Research Report (Summary)
R7906

Indigenous environmental knowledges and sustainable development in semi-arid Africa

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* For a full discussion of the results, please consult the 248-page Final Research Report *

The UK Department for International Development (DFID) supports policies, programmes and projects to promote international development. DFID provides funds for this study as part of that objective but the views and opinions expressed are those of the authors alone.

1. Background and objectives

This study aims to identify and understand the ways in which indigenous environmental knowledges are constructed, mediated, and used by people living in arid environments. A key perspective is to focus on the ways in which men's and women's knowledges are constructed differently and how this might affect natural resource management.

The project builds on growing interest in indigenous knowledge (IK), much of which has been stimulated by the failure of modernisation, based on the transfer of science and technology, to improve the everyday lives of people in LDCs. Consequently, some have suggested the exploration of 'other' knowledge systems as alternatives, thus facilitating empowerment and more appropriate development for poorer, marginal groups in LDCs. The problem, however, is how such IK can be conceptualised, understood and subsequently contribute to development.

Differences in environmental knowledges, however, cannot be satisfactorily explained in terms of a simple binary of 'indigenous' and 'planners' knowledges. Contextual factors are clearly important, including not only economic status, but also the socio-cultural environment in which such knowledge is held, re-worked and developed. Of particular relevance here is the role of gender relations; the ways in which knowledges are transferred (or not) from one generation to the next; the ways in which economic, cultural and local political factors mediate the acquisition and use of knowledges; and the tensions between indigenous and formal knowledges.

The project has the following research objectives:

- to identify key environmental knowledges with regard to the natural resource base;
- to explore and explain the ways in which such knowledges differ between male and female perspectives;
- to identify the ways in which such knowledges inform the management of natural resources for household reproduction and development;
- to explore areas of tension and agreement between indigenous and planners' environmental knowledges in relation to natural resource management;

2. Methods

This study largely deployed qualitative methods to investiage the contextualised and nuanced environmental knowledges of Bedouin. This was achieved by working with local people over extended periods of time, and encouraging an atmosphere of mutual trust in which 'conversations', rather than interviews, took place. The research team divided into two for research visits, with female researchers having discussions with women informants and male researchers with Bedouin men. This division was necessary for cultural reasons. Non-family males are forbidden to enter the women's area in Bedouin settlements, and Bedouin women are generally not permitted to talk with non-family males. From September 2001 to July 2002, regular visits were made to the study groups, with discussions focusing around the agreed checklist of key topics. The results of these discussions and other observations made were entered on a data pro-forma, and

were subsequently entered into the electronic database NVivo for analysis. There are clear advantages in longitudinal work in the sense of obtaining information which is deeper and more nuanced, but at the expense of time and resource.

Three main study groups in separate geographic locations around Egypt were selected: Bedouin in downstream Wadi Allaqi; 'urban' Bedouin from around of Aswan; and Bedouin in and around the Siwa Oasis in northwest Egypt (map 1). These three groups were chosen because of the controlled differences which they brought to the study (for a fuller discussion of methods see Appendix).

3. Findings

3.1. Key environmental knowledges

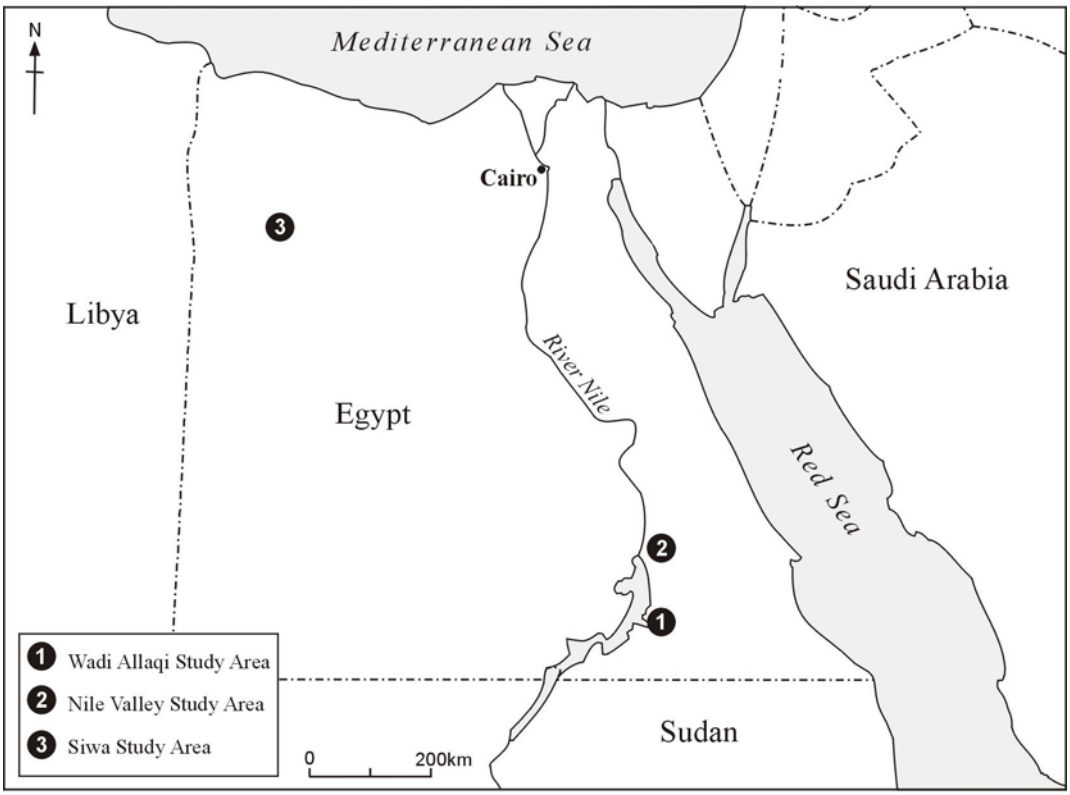
The closest Arabic term to 'resource' used by Bedouin is *m'aish*, meaning literally 'sources of life'. Amongst livestock-herders *m'aish* included forage, water and, to a lesser extent, soils. Bedouin engaged in agricultural activities prioritised land and soils. Some informants even referred to specific livestock or crop species as resources. A minority offered more abstract appreciations, differentiating resources by their characteristics. Consequently, resources for household consumption were differentiated from those for market; however, resources which are sold generate income for food, and therefore constitute *m'aish*.

Among Allaqi Bedouin, the annual cycle of forage availability involves three elements (Figure 1). The first comprises rain-dependent pastures and permanent acacia, mainly located upstream. Informants indicated that annual grasses constituted the most important upstream grazing resource, although some perennial species are important, particularly in years of poor pasture quality (Table 1).

Table 1: Principal upstream forage resources:

Arabic name	**Latin name**	**Livestock**	**Best locality**
Tawil	*Astragalus vogelii*	Camel Sheep Goat	Wadi Umreit
Ushab	*Cyperus conglomeratus*	Camel Sheep Goat	West of Eiqat
Rooq	*Stipagrostis plumosa*	Camel Sheep	Upstream
Natish	*Heliotropium*	Sheep and goat	Upstream
Sont	*Acacia sp.*	Camel Sheep Goat	Haimur, Um Arkah
'Aqul	*Alhagi maurorum*	Camel Goat	Upstream
'Arareeb	*Trianthema salsoloides*	Camel Sheep Goat	Upstream
Shoush	*Panicum turgidum*	Sheep and Goat	Upstream
Damra	*Indigofera arabica*	Camel	Wadi Ghazal
Murmeed	*Psoralea plicata*	Camel	Wadi Jabjaba

The second element comprises seasonal lakeside vegetation, tamarisk trees and bushes around the shore of Lake Nasser, and the aquatic weed *Najas horida* from the lake itself



Map 1 General location of the three study sites in Egypt.

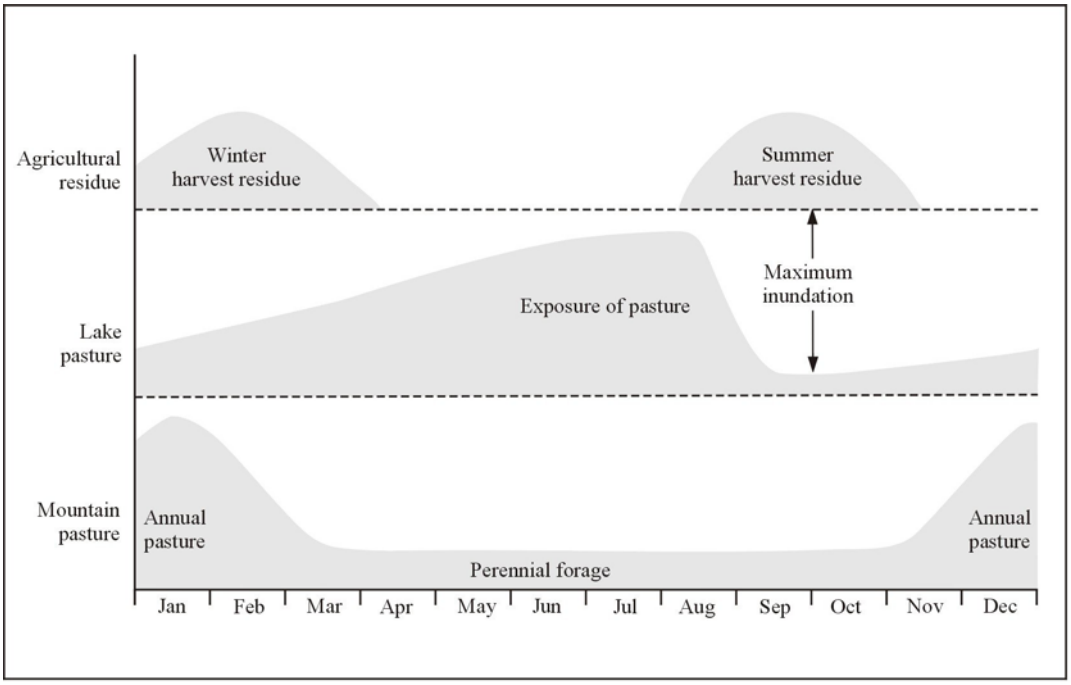


Fig 1 The annual cycle of grazing availability in the Wadi Allaqi resource system.

(Table 2). With the exception of tamarisk, most lakeshore species grow seasonally (or become accessible) as the lake water annually recedes.

Table 2: Principal lakeside forage resources:

Arabic name	Latin name	Livestock	Best locality
Najila	*Panicum repens*	Sheep Goat	Wadi Allaqi
Toroba	*Glinus lotoides*	Camel Sheep Goat	Wadi Allaqi
Sakaran	*Hyoscymus sp.*	Sheep Goat	Wadi Allaqi
Shilbaeka	*Najas horida*	Sheep Goat	Wadi Allaqi
Tarfa	*Tamarix*	Camel Sheep Goat	Wadi Allaqi

The final element is agricultural residues which may be grazed *in situ*, hand collected or purchased from outside the area. The few commercial farms along parts of the lakeshore grow a variety of crops including tomato, melon and watermelon. The quality of this fodder is considered good, but there are health risks to animals from pesticides.

Until recently, Bedouin overcame the problem of seasonal resource scarcity in Allaqi through a mobility strategy. However, during the last five years, this pattern of resource exploitation has undergone change. Interestingly, whilst women prioritised lakeside grazing as the most important resource, men were divided between upstream and agricultural residue grazing (Table 3), reflecting the gendered division of labour in livestock herding.

Table 3: Forage resources of Wadi Allaqi ranked by importance (letters in italics represent male respondents)

Resource ranked by importance	Lake Farm Upstream	Lake Upstream Farm	Upstream Lake Farm	Farm Upstream Lake	Upstream Farm Lake
	B	E	*D*	*A*	*G*
	C	F			*I*
	H				
	J				
	K				

For Nile Valley Bedouin, forage resource elements are similar to those in Allaqi, and people make use of the same grazing areas in the Red Sea Hills and upstream Allaqi. Seasonal lakeshore pastures are also available along the western shore of Lake Nasser, with the principal forage species there including some species also utilised in Allaqi (Table 4).

Table 4: Reported forage resources at Lake Nasser

Arabic name	Latin name	Livestock	Best locality
Najila	*Panicum repens*	Sheep Goat	Al Khazan
Toroba	*Glinus lotoides*	Camel Sheep Goat	Al Khazan
Tarfa	*Tamarix*	Camel Sheep Goat	Al Khazan
Baqoq	*Heleochloa sp.*	Sheep Goat	Al Khazan
Diis	*Juncus acutis*	Sheep Goat	Al Khazan
Sa'da	*Suaeda aegypticia*	Sheep Goat	Al Khazan

Thirdly, local Nile Valley agricultural residues are available (Table 5). It is notable that the women ranked lakeside resources lowest (Table 6). This again may be because they prioritise the value of their own major sphere of livestock management activity. Respondents, particularly women, have developed an extensive knowledge of local crops and are able to distinguish the best parts of each plant to be fed to livestock, as well as the relative nutritional merits of each particular species.

Table 5: Agricultural residues and fodder crops utilised by Nile Valley Bedouin.

Name	Latin name	Livestock
Alfalfa Baladi	*Trifolium alexandrinum*	Camel Sheep Goat
Alfalfa Hejazi	*Medicago sativa*	Camel Sheep Goat
Tomato	*Solanum lycopersicum*	Sheep Goat
Melon	*Cucumis melo*	Sheep Goat
Date	*Pheonix dactylifera*	Camel Sheep Goat
Watermelon	*Citrullus vulgaris*	Sheep Goat
Eggplant	*Solanum melogana*	Sheep Goat
Bean	*Vicia faba*	Sheep Goat
Wheat	*Triticum vulgare*	Camel Sheep Goat
Maize	*Zea mays*	Camel Sheep Goat

Table 6: Forage resources of the Nile Valley ranked by importance (letters in italics represent male respondents)

Resource ranked by importance	Lake Farm Upstream	Farm Lake Upstream	Farm Upstream Lake
	L	*N*	M
			O
			P

In Siwa, there are two principal sources of forage, these being agricultural products and natural forage located in the oases' wetlands and the surrounding desert. All fodder types are harvested from the agricultural gardens and livestock are zero-grazed in pens (Table 7). Few Siwan informants retained any knowledge of the natural forage resources of the desert. Bedouin settlers at Siwa, however, favoured the use of natural forage (Table 8).

Table 7: Siwan fodder species ranked by importance

Name	Latin name	Livestock
Alfalfa Baladi	*Trifolium alexandrinum*	Sheep Goat
Barley	*Hordeum vulgare*	Sheep Goat
Maize	*Zea mays*	Sheep Goat
Date	*Pheonix dactylifera*	Sheep Goat
Olive	*Olea europaea*	Sheep Goat

Table 8: Bedouin forage species ranked by importance

Arabic name	Latin name	Livestock	Best locality
Hajna	*Phragmites australis*	Camel Sheep Goat	Oasis fringes
'Aqul	*Alhagi graecorum*	Camel Sheep Goat	Northern desert
Diis	*Juncus acutis*	Sheep Goat	Oasis wetlands
Ghardaq	*Nitraria retusa*	Sheep Goat	Oasis fringes
Risoo	*Calligonum comosum*	Camel	Oasis fringes
Heidh	*Cornulaca monocantha*	Camel Sheep Goat	Sand dunes
Balbil	*Zygophyllum coccinem*	Camel Sheep Goat	Sand dunes
Talh	*Acacia raddiana*	Camel	Escarpment
Tumir	*Erodium sp.*	Camel	Northern desert

Water resource knowledge is extensive in Allaqi and Siwa, but less so in the Nile Valley, reflecting relative water scarcity for everyday life in the former two. In Allaqi, with increased sedentarisation, water knowledge is evolving centred around the lake and its annual fluctuations. In the Nile Valley, most households have access to a piped water supply; hence, indigenous water knowledge has disappeared or is considered to be of no value. In Siwa, until very recently, potable water was a very scarce resource. Siwans have dealt with the problem of salinity by developing a sophisticated knowledge of water quality in each of several hundred springs in the oases. For example, it is known that 'red' water, with a high ferrous content, is less saline than 'white' water. If water quality from a spring deteriorates, Siwans use their knowledge to dig a new well in the same locality.

All Allaqi informants claimed some knowledge of medicinal plant species (Table 9). Interestingly, it was pointed out that, while many medicinal species are more drought resilient than pastures, successive years of drought has depleted medicinal plant populations. Allaqi women prefer traditional medicinal treatments over modern medicines, thus providing motivation for maintaining such knowledges.

Table 9: Species collected for medicinal purposes at Wadi Allaqi

Local name	Latin name	Medicinal use	Best locality
Harjel	*Selonestorma argel*	Stomach, cold	Um Hebal
Halfa bar	*Cymbogon proximus*	Stomach	Upstream
Owfeen	*Cleome droserifolia*	Kidney	Murrah
Shajar al Ghazal	*Convolvulus microphyllus* .	Analgesic, fever	Upstream
Garud	*Acacia sp.*	Disinfectant	Upstream
Handhal	*Citrullus colocynthus*	Rheumatism	Upstream
Ehleeq		Diabetes	Eiqat
Maswak	*Salvadore persica*	Teeth cleaning	Eiqat
Salamika	*Casis senna*	Purgative	Haimur
Henna	*Echium sp.*	Clean wounds	Upstream
Kharwaa	*Trichodesma ehrenbergii*	Stomach, fever	Wadi Allaqi
Hegleg	*Balanites aegyptaica*	Diabetes	Upstream
Dom	*Hyphaena thebaica*	Headache, toothache	Upstream
Sharba	*Euphorbia geniculata*	Purgative	Upstream

In the Nile Valley, knowledge of medicinal plant species is much more limited than in Allaqi (Table 10), and that knowledge is largely hearsay and not firsthand, except for a few individuals who have travelled into the Red Sea Hills.

Table 10: Species used for medicinal purposes in the Nile Valley

Local name	Latin name	Medicinal use	Acquired from
Garud	*Acacia*	Clean wounds	Market
Harjal	*Solonestorma argel*	Stomach, cold	Market
Handhal	*Citrullus colocynthus*	Rheumatism	Market
Shai	*Pulicaria incisia*	Toothache	Market

Siwans rarely leave their oasis and now retain little knowledge about medicinal species growing in the desert locations. However, people living at Al Qara in close contact with the Bedouin and the surrounding desert, and the Bedouin themselves, had a much more extensive knowledge and were sometimes called upon by the Siwans to perform treatments (Table 11).

Table 11: Species used for medicinal purposes in Siwa

Local name	Latin name	Medicinal use	Best locality
Sheeh	*Artemisia herba alba*	Stomach	Northern desert
Handhal	*Citrullus colocynthus*	Rheumatism	Northern desert
Falizliz	-	Cancer	Northern desert
Arrksuus	-	Kidneys	Cultivated
Shajaret Miriam	*Anastatica hierochuntica*	Child birth	Northern desert
Meela	-		Oasis fringe
Sakaran	*Withania somnifera*	Hallucinogenic (recreational drug)	Northern desert
Kharoob	*Anagyris foetida*	Diarrhea	Cultivated
Al Afraj	*Polygonum equisetiforme*	Stomach	Northern desert
Hamila	-	Stomach	Northern desert
Gumilla	-	Stomach	Northern desert
Nana	-	Stomach	Cultivated
Shajaret Reeh	*Haplophyllum tuberculatum*	Flatulence	Oasis fringe
Halfa bar	*Cymbogon proximus*	Stomach	Northern desert
Rubia	-	Bones, liver	Oasis fringe
Shaeer		Colds, diabetes	Cultivated
Za'ta		Ease childbirth, wetnursing	

Soil knowledge is limited among Allaqi and Nile Valley Bedouin, reflecting only the recent use of soils by the former, and the lack of access to agricultural land by the latter. In Siwa, however, because of the greater importance of commercial agriculture, soil knowledge is extensive. This is important because, for example, there are 16 different varieties of date alone, each requiring a different management regime. Another example concerns high soil salinity, which is treated by mixing in sand, water and livestock manure. It is then flushed through with more water and subsequently planted with a nitrogen-fixing crop like alfalfa, before being ready to take fruit trees.

Bedouin IK is very aware of both short- and long-term change. Natural resources in Allaqi, for example, are recognised as highly variable through the calendar year (Figure 1). Seasonal change in resource values within the Nile Valley is primarily linked to the local agricultural calendar and residue grazing availability. Seasonality in Siwa is principally linked to the date and olive harvests, both occurring between September and December, and, to a much lesser extent, by the flourishing of local forage species, such as *Alhagi graecorum*, in the summer.

Seasonal inundation by Lake Nasser has brought about long-term environmental change, producing a whole new pasture, water and agricultural resource regime, whilst also

destroying some of the previous resources of the Eastern Desert. Overall, the value of upstream pastures has declined relative to new shore grazing resources. The effects of drought have been less severe on Nile Valley Bedouin where livestock production is cushioned by the availability of agricultural residues. The principal issue at Siwa is not drought, but salinity and soil condition, problems associated with irrigation from the brackish shallow aquifer. Using local soil management techniques, newly cultivated land is productive for about ten years after reclamation, but thereafter production rapidly diminishes regardless of effort.

3.2. Women and gender relations

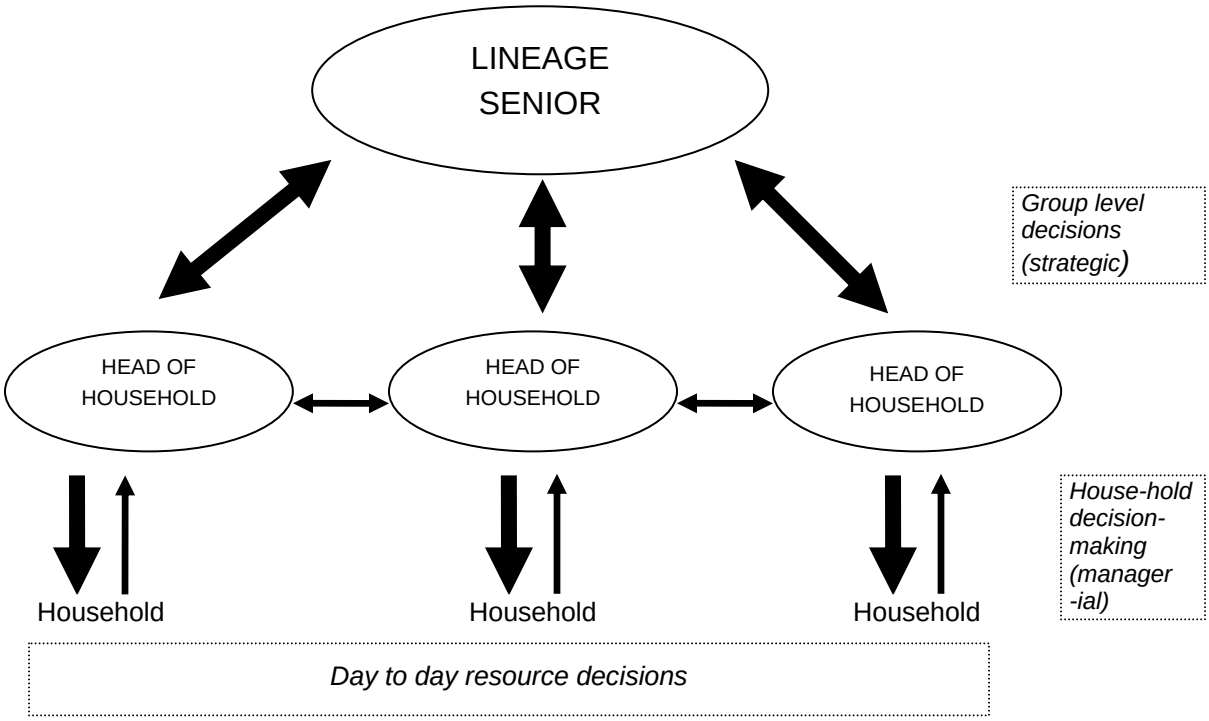
There are clear gender roles amongst the communities in this study, largely based upon scale and formality, which are reflected in IK. Men's roles involve large-scale decision-making about resource use, while women take daily 'mundane' decisions. Men dominate decisions about resources that involve commercial value, and other decisions which are 'political' in nature, while women's decisions are generally confined to subsistence issues. Some insisted that women play no role in natural resource management. However, there is other evidence that decision-making is negotiated within the household.

Women are largely constrained to the domestic - the space of the household and its immediate environment - although this is a variable concept both in space and time. Thus, although the gendered division of space is constant throughout the communities studied, there are variations. Women's role in resource management, and the environmental knowledges they hold, is closely linked to the proximity of the resource to the household. However, the gender division of resource decision-making is not a simple binary, but is arranged around patriarchal authority; not all men have freedom in their decision-making, but may have to defer to the authority of the head of household (Figure 2).

The difference between men and women's spaces have a significant impact upon the knowledges each can attain. While men have access to a spatially extensive range of environments, women's experience is more constrained and they have a much smaller array of people with whom they interact. Hence, women's opportunities to learn are much more restricted than those of men. For instance, although both men and women talked about definitions of resources and listed the most important ones, the answers given by women were dominated by questions of household survival rather than the economic value of resources. Similarly, women were less knowledgeable about the practical power relations involved in resource management.

Men and women learn differently. While young children stay around the household and so learn from women, older children learn from relatives of their own gender. Thus the basic skills are taught to children by women and then specialist knowledge is passed on by the same gender relatives once the children mature. The exception to this is grazing which is predominantly taught to young children by accompanying older children on their duties.

Figure 2: Delegation of natural resources decision-making responsibility in Bedouin households.



New knowledges are developed, which illustrate well the adaptive and hybrid nature of the local knowledges held by the women respondents. These range from the relatively superficial (such as the replacement of goat skins with plastic containers for making milk products), to much more significant (introduction of agriculture). Women are aware of traditional practices, and understand the cultural beliefs that underpin them. For example, Nile Valley women can milk sheep and goats but they feel ashamed to do this in the presence of their relatives from the desert, for whom this practice is forbidden. In Siwa, young women now know much about date palms, even though they know nothing about acacia. The palms are to the settled women, what acacia is to their desert kin. The younger women in Siwa say that it is not important for them to know about the desert now. What is important is that they understand the rules of land ownership in the village to avoid conflict over resources. Notably, patriarchy is being challenged more generally. Some believe that the traditional sheikhs are no longer as important as previously as the state is now in control. However, when ownership of resources was discussed, only men introduced the concept of the state. This formal arena of power and control is outside the sphere, and therefore knowledge, of the women.

3.3 The use of environmental knowledges in natural resource management

The empirical results from this research demonstrate that IK is firmly embedded within the economic and socio-cultural contexts in which they are found. Economic context is central to understanding how local knowledges are produced and used in daily resource management. Wealthier families exhibit wider knowledges than poorer families, and this

is reflected in resource management. For instance, wealthier Allaqi families with sufficient camels available for transport can graze livestock on agricultural residues around the lakeshore. While these families are aware of the relative fodder values of these resources and the dangers from pesticides, such knowledges are unknown to the poorer families without the economic resources to travel there. There is a clear relationship between knowledge, resource management and wealth.

All three communities are experiencing change towards a market-based economy, although unevenly felt within each community. Those with fewest resources have become increasingly marginalised, being less able to take advantage of new natural resource opportunities (see above). Information attained at markets is also important, whether related to new environmental knowledge or to the relative value of different products. Those with access to such information have a clear economic advantage. This transition, however, has not been straightforward. Despite the increase in private ownership, Bedouin practices of communal ownership of natural resources persist; for instance, undeveloped land in Siwa is still considered a communal resource despite attaining monetary value.

The role of social and cultural contexts is also highly significant. Sedentarisation, for example, is creating new social roles within the family and thus different knowledges. The extent of women's environmental knowledges appears to be changing more profoundly than men's, as they are developing more spatially restricted environmental knowledges in response to increased sedentarisation. This will impact eventually on the entire family, by reducing the scope of children's environmental learning, as women are currently responsible for the education of children up to the age of 10-12 years.

3.4 Indigenous and planners' environmental knowledges

There remains a fallacy amongst some that IK exists as a pristine body of knowledge to be drawn on and incorporated into some grand design of knowledge for development. There remains a deep suspicion among many of those development practitioners interviewed that IK is unmodern, unscientific and hence of questionable development value. Even for those who are more sympathetic, there is a sense of IK being traditional, unchanging, timeless, conservative and somehow 'shared' within communities. The results of this study, however, suggest a different conceptualisation of IK, in that it is:

- *Hybridised*. Bedouin environmental knowledges are not just internal to the group, simply being passed down through generations. Although much knowledge is transmitted in this way, Bedouin knowledges have long been influenced by outside, most notably Nubians, before the construction of the High Dam. They continue to be influenced by contact with the *fellahin* of the Nile Valley and Siwa, and people met at market places and elsewhere. Hence, changes to Bedouin environmental knowledges do not only come from Western science or planning. This challenges the binary in the literature between IK and formal science. Moreover, the introduction of new knowledges does not necessarily herald the loss of IK, but reworking current knowledges into forms more appropriate to changing circumstances.

- *Transitory and provisional*. Knowledge about resources held by the three Bedouin groups is utilitarian, opportunistic, and evolves according to changing circumstances. With increased sedentarisation, new knowledges about agricultural residue resources have emerged, and existing knowledge of upstream resources is being lost among younger people. Among Bedouin in both the Nile Valley and Siwa, environmental knowledges about desert resources have been replaced by new, relevant knowledges about soils, tree species etc.

- *Constantly being re-worked and re-evaluated*. Examples include new grazing opportunities on agricultural residues in Sayalla, and new grazing from observation and experimentation about the best types of fodder for improving animal quality. Some changes are forced, such as restrictions on upstream grazing at Allaqi created by drought, whilst others, such as the use of aquatic weed for animal feed, are a matter of choice in the interests of economic efficiency.

- *Utilitarian and pragmatic*. IK is sometimes presented as being inherently ecologically sustainable. However, sometimes groups must simply follow survival strategies. For example, due to limited alternatives, there is extreme grazing pressure on the exposed lakeshore grazing around the Sadenab area in downstream Allaqi. Bedouin are highly pragmatic about knowledge. In the Nile Valley, many encouraged their children to pursue formal education and chose not to instruct in desert environmental knowledges, and, as described already, Siwan women are unconcerned about their lack of knowledge of acacia management. For the Bedouin, knowledge is primarily experiential. If certain areas are no longer visited, it will be impossible to gain an accurate knowledge of them. It is only when a person has their own experience of an environment that they can say that they have knowledge of it.

- *Differentiated throughout the community.* IK is uneven both across communities and households based on gender, access to different environments, issues of wealth and mobility, and on experience, and thus age; hence, the concept of community knowledge is unhelpful. Consultation with experts in different fields within the communities illustrates Bedouin recognition of the unevenness of knowledge in their own communities.

The field evidence from this study raises some important policy implications:

- There is a need to re-conceptualise the term ‘indigenous environmental knowledge’ as ‘local environmental knowledges’. This is not merely semantics but reflects the complexity of such knowledges as hybridised, pragmatic, utilitarian and transitory.

- The concept of a consensual community knowledge needs to be re-assessed. The results of this study demonstrate that the depth and range of environmental (and other) knowledges vary within communities and even within households. This does not mean that there are no shared knowledges, but that the extent to which these exist and are accepted within communities needs to be considered critically.

- 'Experts' on particular aspects of environmental knowledge exist within communities and are consulted on particular issues (e.g. desert routeways to known seasonal grazing resources; medicinal plant use). These environmental 'experts' represent a resource to be potentially managed in sustainable development practice, either as sources of information to be further developed, or as already recognised experts in the community, as disseminators of new knowledges. It is a relatively easy task to identify who these individuals are in practice.

- If local environmental knowledges are to contribute successfully to sustainable development practice, then it is vital that their policy use is grounded in the economic and socio-cultural environments in which they are found. This study has demonstrated the ways in which environmental knowledges are firmly grounded. It is clear that as these realities change and modify, so do local environmental knowledges. If the incorporation of IK into sustainable development strategies is to be successful, then such strategies must be sensitive to these changes.

- It is clear that economic diversity within communities, and even households, can have a significant impact on environmental knowledges. Poorer households have fewer resources to risk in developing new knowledges. A sustainable development plan, which incorporates local knowledges without dealing with economic differentiation, is likely to face limited success.

- It is unhelpful to assume that the household can be treated as unitary, sharing environmental knowledges and economic objectives. This study has demonstrated both the importance of taking seriously gender relations and the ways in which this can be done in the context of local environmental knowledges. Thus, the recent interest in ideas of 'empowerment' and grassroots development needs to ensure that a range of voices is heard from the communities involved, not only from groups identified as 'men' and 'women', but also from those of different levels of wealth and from those facing different household arrangements (such as widowhood), something which raises important issues of power relations.

4. Dissemination

Symposium

A symposium was arranged for the immediate dissemination of initial research findings in Egypt. Entitled "Environmental Change and Desert Development: New Water, New Opportunities in Southern Egypt", the symposium was held between 16 and 18 December 2002, at the Unit of Environmental Studies and Development (UESD) at South Valley University, Aswan, Egypt.

This symposium presented the latest research on natural resource development in the eastern part of the High Dam Lake area, based mainly on work being undertaken at the UESD. One of the key sessions allowed the DFID project team to present the project to an audience of over 70 participants, drawn from the following institutions: UNESCO;

UNDP; IDRC (Canada) DANIDA; British Council; Egyptian Environmental Affairs Agency; Ministry of Social Affairs; Ministry of Agriculture; Aswan Regional Planning Centre; Aswan High Dam Lake Development Authority; Aswan High Dam Authority; South Valley University; Assuit University; Cairo University; Ain-Shams University (Cairo); University of Glasgow (UK); University of Bucharest (Romania).

Webpage
The report is accessible via the Aswan-Glasgow Link pages hosted by the University of Glasgow (http://www.geog.gla.ac.uk/aswanlink/projects2.htm). The executive summary is available as an HTML page, while a copy of the full report can be requested by email.

5. List of publications

- *Indigenous environmental knowledges and sustainable development in semi-arid Africa*, DFID Final Research Report (R7906). COPY ENCLOSED
- *Indigenous knowledge, local knowledges? The value of IK in development research and practice.* In final preparation, to be submitted to **Progress in Development Studies**.
- *The production of indigenous environmental knowledges*. In final preparation, to be submitted to **Journal of Development Studies**.
- *Gendered spaces, gendered knowledges*. In preparation, to be submitted to **Environment and Planning D: Society and Space**.

Appendix
Research methodology and methods

1 Methodological considerations

A trusted and well-used method of collecting data and information has been that of formal questionnaire surveys based on carefully, and sometimes not so carefully, constructed random sampling frameworks. This provides a degree of control over the validity and representative nature of statements which can be made about particular populations. Although an efficient and frequently effective way of collecting large amounts of data, there can also be difficulties with this approach. Questionnaires can impose their own logic on the respondent, and therefore the results may be less representative than claimed, as less of the voice of the respondent is heard, drowned out by the structured approach of the questionnaire. In any case, questionnaire surveys, because of their imposed structures, are notoriously inefficient at teasing out deeper meanings held by members of communities, and at identifying the multiplicity of concerns within those communities (Frankfort-Nachmias and Nachmias 1996).

An alternative approach has been to develop qualitative methodologies. Whereas formal, structured sample surveys are seen to be objective, rigorous and (quasi-) scientific, and therefore produce what are seen to be scientifically legitimate results, qualitative methods are criticised for being the opposite. There remains a strong conviction among many that quantitative data are essential, and, indeed, a power accrues to these knowledges through the legitimisation afforded by formal science discourse (Agrawal 1995; Kalland 2000). However, there are difficulties. Whereas science fragments, compartmentalises, tests and reconstructs knowledge in a systematic, controlled and replicable manner, this approach is not always particularly helpful or enlightening when trying to understand the complexities inherent in real world socio-economic and cultural situations, where knowledge held by individuals or communities is not divided up into discrete and convenient chunks (Swift 1979; Ellen and Harris 2000). Indeed, this raises the very real danger that other local/indigenous/community knowledges become distorted by attempting to impose the structures of western scientific models on them (Sillitoe 1998). Local or indigenous knowledges, for example, are more behaviour-based and holistic than scientific knowledges, and can only be meaningfully interpreted in the social and economic contexts within which they have been developed (Kalland 2000; Sillitoe 1998; Turner 1993). The idea that local knowledges can be fragmented and de-contextualised is not helpful. As Kalland (2000:326) succinctly puts it: “as local people are more concerned with qualitative data, it follows that it is difficult to incorporate their knowledge into the scientists’ models”.

This study will largely employ qualitative methods compatible with these lines of methodological argument. The emphasis will be on identifying and teasing out the holistic, contextualised and nuanced knowledges of people from within the communities. This is to be achieved by working with local people over extended periods of time, and encouraging an atmosphere of mutual trust in which ‘conversations’, rather than interviews, take place. Although a checklist of topics has been developed, based on

previous fieldwork in the Eastern Desert by members of the research team, this list can be seen as provisional in the sense that some topics may in time disappear from it, and others become added, in the light of conversations. As far as possible, the agenda is informant-driven. This does not mean that quantitative or 'objective' data are to be ignored. Rather, they will be used, as appropriate, to support arguments, but not to generate the arguments themselves.

2 Choice of study groups

Three main study groups in particular geographic locations were initially selected, these being bedouin in downstream Wadi Allaqi; 'urban' Bedouin from around the city of Aswan; and Bedouin in the hill areas (*jebel*) of the Eastern Desert. These three groups were chosen because of the controlled differences which they brought to the study. The Bedouin of downstream Wadi Allaqi comprise groups who have relatively recently moved into that area to take advantage of the new resource opportunities, primarily guaranteed water and associated grazing associated with the High Dam Lake (Lake Nasser). Environmental knowledges have had to develop to take account of this new natural resource base. In addition, as the area is only about 200km south of Aswan, and an asphalt road has recently been constructed to serve the area, this generates questions as to how local knowledges are further mediated by outside experiences which are now relatively commonplace, at least for the men. This, of course, raises a central issue for this research as the extent to which local knowledges possess an identifiable gender dimension. The Bedouin in this area are overwhelmingly Ababda, mainly from three clans (Fashekab, Hamedab and Sadenab), although a Bishari man has married into one of the communities.

The 'urban' Bedouin represent a group which has chosen for various reasons to migrate out of the desert and live in an urban, or peri-urban, environment. The choice of this group was made partly to investigate the ways in which environmental knowledges developed in the desert become mediated by the urban experience and, indeed, may become lost, and partly to evaluate the place-specific nature of such knowledges and how they evolve. Of particular interest is the extent to which desert environmental knowledges have survived the urban transition and the generation gap between the older generation, who have known the desert, and the younger generation, who are essentially urban residents with little desert experience. This comparative element to the study is important as it may help to identify changes in attitudes towards (and knowledge about) natural resource management, where socio-economic development occurs along the trajectory of sedentarisation. Informants among the settled Bedouin are from both Ababda and Bishari.

The third group proposed is located in Eigat near the Egypt-Sudan border at some distance from downstream Wadi Allaqi and some considerable distance from the two towns of Aswan in the Nile Valley and Shalateen on the Red Sea Coast. This group, therefore, has the least regular contacts outside their area, and, in that sense, is potentially the group with the least amount of outside mediation of their environmental knowledges. Moreover, water is of much more critical concern for this group than the other two, as

they are wholly dependent on winter rainfall for grazing and the replenishment of groundwater for wells. However, a major practical problem curtailed our proposed fieldwork programme in this area. Following the September 2001 attack on the World Trade Center in New York, the Egyptian military authorities withdrew travel permits for the southern half of the Eastern Desert as a precautionary security measure. It therefore became impossible to visit Eigat after October 2001. However, in February 2002 some relaxation of this situation was introduced, and permits are being selectively issued for one 4-day visit per calendar month. Consequently, members of the research team visited the area in mid-February 2002 and started data gathering. However, whereas the work in downstream Wadi Allaqi and among the 'urban' Bedouin has been based on repeat visits and has adopted a longitudinal approach, this was no longer possible upstream. The material collected in Eigat was not sufficiently rich and detailed to allow for meaningful comparison with that collected in the other two field sites.

As a consequence of this problem, but also due to concerns that the project needed the contrast of a distinct (yet comparable) physical environment to the Eastern Desert to highlight local knowledge differences, it was decided to conduct further fieldwork at an alternative third site. The area chosen is in and around the Siwa Oasis and Qattara depression of the north-western Desert of Egypt. This provides a contrasting natural environment to the Eastern Desert in that the local ecology is largely based around artesian groundwater, and thus natural resources are not subject to the same degree of temporal and spatial fluctuation as rainfall and lake levels which underpin the ecology of the south. Two study groups in this area are drawn from among the Berber Siwan population and from the Awlad Ali Bedouin, these being communities which use and manage resources in essentially different ways.

3 Study group household coding and case histories

For ethical reasons, research participants have not been named in this report and are instead allocated a code letter. This coding system is employed throughout the report and enables the reader to refer back for summary information. Codes have been allocated on the basis of participation in discussions. Since separate male and female discussions were always conducted, this has resulted in multiple codes for a single extended household (i.e. male and female participants). The following case histories provide household information holistically, with one or more codes allocated to each extended household. The gender of individual research participants and the relationship between them is given in the code box.

A	Male	
B	Female	Wife of ***A***
C	**Female**	Daughter in law of ***A***

A is the senior member of the Hamedab (Ababda) clan at Wadi Um Ashira at downstream Wadi Allaqi. Other Hamedab are found in the Nile Valley and the Eastern Desert, for example, at Abraq wells.

The *hissa* at Um Ashira comprises about six sub-households (those of **A**'s sons and nephews). The group has been in Um Ashira for about ten years, but moved to their current location about three years ago after the lower wadi was flooded. Owing to drought, the household has not shepherded livestock to their traditional upstream pastures for five years, and charcoal production and medicinal plant collection has now also ceased.

The principal income of the group is from livestock production (principally sheep, although some camels and goats are also managed). ***A*** makes extensive use of agricultural residues at Abu Sku and spends most of the year there with his sheep (the goats remain at Um Ashira with the women). ***A*** maintains a close personal relationship with the farmers at Abu Sku to gain access to the fodder there. This means that he usually needs to be at Abu Sku in person to arrange livestock access.

While many of the menfolk are away at Abu Sku or visiting markets in Aswan, the women hold responsibility for herding the goats locally at Um Ashira (each household has about 20). However, there is usually at least one adult male in the camp (often one of ***A's*** sons).

While the men travel frequently to Aswan, women are much more restricted and only go when necessary for visits to the doctor or for special occasions, such as weddings.

D	Male	
E	Female	Wife of ***D***
F	**Female**	**Daughter of *D*'s brother**

D is the senior member of the Sadenab (Ababda) clan at Wadi Allaqi. Other Sadenab live in the Nile Valley. There are about eight households and about 40 people in this group.

The Sadenab originally lived around the Unqat wells in upstream Wadi Allaqi. They 'owned' these wells and other natural resources in the area, but moved downstream to Wadi Allaqi about 20 years ago (or about 10 years after the creation of Lake Nasser). The reason for this move was drought, the death of their camels, and the prospect of better access to Aswan. Due to the continuing drought, the Sadenab have not returned to their traditional upstream pastures for several years. Instead, Sadenab livestock are herded around the lake area. They are the only Bedouin group in Wadi Allaqi who do not have regular access to post-harvest residues from agriculture. The group have a small number of camels (three or four).

Some Sadenab men are employed with the Egyptian Environmental Affairs Agency (EEAA) and the Unit for Environmental Studies and Development (UESD) of South Valley University in Aswan, and bring in a small income. In addition to local sheep and goat herding, most Sadenab women cultivate small gardens on the lakeshore. The group also receives a small income for looking after the boats of unlicensed fishermen.

Women from the Sadenab visit Aswan very infrequently.

G	**Male**	
H	Female	Wife of ***G***

G is eldest brother of his family, thus the senior member of the Fashekab clan at Wadi Allaqi.

The Fashekab were resident at Wadi Quleib until 2000, after which they moved permanently to Sayalla on the southern shore of the lake in Wadi Allaqi. Prior to this move, they had been seasonally visiting the area with livestock for about ten years (since agricultural production first began at Sayalla).

Sayalla is being developed into a small village with some basic infrastructure, and ***G*** is talking of wanting to build a house and settle permanently in the area. ***G*** has not sent his livestock upstream for several years because of drought so he sees no advantage in remaining mobile.

Agricultural residues are available at Sayalla for much of the year and the household has now established links with the farm owners. Since ***G*** now owns a pick-up truck, travel to Aswan is much easier than formerly and the household supplements its livestock income with the hire of the truck to deliver supplies.
Women of the household remain responsible for sheep and goat management around the lakeshore, while the men supervise grazing on agricultural lands and camel browsing. Although far from Aswan, the members of the household are able to visit Aswan with regularity because of the vehicle. The households of several kinsmen are located in the vicinity of ***G***'s household, as they are increasingly dependent on supplies delivered by his vehicle

I	**Male**	
J	Female	Wife of ***J***

I is brother of ***G***, the senior member of the Fashekab clan at Wadi Allaqi.

The Fashekab were resident at Wadi Quleib until 2000, after which they moved permanently to Sayalla on the southern shore of Wadi Allaqi. Prior to this move they had been seasonally visiting the area with livestock for about ten years (since agricultural production first began at Sayalla).

Although ***I*** and ***J*** live separately from ***G***, they remain in the same general area, as they share access to the same agricultural residues and depend upon ***G***'s vehicle for supplies. The principal income of the household is livestock, and about 130 sheep and goats, and three camels, were observed there. The household is heavily dependent upon the neighbouring farms for the supply of agricultural residues as fodder.

At present, household mobility is restricted to local movements along the lakeshore and herds have not been shepherded upstream for about three years.

K	**Female**	

K is a single woman of the Fashekab. She lives alone with her teenage son. She moved to the area of Sayalla from Wadi Quleib three years ago to take advantage of the residues on agricultural farms there.

They have a small herd of about 30 sheep, which is their sole source of income, although her son also contributes labour to ***G*** and ***I***'s households. They receive logistical and other support from the household of ***G***.

L	**Male**	
M	Female	Wife of ***L***

L is a member of the Ababda Sadenab clan, settled in the village of M'qata in the Nile Valley. His father first built their house and brought ***L*** to the village when he was a child.

In many cultural respects the household seems very much like its Egyptian neighbours; the women go unveiled in the company of men and never visit the desert areas outside the village. Unlike the desert Ababda, the women in the village do the milking of sheep. While the household has no camels, it does own a cow.

L describes himself as a "sheep capitalist". He buys sheep as a joint venture with other people's capital, then grazes and resells them, dividing profits fifty-fifty with his investors. While the household makes heavy use of village agricultural resources for fodder, ***L*** and his sons also seasonally drive the sheep down to the west bank of Lake Nasser for lakeshore grazing. The women never accompany them on these trips. Until the recent drought, ***L*** also sometimes took his herds back up to his kinsmen in Wadi Allaqi.

The household owns a small area of land and date palms in the village. The women of the household tend the cow and a few sheep for household use, while the men are responsible for the larger herds. All the household members assist in the seasonal date harvest (both their own and neighbours') which rewards them with a portion of the harvest and grazing rights around the village.

N	**Male**	
O	Female	Neighbour of ***N***

N was one of a group of Ababda and Bishari interviewed at Wadi Abu Sbeira in the Nile Valley. ***N*** is a Fashekab Ababda, as was one neighbour, while a second was a Hamdorab Bishari. This second neighbour was ***O***'s uncle. Because this uncle was frequently absent, he was only interviewed once, but his Ababda neighbours were always on hand.

N and his neighbour were both born in Abu Sbeira and grew up there. Both are employed as guards by a local company and thus know little about the wider environment. However, after marriage ***N*** decided to get involved in livestock and bought himself a herd. He now travels annually to the Western Desert with these as a sort of working holiday.

The Bishari and his niece ***O*** came to Abu Sbeira about ten years ago from upstream Wadi Allaqi. They still live in tents among the Ababda houses of the village. The Bishari's business brought him to Abu Sbeira; he works as a professional camel drover, meeting *dababik* (camel herds) at the Sudanese border and bringing them up the west shore of Lake Nasser to Abu Simbel where they are loaded onto trucks. He invests his salary in camels which he buys and sells himself at Daraw market.

None of the settled Bedouin at Abu Sbeira own land and while ***O***'s uncle has some sheep of his own they are looked after by relatives in the desert. The Ababda and Bishari women at Abu Sbeira are allowed to visit the agricultural areas around the village and take small herds of sheep and goats for foraging. Except for ***O***'s uncle, none of the respondents are regular visitors back to Wadi Allaqi.

P	**Male**	

P is a Hamdorab Bishari who lives in the Bishari district in Aswan. He was born there. Like his father before him, he works as a trader and agent for his Bishari kinsmen in the desert (upstream Allaqi and Elba). ***P*** receives and markets supplies of charcoal, livestock and other desert commodities from the interior. He supplies his kinsmen with information and provides representation and services for them in the Nile Valley. Among these services, ***P*** organises for livestock to be grazed on agricultural residues immediately before sale to put extra weight on. He also cares for sick relatives when they come to Aswan for medical treatment.

He maintains a network of contacts and associates throughout the Nile Valley, the Eastern Desert and even in Cairo. Because of his business, ***P*** often travels to Wadi Allaqi and the Eastern Desert.

P has livestock of his own, but these are kept in the desert with his Bishari kinsmen. ***P***'s eldest son does not want to follow the family trade. He cannot speak the Tu Bejawie language, and instead works on a cruise ship on the Nile.

Q	**Male**	
R	Female	mother of ***Q***

Q and his family are Ashaebat Bedouin of the Awlad Ali tribe. They live in the village of Baha el Din, the western-most settlement of the Siwa oasis. ***Q*** was born in Siwa, but his mother was brought to Siwa for marriage from a Libyan desert tribe.

The Ashaebat haved lived at Baha el Din for more than a hundred years, but only the generation of ***Q***'s father built houses alongside the native Siwans and settled there. ***Q*** helped his father to establish olive and date producing gardens. ***Q*** himself works during the summer months as a professional shepherd, hiring his services to Awlad Ali Bedouin from the north coast, and managing sheep in the desert west of Siwa. While ***Q*** is absent, his sons tend the gardens and his wife, mother and daughters manage the household livestock around the village.

While the Bedouin of Baha el Din have adopted some aspects of Siwan culture (such as language), the women have much greater freedom of movement than Siwan women.

S	**Male**	

S is a Berber Siwan living in the main settlement of Shali. He lives with his mother and sisters, and, as the only adult male in household, he is responsible for tending the family's gardens.

S also has older brothers who have left Siwa to work in Cairo and Alexandria and remit money to their family. The household's local income derives from the sale of olives and dates, but some other vegetables and crops are also grown for domestic consumption. ***S***'s mother and sisters manage about 15 sheep in a pen beneath their mud-brick house. While the family is not wealthy, neither are they poor by Siwan standards.

T	**Male**	
U	Female	Wife of ***T***

T is Sheikh of the Al Qara clan, one of the eleven Berber tribes of Siwa. Al Qara is a small oasis about 130 kilometres east of Siwa, at which live the 65 families of Al Qara. Until very recently, the population at Al Qara was severely restricted by the availability of water for drinking and irrigation, but this changed when a deep well was sunk.

T, like all Al Qara people, manages a garden cultivating olives and dates for market, and vegetables for domestic consumption, while ***U*** and his daughters are largely confined by Siwan tradition to the house where they care for a small number of goats. The women rarely visit the gardens.

The households of Qara differ from those elsewhere around Siwa because they are remotely located, and thus have closer ties to the passing Bedouin than to the other Siwan tribes.

V	**Male**	
W	Female	Wife of ***V***

V is the senior member of a group of Asheibat Awlad Ali Bedouin who settled at Ain Safi in the eastern part of Siwa in the mid 1980s.

The household has in the past ten years just begun cultivating, although land ownership is not yet widespread among the Bedouin at Ain Safi. At present, the household is still largely dependent upon other income sources. They manage their own livestock (sheep and camels), and the young men of the household provide shepherding services for Awlad Ali Bedouin from the north coast, taking their herds far into the desert during the summer months.

Unlike the Bedouin settled at Baha el Din, those at Ain Safi have not yet had the opportunity to integrate with their Siwan neighbours, and so have not taken on any of their cultural attributes or learned their language. Although related to the Asheibat Bedouin at Baha el Din, the household of ***V*** also maintains strong links to the tribes of the north coast.

W and the women at Ain Safi spend much of the day herding livestock locally around the settlement.

X	**Female**	

X is the wife of a senior member of the Asheibat Bedouin clan at Baha el Din in eastern Siwa. The household has always been based at Baha el Din, although during previous generations it was more seasonally mobile than at present. ***X*** remembers visiting several desert oases when she was younger.

The head of household has invested heavily in extending their cultivated gardens, and the livestock dependency of the household has diminished. In addition to date and olive cultivation, three adult sons of the household are employed and bring in a salary. A small number of domestic livestock is maintained by ***X*** and her daughters.

Unlike the neighbouring Siwan women, Bedouin women like ***X*** are free to wander the village, visit the gardens and even ride a donkey.

4 Critical evaluation of field methods

Drawing on the methodological position set out in Section 1 above, data collection was undertaken through the careful use of qualitative rather than quantitative field methods. In downstream Wadi Allaqi (including the area of Sayalla), six households were selected, differentiated by clan and by socio-economic status. A further three focus groups were selected from among Bedouin communities who have settled in and around Aswan. Five households were selected in Siwa. These selections were made to reflect various stages of sedentarisation and a range of different relationships to the natural resource base. In this way it was hoped to elicit information about the evolution of environmental knowledges and changing attitudes to natural resource management when households undergo the process of settlement and deeper engagement with the formal economy.

The research team divided into two for the visits, with the female researchers having discussions with women informants and the male researchers with Bedouin men. This division was necessary for cultural reasons. Non-family males are not permitted to enter the women's area in Bedouin settlements, nor are Bedouin women generally permitted to talk with non-family males. Even though women visitors can enter the male spaces in the settlements, conversations can be relatively inhibited compared to a wholly male occupation of that space. As far as possible, the two parts of the research team talked with men and women from the same family group, although this was not always possible. Over the period from September 2001 to July 2002, regular visits were made to each of these groups, with discussions focusing around the agreed checklist of key topics (Annex 1 of full report). The results of these discussions and other observations made were entered on the pro-forma data form (Annex 2 of full report), and were subsequently entered into the electronic database NVivo.

During each visit, discussions not only visited the issues on the checklist, but informants were encouraged to raise other points and questions. The emphasis was very much on trying to generate a conversational atmosphere. Ideally, all conversations would have

been taped. This, however, was not possible as the informants were only too aware of what tape-recorders were and how they could be used. Indeed, some related to us experiences several years previously of the use of tape-recorders by officials which resulted in some people's views being thrown back at them at a later date by the authorities. The tape-recording of conversations was not, therefore, an option. Writing notes during discussion similarly made the Bedouin feel uncomfortable. As an alternative, each conversation generally had a minimum of two, and a maximum of three, researchers present. Whilst one participated actively in the discussion at any one time, the other listened carefully to memorise as much of the conversation as possible. The researchers mixed up talking with listening as much as possible to make the conversation seem more natural and flowing. After the visit had ended, and the researchers had departed the settlement, information was immediately cascaded into notebooks and onto the field data forms (Annex 2 of full report). Whilst recognising the problems associated with this approach, it was necessary under the particular socio-cultural and political realities of the area. As a method drawing on the immediate memories of two or three researchers, it worked successfully and efficiently, and allowed researchers to challenge each other if it was thought that one of them had misinterpreted something said. The immediacy of this checking process, however, provides an efficiency that listening to tapes at some time afterwards cannot replicate, when the experience has become distanced in time from the body language, gestures and other non-oral elements of a conversation. These are still fresh in the mind and were used, where appropriate, to provide added depth and understanding to the results of the conversations. The unfortunate consequence of this is that the Bedouin voices cannot be heard directly in the written account of this study but must be mediated through the researchers' memories and words.

Observations were also made by the fieldworkers on each visit, enumerating adults and children in the settlement, as well as livestock. Discussions took place about recent visitors or events since the last visit made by the research team, and note taken of the condition of the animals, in particular indications of poor health such as diarrhoea. As relationships grew between the informants and the researchers, so the conversations became more relaxed and trusting. Cross-checking, or triangulation, suggests that the results of discussions have become increasingly secure. There are clear advantages in this sort of longitudinal work in the sense of obtaining information which is deeper and more nuanced, but at the expense of time and resource.

There were, however, some difficulties associated with the methods used, some conceptual, some practical. Of particular concern was the balance needed between researchers being too leading in discussions, and not being leading enough, resulting in too diffuse a set of information. Although direction was necessary, it was important that the voices of the informants were heard, that, as far as possible, they should lead and drive the conversations. This can be very time-consuming, but rewarding and wholly necessary in the context of this research. There is also the danger with this, however, that researchers may over-empathise with the informants, and may therefore not always distil the important message or information. Certainly as relationships grow during this type of longitudinal research, this can become an issue. On the other hand, the research benefits

from this type of experiential situation are almost incalculable, and produce a depth of understanding and nuance that questionnaire surveys and one-off visits can never hope to emulate.

Related to this is the problem raised from working in a large team (four women and four men) and ensuring that the team always maintains its shared understanding of the key issues. This is further exacerbated by the team having to divide into two units to undertake fieldwork, the women researchers working solely with women informants, and the men researchers likewise with male informants.

While separate male and female discussions are in nearly all cases a cultural necessity, this can lead to a further methodological concern for the comparative value of data thus gathered. Can all differences in the information gathered be attributed to the existence specific gender knowledges, or is it possible that discrepancies may result from differences in the way conversations are conducted? For example, men in conversation were rarely engaged in other activities simultaneously, while women were not always able to give their full attention to discussion with researchers when otherwise engaged with children or domestic work. Continuing dialogue between team members was therefore an important activity to reduce and control (or at least be aware of) such problems. In addition, the advantage of the focus group approach was that it facilitated a more 'natural' form of exchange than through a one-to-one interview. However, such discussions can become dominated by assertive individuals. While this may mean that all voices are not heard equally, this does, nevertheless, accurately represent the ways in which certain individuals and groups may dominate social realms more widely.

A final influence on the data collected in discussion with the Bedouin was the presence of a state security officer during some of the meetings with men at Wadi Allaqi. It was deemed necessary that foreigners in the desert be accompanied by security personnel. It may be that his presence inhibited discussion about the use of resources in sensitive areas (especially concerning the border with the Sudan), and more generally may have made the men more reluctant to talk openly. This constraint was not directly present in the context of women's discussions although the fact that the security officer arrived with the research team may have raised suspicion or concern among all of the Bedouin. On the other hand, the Bedouin are aware of the demands on travellers of the security services and so may not have seen this as a particularly unusual event.

5 Data analysis

The information and data collected, and recorded on the field data forms, was transferred into electronic form using QSR NUDIST NVivo, proprietary software produced by Qualitative Solutions and Research. NUDIST (an acronym for Non-numerical Unstructured Data Indexing, Searching and Theorising) is designed to handle qualitative data and to seek out consistent patterns, similarities and contrasts between different data sets. The principal application of the software allows for the easy and rapid sorting and comparison of data by different categories and sub-categories (for example, respondent name, gender, informant location or all of these). This also facilitates searches along pre-

coded themes, or by using keywords (such as particular plant species or geographic locations). Essentially NUDIST provides an effective indexing system for data generated by the study.

Data were entered into the NUDIST software simultaneously as the field research continued. The rapidity and flexibility of the software in organising incoming 'layers' of data meant that themes requiring further attention, or important absences in the data-set, could be identified while fieldwork was still in progress. In this way, the 'real-time' management of data served to tailor ongoing research activity to optimum effect.

6 Key Topics/Issues/Conversations

1. What is a resource?
What makes something a resource?
How is a resource valued?
How does its value vary between seasons? Over years?
What other information would be helpful in valuing resources?

2. How are resources prioritised?
Water? Vegetation? Soils?
Importance of each in relation to each other?
Seasonal variations in this importance?
How are plant species for grazing prioritised?
How do these priorities vary over geographic space?

3. Which are the preferred plant species for camels, sheep, goats? And why?
List for camels?
List for sheep?
List for goats?

4. Other uses of vegetation?
Charcoal - preferred species? Why? Best areas? Why? Markets?
Medicinal uses - preferred species? For what purposes? Markets?

5. How did you learn about resources?
Importance of being told by father/mother, other relatives?
How? In what ways?
Importance of personal experience? Learn by mistakes?
How much experimentation takes place?
How is knowledge accumulated?
How is knowledge gained from outsiders?
How is new knowledge evaluated?

6. How is information about resources passed on?
In conversation?

By copying actions?
By specifically teaching children?
What variations are there in terms of what children will be told at what age(s)?
PRA drawings with different age-groups of children related to resource use and management.

7. How are resources managed?
How are knowledges used in the management of resources?
Who takes decisions about resource use?
How does this vary between resources?
How does decision-making on resource use vary over time?
How does knowledge about a particular plant (for example) affect the way it is managed?
What is known about how other bedouin manage resources in the Eastern Desert?
How important is it to know how others manage resources in managing their own resource use?
In what ways are tribe/clan leaders important in the management of resources?

8. How are conflicts over resource use managed?
What are the main reasons for conflicts over resources occurring?
How frequent are conflicts over resources?
What are they usually about?
How are any conflicts resolved?
Who are the 'important' people in resolving conflicts?

9. In the Eastern Desert, which are the best areas for grazing? Why?
Where?
Why?
How often do you go there?

10. In the Eastern Desert, where are the most reliable sources of water? Why?
Where?
Why?
How often do you go there?

Basic information about respondents:
- location of the conversation
- tribe, clan
- approximate number of people in settlement
- approximate number of livestock around the settlement
- frequency of visits to towns (eg Aswan, Shalateen)
- how long at the present location
- how frequently do they move in a typical year

7 Field Data Record Form

Wadi Allaqi : Indigenous Knowledges and Gender

Data/discussion record sheet

Date of visit	
(To be completed in pens of different colour)	

Section one: Basic response group data

1. Household (name of head)	
Key female respondant	
2. Tribe/clan	

3. Location	
4. Est. human population	
5. Est. livestock population	
Qualitative observations on condition of animals and people?	

6.Period at present location?	
7. Frequency of town/market visits	

Normal annual mobility
Who moves and why?

Section two: Defining resources

What is a resource? How is it valued?
How does the use/value of resources vary over time?

Section three: Prioritising resources

What are the relative importance of different resources?
(e.g. water, vegetation, soil)
Does this change seasonally, across geographic space or with economic circumstance?

Section four: Favoured grazing species

Camels	

Sheep	

Goats	

Section five: Other vegetation uses

Preferred species for charcoal? Why? *Best areas to get these and where is the product marketed?*

Preferred species for medicinal use?
For which purposes?
Are they marketed, if so how?

Section six: Transmission of knowledges

How was environmental knowledge first acquired?
From mother? father? Or whom?
How was it taught/transmitted?

How much knowledge is acquired through personal experience?
Does experimentation take place?

How is environmental knowledge accumulated?
Can it be gained from others?
How is new knowledge evaluated?

How is environmental knowledge passed on?
Are children or others taught?
How are they taught and at what age?

Section seven: Management of resources

Are knowledges used to manage resources?
Who takes decisions about resource use?
Does this vary between resources?
Does this process vary over time/season?

What is known about resource management by other Bedouin groups?
How important is it to have information about other resource users?
Are/how are tribal or clan headmen important in management of resources?

Does conflict over resources occur?
Why and how does it occur?
How is conflict resolved and what mechanism is employed?

Section eight: Resource information

	Location	*When visited*	*How often*
Best areas for grazing			

Reasons for above /further information

	Location	*When visited*	*How often*
Most reliable water sources			

Reasons for above/further information

8 Supplementary Data Form

Date of visit		Qualitative observations on condition of people and animals
Approximate age of respondent		
Sex of respondent		
Tribe / Clan		
Estimated human population		
Estimated livestock population		
Location		
Time at present location		

What are the best grazing species for:		
	Wet season	Dry season
Camels		
Sheep		

Do people around here produce charcoal?
How do they make it?
Who has responsibility for the trees?

Do people around here move each year?
Who moves?
What time of year?
Where do they move?

Why do they move?
How often do you visit a town?
Why do you go?

How do people around here learn about the environment / nature?

Do other tribes / clans do things the same way as you do?

Does conflict over resources occur?
Why and how does it occur?
How are conflicts resolved?

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