. Reduced household mobility was the primary factor. According to older women, the interruption of migrations and changing environmental factors discouraged younger women from collecting and learning about medicinal plants. The women argued that the landscape was not as green as it once was, particularly around villages. Opportunities for teaching younger generations about these plants therefore became limited. Drought severely affected the region in the 1980’s and early 1990’s so many of these annual plants did not grow during these years. Among respondents who did not collect medicinal plants, most gave one of the following reasons: “The plants are too far away,” “They grow in the mountains;” “I don’t know them;” “I buy them at the souk” or, “I see the doctor in town.”

Collection rates suggest that medicinal plants represented a valuable resource to women in mobile tent households and among the poor settled in town. Although rangelands were also denuded around larger towns of Bouarfa and Tendrara, the souk provided an alternative access to medicinal plants and constituted a new space for learning about medicinal plants. Younger generation women in towns knew more about medicinal plants than their village counterparts. Since herbalists at the town souks were not necessarily from the local area and often imported plants from other parts of Morocco, women may have increased their knowledge about a greater variety of medicinal plants. Moreover, town women, who were generally dependent on male income earners, used this opportunity to maintain control over their role as family healers. These data caution against assuming that all women who used traditional medicinal plants for healing relied on local or indigenous knowledge.

This case supports some but not all the findings of the indigenous knowledge literature. These theories generally posit that commercialization and integration of subsistence economies into a cash market reduces access to and knowledge about traditional medicines. Among the Beni Guil, declining collection of rangeland medicinal plants didn’t necessarily imply reduced access nor diminishing knowledge about medicinal plant species. The Beni Guil

This case supports the need for employing integrated approaches to evaluate local knowledge and resource use. These perspectives challenge the orthodox theoretical dualism that pits “local knowledge and indigenous, sustainable systems” against “external, Western, non-sustainable systems” (Agrawal 1995; Batterbury 1997). Indeed, research suggests that more than half of all Beni Guil households surveyed said they bought traditional medicinal plants at the weekly souk. This demonstrates that at least for now, people benefit from commercial markets that allow them to combine traditional medicinal practices with modern alternatives.

For a compilation of studies on the consequences of economic development on indigenous knowledge systems, see: Agriculture and human values Volume VIII. Numbers 1 and 2, 1991.
living in towns used *souk* herbalists as a way to access and learn about medicinal plants, although it is doubtful that future generations will be able to identify where these diverse plant species grow on their landscape.

This case supports the need for employing integrated approaches to evaluate local knowledge and resource use. These perspectives challenge the orthodox theoretical dualism that pits “local knowledge and indigenous, sustainable systems” against “external, Western, non-sustainable systems” (Agrawal 1995; Batterbury 1997; Bebbington 1997). Indeed, research suggests that more than half of all Beni Guil households surveyed said they bought traditional medicinal plants at the weekly *souk*. This demonstrates that at least for now, people benefit from commercial markets that allow them to combine traditional medicinal practices with modern alternatives.

The fact that medicinal plants have become commercially available raises questions about environmental change and the availability and rejuvenation potential of these diverse plant species. Further research is necessary to understand where *souk* herbalists collect plants and how their commercial activities affect plant diversity and availability in specific rangeland locations.

**MANAGEMENT OF FUELWOOD RESOURCES AND LAND-COVER IMPLICATIONS**

Compared to medicinal plants and wild mushrooms, it is easier to measure the environmental impact of changing fuelwood collection patterns. Based on dry wood weights, PDPEO project research found that average household fuelwood consumption ranged from 5 Kg/day in the summer to 10 Kg/day in the winter (Bruck 1996). There were only slight variations of this consumption pattern between mobile tent households and settled village households although the impact of fuelwood collection was most severe around villages (Maatarka and Mengoub).

Primary data using land-cover intercepts indicated 10% vegetation cover near Maatarka, compared to averages of 25 to 40% near tents, and up to 50% coverage in uninhabited areas of the Dahara. Differences in regional vegetation ecology also represented important factors affecting the impact of fuelwood collection. For example, a large variety of woody shrubs make up the dominant vegetation cover in the Sahara, whereas quick-burning perennial halfa grass (*Stipa tenacissima*) dominates in the Dahara. Consequently, households settled in the Dahara concentrate fuelwood collection on the halfa grass. It burns quickly, so women remove the grasses by the roots because this part of the plant burns longest. This practice removes vegetation cover and interferes with the
rejuvenation potential of the perennial grass. Pressure on fuelwood resources was also heavy in the Sahara. But, the relative demand on woody shrubs was lower since these are slow-burning fuel resources. Although land users also up-rooted some of these shrubs, they often cut species above the roots (e.g. *Retama retam*). This practice encourages plant rejuvenation.

Village women also over-exploited fuelwood resources close to home because they preferred not to walk far from the surveillance of others, in accordance with the value of female seclusion. Fuelwood collection was concentrated around settlements diminishing both ground cover and species diversity.

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**Figure 6** Percent women collecting fuelwood by location and class.

**Figure 7** Percent men collecting fuelwood by location and class.
Preferences and access to various fuelwood species depended on whether households were mobile tents or fixed in villages or towns. For example, in tents, land users collected on average 3.6 different fuelwood species, villagers used only 2.3 varieties, and in town only 1.5 different plants were used. Research revealed that the best fuelwood species diminished relatively quickly compared to fast-burning resources. The best hardwood species (e.g. *Retama retam* and *Arthrophytum scoparium*) were rarely found around villages, but were re-generating around larger towns. Range extension workers at the Agriculture and Development office in Bouarfa noted that around Bouarfa vegetation cover had actually improved due to the increased use of commercial fuel sources such as natural gas.

The degree to which households relied on fuelwood resources depended on class and location variables. And, as illustrated in Figures 6 and 7, these variables shaped gendered fuelwood collection activities.

Considering the differences in the scale, Figures 6 and 7 demonstrate that women bore the burden of fuelwood collection, particularly in tent households. In villages and towns, both class and gender variables came into play. In the villages, most women (between 75 and 85%) collected fuelwood. But, some 18 to 35% of the men also participated in this activity. In villages, natural resources provided cooking and heating fuel for most households. But, compared to women in tents, villagers travelled much farther (up to 12 miles one way) to collect wood. Since the cultural value of female seclusion discouraged women from travelling long distances alone, they engaged in concentrated and less cautious extraction methods. This degraded not only vegetation cover but also species diversity around villages. Distances to fuelwood collection sites gradually increased so men more commonly accompanied women or were needed to drive mule-drawn carts or trucks in order to haul wood back home.

The same pattern existed in towns, with some variation: only men and women in poor households collected fuelwood. As with the patterns for mushroom and medicinal plant collecting, the trends suggest that as households become more settled gender roles shifted from sex-specific activities to increasingly shared resource collection and management strategies.

These data point toward several important findings. First, that access to some fuelwood species declined with settlement, threatening over-exploitation of particular species at some but not all settled locations. Range cover had actually improved around larger commercial towns where alternative fuel resources were used. Second, concentrated fuelwood collection activities around villages and sedentary tents resulted in significant range cover loss and increased distances to fuelwood collection sites. Third, longer distances to...
abundant fuelwood resources shifted the gendered nature of fuelwood collection and more men participated. Yet, interviews with PDPEO conservation project managers indicated a continuation of the perception or “gender myth” that fuelwood collection was women’s work. Men had not been identified as a ‘user group’ and were not included in educational efforts that encouraged cutting fuelwood resources above the roots. Understanding that these roles have begun to shift provides important information for targeting both men and women in conservation programs.

CONCLUSION

The Beni Guil case study in eastern Morocco demonstrates that gender-based resource management patterns shift in response to settlement, commercialization, and more intensive land-use practices. Many household resource responsibilities such as collecting wild foods, medicinal plants and fuelwood are increasingly shared by women and men as households adapt to economic and environmental changes associated with sedentarization.

Structural theories on women, environment and development posit that women lose control over resources as pastoral nomads settle and become integrated into a cash economy. The Beni Guil case suggests, however, that important nuances exist which cannot be reduced to class variables, gender stereotypes, or simple household mobility categories. In mobile tents men and women maintain easy access to a variety of range resources from different ecological niches. These households continue to move in order to take advantage of seasonally available resources and assure women of close proximity to natural resources. Despite the integration of tent households into a commercial economy, most tasks remain sex-segregated according to traditional roles.

As households become more fixed in villages and towns, however, collection activities shift from women to men. According to the gender and environment literature, women’s loss of access to natural resources increases their dependency on male income earners. A more complex gendered adaptation occurs among the Beni Guil. Women often find alternative ways to access resources they need to fulfill their household responsibilities. However, this is more difficult in villages where access to natural rangeland resources or markets is limited. In villages, gender roles become most flexible.

Weekly commercial market in towns also provide Beni Guil women settled there with new opportunities to maintain control over resources. Lower collection activities among women in town does not necessarily imply a corresponding loss of access to resources nor a loss of knowledge about them. In towns, women take advantage of the market.
advantage of the market. Depending on class characteristics, women use the market in various ways. Wealthy and moderate town settlers no longer collect rangeland resources themselves but buy them at the market instead. Women in poor households use truck transportation available on market days to collect and then sell wild mushrooms and truffles. The weekly market provides poor women with an opportunity to generate income.

The market also represents a new space for learning about medicinal plants. Some research suggests that commercialization erodes indigenous knowledge systems and devalues women’s roles as family healers (Mehta 1996). The Beni Guil case suggests otherwise. Findings from this case support recent critiques of the orthodox dualism of indigenous/local/traditional versus external/commercial/modern (Bebbington 1997; Batterburg 1997). Instead, a new approach necessarily recognizes hybrid livelihood systems as complex strategies that rural households utilize to preserve tradition while adapting to social, demographic, economic and environmental change.

Further, the Beni Guil example also points to a theoretical weakness in studies among pastoralists that view households as either mobile or settled. Among the Beni Guil, some households are split and represent units that are both fully mobile and settled. The reconceptualization of household mobility as well as careful attention to the type of settlement (rural village or commercial town) provides more accurate insight into the gendered aspects of social adaptations to sedentarization and environmental change.

Examining how gender is embedded in ecological, cultural and economic structures at a given point in time also proves more useful than ecofeminist views that essentialize women with nature. The Beni Guil case demonstrates that women take advantage of new truck technology to reach more remote sites where they collect commercially valuable wild mushrooms and truffles. This strategy helps them maintain control over their roles as providers of food and fuel to the household even though this activity carries with it negative environmental consequences. Women also respect the cultural norm of female seclusion, which encourages over exploitation of fuelwood resources close to home, suggesting a greater affinity with culture than with nature.

By addressing the gendered responses to the environment as well as considering potential environmental impacts, this case study fills a gap in the geographic literature in North Africa and the Middle East that has looked at the environmental impacts of nomadic settlement and land-use intensification through larger-scale processes including: historical, political and economic contexts; erosion of local resource management institutions; land tenure changes; and demographic or technological change. By shifting the focus to intra-household dynam-
ics, new insight is gained concerning environmental change and the future potential for sustainable livelihoods in North Africa’s arid lands.

Promoting sustainable environmental management of Morocco’s rangelands requires adding intra-household analyses of constraints and opportunities in meeting livelihood needs. More information about gendered land-use practices will promote development policies and conservation programs that target appropriate land-user groups. Identifying how men and women’s resource interests intersect with class, location, and household variables suggests more accurate trajectories of local scale land-cover change in the future.

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