



# Steps Towards Averting Desertification in the Sefiane Rural Community, Algeria: The Role of Environmental Education

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## *Abstract*

*Desertification reflects and contributes towards societal problems such as poverty, underdevelopment and lack of food security. For mere survival purposes, many people feel they have no option but to engage in environmentally unsustainable activities that further contribute to desertification and perpetuate the cycle. Constraints in successfully dealing with desertification have been identified as being a lack of adequate and validated information on the different aspects of the phenomenon in individual areas, a lack of sustainable development plans for desertified areas, a lack of active awareness-raising campaigns, a lack of appropriate training on assessment and mitigation of desertification and the neglect of local stakeholder involvement in addressing land degradation and desertification. This paper provides a contextual profile of desertification and land degradation processes in the Sefiane rural community in Algeria, focusing on how the community's survival is affected by their current farming activities. A qualitative study using a snowball sampling technique to identify respondents was conducted. Data collection tools included observation, interviews and questionnaires. The research findings, which highlighted activities that farmers engage in that compromise their ability to sustain their environment and their livelihood, were considered and used as a guideline to develop a framework for a contextually relevant environmental education programme that could empower the local community to address the land degradation and sustainable agricultural concerns in their community.*

## *Introduction*

A cloak of loose, soft material, held to the earth's hard surface by gravity, is all that lies between life and lifelessness. (Wallace H. Fuller, 1975)

Algeria, the second-largest country after Sudan on the African continent, is situated in northern Africa, bordering the Mediterranean Sea between Morocco and Tunisia. Algeria is an arid to semi-arid country with irregular rainfall. The total area of the country is 2 381 740 km<sup>2</sup> of which some 80% is desert. Only three per cent of the land is arable, 13% constitutes meadows and pastures and 2% is under forests and woodlands. The terrain comprises a discontinuous coastal plain, a parallel range of the Saharan Atlas mountain system in northern Algeria, a high plateau and the desert.

Along the Mediterranean the winters are mild and wet and the summers are dry and hot. Inland it is drier with cold winters and intensely hot summers. In eastern Algeria, the average

temperatures are somewhat lower, and on the steppes of the high plateau winter temperatures hover close to freezing. A prominent feature of the Algerian climate is the sirocco – a dusty, choking south wind blowing off the desert, sometimes at gale force. The climatic and environmental conditions are influenced by the presence of the great deserts in both the south and the east; by human activity (urbanisation and the creation of industrial infrastructures) and by harsh natural conditions that include drought, flooding, forest fires, strong winds and freezing conditions that may even include snow (Coutsoukis, 2004).

Civil unrest and the resulting regional conflicts as well as the lack of environmental awareness, sensitivity and concern among the population have jointly contributed to the destruction of human settlements, infrastructures and environmental resources (Phillips, 2007). Current environmental issues in Algeria include soil erosion, rangeland destruction and land degradation caused by overgrazing, unsound farming practices, indiscriminate collection of fuel wood, uncontrolled fires, inadequate supplies of potable water and the pollution of rivers and coastal waters by the dumping of raw sewage, petroleum-refining wastes and other industrial effluents. Global warming is contributing to changing climate patterns and plays a role in the desertification of vulnerable areas (UNEP, 2000).

Estimates by Abdelgawad in 1997 already indicated that 82.74% of Algeria's country area was desertified and a further 9.66% was, and continues to be vulnerable to desertification. Abahussain, Abdu, Al-Zubari, El-Deen and Abdul-Raheem (2002:541-542) point out that despite continuous efforts to combat desertification, little has been achieved in terms of halting its spread and reversing the process. Among other constraints identified in their research, they point out that a lack of adequate and validated information on the different aspects of the phenomenon in individual areas, a lack of sustainable development plans for desertified areas, a lack of active awareness campaigns, a lack of appropriate training on assessment and mitigation of desertification and the neglect of local stakeholder involvement in addressing land degradation and desertification hold back the reversal of the desertification process.

### *Underlying Concepts*

To clarify the premise upon which the research reported in this paper rests, it is necessary to provide a cursory explanation of certain principal concepts that underlie the study.

#### **Desertification as a phenomenon**

The term 'desertification' was first coined by French scientist and explorer Louis Lavauden in 1927 but only gained prominence almost two decades later in 1949 when Aubreville, a renowned botanist and ecologist, published the book *Climats, Forêts, et Desertification de l'Afrique Tropicale* (Aubreville, 1949). Aubreville suggested that land destruction – which would lead to desertification – was caused by tree cutting, indiscriminate use of fire and flawed cultivation practices that exposed the soil to water and wind erosion. Aubreville reasoned that desertification was due to human activity and was caused by communities' indiscriminate and destructive habits.

Decades later, at the United Nations (UN) Conference on Desertification held in Nairobi in 1977, desertification was defined as being:

the diminution or destruction of the biological potential of land, that can lead ultimately to desert-like conditions. It is an aspect of the widespread deterioration of ecosystems, and has diminished or destroyed the biological potential, i.e. plant and animal production, for multiple use purposes at a time when increased productivity is needed to support growing populations in the quest of development. (UN Secretariat of the Conference on Desertification, 1977)

Dregne (1983) points out that in different areas and among different peoples 'desertification' may mean degradation of grazing lands, destruction of vegetative cover, wind erosion, degradation of productive land into a wasteland, degradation of vegetation and soil – all of which are manifestations of the process described in the UN document.

Perez and Thompson (1996) summarise the process of land degradation by pointing out that pastoral rangelands deteriorate due to overgrazing. There is a reduction in the proportion of edible perennial plants and an increase in the proportion of inedible species. The reduction and death of vegetation in dry seasons increases the area of exposed ground. This is followed by a deterioration of the surface conditions that are vital to sustain plant growth. Impoverishment of plant-water relations is especially pronounced, and ephemerals now respond poorly to rain. With the consequent increase in runoff, sheet and gully erosion sets in on sloping ground, and the topsoil and its nutrient store are lost. These changes result in an environment that is inhospitable to plant growth and consequently unsuitable for pastures. With continuing erosion, formerly productive lands may be lost. These changes are more drastic where devegetation occurs in strategic areas such as on watershed uplands and marginal lands. The processes leading to degradation and desertification are even more rampant where soils are exposed and disturbed in dry land cultivation. As density decreases, the risks of wind erosion, water erosion and the adverse effect of increased solar radiation on bare soils are dramatically increased. Surface albedo (reflectivity), also enhanced by a reduction in the vegetative cover, is a major contributor to desertification processes (Glantz & Orlovsky, 1983).

Furthermore, when the exposed soil is trodden and compacted by herds of livestock it loses its ability to hold moisture and to support plant growth. Consequently, edible plant species are lost and inedible species overrun the area. A similar situation can arise from unsound agricultural processes, which sap the soil of nutrients, overload it with salts, dry it out and compact or seal its surface. This causes waterlogging that removes air from the soil and allows toxic substances to accumulate (UNEP, 1992).

Unsustainable activities as discussed above are prime causes of desertification, but equally, the inappropriate decision-making of policy-makers, unsustainable utilisation and inept management of arable lands and pastures, the lack of awareness of environmental resource management by land users and managers, and poor knowledge of ecological and hydrological systems in arid regions are other principal factors that contribute towards desertification.

### **Environmental education as a means to address desertification issues**

There have been almost four decades of development since the concept of modern environmental education was introduced at the United Conference on Environment and Development (1972). Over the years fuller clarification of the underlying principles, objectives and purpose of environmental education has evolved. The assumption has been that environmental education is an indispensable means of dealing with environmental issues and risks and finding solutions to environmental problems. It is believed that as an approach it has the potential to strengthen people's capacity to acquire and develop knowledge, values, attitudes, skills, decision-making ability and ethical behaviours that contribute towards and are beneficial for the environment; to address environmental and development risks and issues; and to be more aware of and better understand environmental complexities. At the World Summit on Sustainable Development (2002) the critical linkages of environmental education with sustainable development and social-justice issues, poverty alleviation and the judicious use of natural resources was highlighted, following similar discourses in Agenda 21 ten years prior to the World Summit on Sustainable Development (Rose & Bridgewater, 2003:264).

The competencies listed above, which environmental education has the potential to develop, can collectively be described as environmental literacy. There are several definitions of environmental literacy, but all contain elements that refer to people's knowledge about, awareness of, concern for and ability to understand how the environment – both physical and natural – functions and how humans interact with, are affected by and in turn affect the environment. To be environmentally literate, individuals require a holistic understanding of the environment. However, environmental literacy, which requires the ability to perceive, decode, analyse and use information, differs from one person to another and consequently people's ability to process and analyse information varies. Environmental literacy tends to be manifested in people's behaviour towards the environment: the ways they use, conserve, maintain and coexist with the environment (Hares, *et al.*, 2006:129). The underlying implication consequently is that an indicator to determine the success of environmental education processes would be to establish how environmentally literate an individual is.

Several recent studies indicate that raising the environmental literacy of communities through environmental education has been successful in dealing with desertification and related issues. In certain of these studies, contributory factors were identified that played a part in the success of the intervention. The table below provides a summary of the results of selected environmental education initiatives and also lists those factors which contributed to the success of the project or intervention

**Table 1.** Summary of results of selected environmental education initiatives.

Country and issue	Factors contributing to success	Source
Burkina Faso, Yatenga region – alleviation of land degradation	Incorporating the existing cooperative development associations to provide access to appropriate and context relevant knowledge that is obtained from local farmers	Annorbah-Sarpei, A.J., <i>et al.</i> , 1993
Ghana – forest reclamation and management	Linking communities, networking, using local knowledge and belief systems	Annorbah-Sarpei, A.J., <i>et al.</i> , 1993
Kenya, Kerio Valley – land degradation due to erosion	Ensuring community participation in planning and implementing initiatives; transparency of decision-making, local knowledge a key ingredient of initiatives	Annorbah-Sarpei, A.J., <i>et al.</i> , 1993
Zimbabwe – land degradation due to drought	Acknowledging and respecting local culture; outside knowledge is complimentary to local knowledge	Annorbah-Sarpei, A.J., <i>et al.</i> , 1993
Africa general – African pastoralism	Understanding the dialogue between scientists, policy-makers, educators and the environment; dialoging with cultural geography	Warren, A., 1995
Kalahari, South Africa – rehabilitation of rangeland	Understanding the social, economic and environmental dynamics of the situation; respect for and inclusion of indigenous knowledge in the intervention strategies	Van Rooyen, A.F., 1997
Botswana, Boteti – land management of degraded lands	Eliciting local community participation in planning and administrative procedures to contain desertification	Darkoh, M.B.K., 2000
Namibia, Spitzkoppe – water management to ensure water security in arid regions	Raising interest and confidence of the community to find their own solutions	Bethune, S. and Schachtsneider, K., 2004
Indonesia, Sumatera – forest rehabilitation and management	Building in social activities to give individuals and community the responsibility for managing the project	Hidayat, H., n.d.

In summary of the above and from comments made by other researchers about the usefulness of environmental education interventions to address issues related to land degradation and desertification (Stern, 2000; Winslow, *et al.*, 2004), it becomes clear that environmental education initiatives that aim to enhance environmental literacy in contemporary situations need to consider, in addition to the basic education provided in terms of knowledge of the

environmental issue, skills to deal with the issue and attitudes that are pro-environmental all of which inter alia:

- diagnosing problems thoroughly through dialogue with those in the area;
- finding localised, community-based solutions;
- respecting local culture, perspectives and resources;
- building on traditional beliefs that are pro-environmental;
- strengthening existing environmental efforts;
- improving systems for knowledge exchange;
- following an integrated ecosystems approach to enhance environmental literacy;
- allowing for multifaceted interventions that vary depending on existing and emerging needs;
- developing portfolios of options rather than recipe-like solutions;
- establishing local self-reliance; and
- using science and technology to guide and not dominate the initiatives.

Environmental education initiatives seemingly need to seek to influence processes rather than to define conditions and end results. The approach should be adaptive and reflective rather than focusing only on the achievement of a pre-planned end product (Leach, *et al.*, 1999:242).

### **Education for sustainability**

The central role of education and training for sustainable development is to increase people's ability to understand, adapt to and appropriately transform the environment for the satisfaction of their own and their community's needs, remembering that the underlying principle of sustainable development is to ensure that it should also be possible to meet the needs of future generations.

The concept of sustainable development is rooted in a systems thinking paradigm. Key to sustainability issues is the need to recognise that its achievement is dependent on understanding the interaction between the various dimensions of the environment – the natural, social, cultural, economic, political and ethical. In short, sustainable development as described in the Brundtland Report (UNCED, 1987:43) has four main implications:

1. a concern about the relationship between the use of resources, population growth and technological development and advancement;
2. a concern about the production and distribution of resources of food, energy and industry among the developed, developing and underdeveloped nations of the world;
3. a concern about uneven development such as the gross imbalances between the rich and the poor nations, and about economic dominance and ideological differences; and
4. a concern about environmental degradation and ecological disaster.

Sustainable agriculture which is a strategic concern in this study is defined as agricultural practices that are economically viable, socially acceptable, environmentally friendly and technically appropriate. Failing to capture the full factors, actors, structures and relationships that interact to impact on the prospects of sustainable development in terms of sustainable

agriculture limits the analytical understanding of and intervention process to address the issue as well as achieving positive outcomes (Milton & Ochieng, n.d.).

To adequately address desertification and land degradation issues in a bid to achieve sustainable agriculture, it is necessary to follow an inter- and multidisciplinary approach that recognises the importance of process and not only product. Ideally, local sustainable development initiatives can engender learning processes – the benefits of which go well beyond the projects themselves pointing the way to solutions of other problems.

### *Initiatives to Address Desertification in Algeria*

Over the past decades, desertification as a critical environmental issue has been a topic of serious study. In June 1989, in Agadir, Morocco, the Association for Development and Cooperation was established to find ways to curb desertification since it was becoming a critical environmental concern. Solutions were sought from the environment itself. The cultivation of edible perennial plants that are native to hot deserts was proposed as a means of holding back the invading desert sands (Eden Foundation, 1989:1).

These initial steps to prevent or address the impact of desertification were followed by others. International organisations such as the United Nations (UN), non-governmental organisations (NGOs), environmental experts, academics, farmers and pastoralists met in Murcia (Spain) between 16 and 18 June 2000 at the Mediterranean NGO Network for Ecology and Sustainable Development Conference to discuss national programmes to combat desertification, land use during drought and sustainable development (MED Forum, 2000).

In March 2002, in Djerba, Tunisia, two working groups were established to work on sensitivity mapping on desertification and incidences of drought at the Desertification Information System for the Mediterranean Technical Workshop (DISMED, 2002). A significant highlighting of the gravity of desertification as a critical environmental issue occurred at the conclusion of the Convention against Desertification session held on 15 July 2002 by the UN Secretariat of the Convention to Combat Desertification (UNCCD). Mr N'Diaye, of the UN Secretariat of UNCCD, emphasised that desertification is a global issue, which unfortunately has not been accorded due importance in today's society. He emphasised that 110 countries worldwide are now seriously affected by desertification (UNCCD, 2002). The three concluding points of his discussion were the following:

1. desertification constitutes a serious problem on a global level as well as a local one;
2. desertification is one of the major causes of poverty in many parts of the world; and
3. in order to combat the problems caused by desertification, good governance is required in combination with democratic participation from countries globally.

The Algerian Minister of the Environment, in response to these pronouncements, announced the following:

- the establishment of an Institute of the Deserts of the World with a scientific council made up of prominent scientists under the aegis of the World Desert Foundation,

- the convening of a high-level Sustainable Development Conference in Algiers to promote an integrated land and water resources approach towards combating desertification, and
- the submission of a proposal to the then Secretary-General of the UN, Mr Kofi Annan, that 2004 should be declared the International Year of the Deserts of the World.

At Dubai's Festival of Cultures and Civilizations of World Deserts, held in April 2005, representatives from 40 countries, including President Abdelaziz Bouteflika of Algeria and then-President of South Africa, Thabo Mbeki, adopted a charter calling on the world to unite to fight desertification (Agence France-Presse, 2005). Despite these and other initiatives, desertification continues and threatens the lifestyles and livelihoods of many of the communities who live in vulnerable areas.

### *Research Context and Design*

One of the regions adversely affected by land degradation, rangeland destruction and desertification in Algeria is the Sefiane rural community (population 11 700) in Batna province (population 247 500) (Statoids, 2002). Batna City is the fourth-largest in Algeria, and Batna province is made up of 22 districts and 61 municipalities, of which Sefiane is one. Unemployment in the villages and rural areas is high and the communities live in relative isolation from modern services. The local people are known as *chaoui* in Berber, which means 'free men'. The name has its roots in a history of their ability to avert invasion or subjugation by local and foreign powers.

**Figure 1.** Map of Algeria indicating the location of Batna province in which the Sefiane community is located.



(Source: <http://dic.academic.ru/dic.nsf/enwiki/292912>)

### Research design

As indicated above, Abahassain, *et al.* (2002) identified a number of constraints in addressing land degradation and desertification, one of which was lack of awareness and training about desertification and land degradation and the lack of local involvement in addressing the issue. Taking these identified constraints as a point of departure, the aim of the research was to determine to what extent Sefiane community members were aware of the deterioration of the environment, how the community contributed towards the process of desertification and what the impact of desertification and land degradation is on this rural community. In searching for ways to address the problem, an investigation was also carried out to determine how community members could be assisted to enhance their ability to take action against the process of desertification and land degradation to enable them to make a sustainable livelihood. In order to achieve the outlined research aims, it was necessary to:

- determine existing living and environmental conditions of the Sefiane rural environment;
- establish what pastoralists' and agriculturalists' day-to-day actions and behaviour comprised and how these impact on the environment; and
- use the research findings as a point of departure to establish a framework for an environmental education programme aimed at raising awareness and increasing environmental literacy among the community.

Interaction with and observation of the community at work was undertaken in search of relevant data. The research tools used were observations coupled with a research survey comprising questionnaires and focus group interviews in which local subsistence farmers or agriculturalists and pastoralists from the Sefiane community – people whose livelihoods are inextricably linked to the soil – were the primary respondents. Of the total of 80 farmers in the community, a sample of 48 was selected.

The Sefiane farming community is widely dispersed. Depending on grazing conditions and the availability of water, shepherds are known to graze their herds far from one another and they often move to outlying regions in search of suitable conditions. Only the agriculturalists are more or less confined to a particular region. Consequently, a non-probability snowball sampling technique was used to set up the research population of information-rich respondents. The researcher first identified and met with an agro-pastoralist who is well-known in the region and discussed with him the purpose of the research. This person then suggested another two likely respondents and so it continued. Of the total of 50 pastoralists and 30 agro-pastoralists in the community, a group of 30 pastoralists and 18 agro-pastoralists were purposefully selected on the basis of accessibility and relative permanency of residence.

A holistic approach to the research was required since the first aim of the study was to establish existing levels of environmental knowledge, skills and attitudes among the research population. It was necessary to construct a general view of the region and then focus on the targeted population with descriptions of the people themselves, the nature and circumstances of their living, their interaction with each other, the way they went about securing their existence, their everyday activities and actions and their interaction with the environment.

Field research that consisted of direct, non-intrusive, unstructured observation that allowed monitoring of human interaction with others and the environment was undertaken. Field observations that comprised a series of visits at frequent intervals to the region were undertaken between May 2005 and April 2006. Field notes in the form of key words or thoughts were made on site with more descriptive narratives being added after the observation. Photographs were also taken to support observations. Key concerns considered during the observation process included ensuring that detail was captured, discerning what was important to record and interpreting actions and interactions of those being observed. Observation data gave indications of activities, behaviour and attitudes.

Analysis of the observation data was used to set up the qualitative question schedules used in the questionnaires and interviews. The completion of the questionnaires was guided by the researcher in instances where literacy levels were low. Individual and focus interviews were selected as a data-collection tool because of the assurance this provides in obtaining the required data, and the adaptability of interviews to enquire into arising issues while yet staying within the bounds of the design protocol. A focus group interview was conducted towards the end of the research period with a member of the local authority and agricultural support structure.

The data arising from the observations, interviews and questionnaires was analysed through a process of encoding. The encoded data was then interpreted and subsequently organised and condensed into themes and categories associated with each theme. This process contributed to analysis of the research data and descriptive reporting.

## *Research Findings*

The presentation of the research findings is aligned with the stated research aims.

### **Existing living and environmental conditions**

People in Sefiane lead a harsh lifestyle where mere survival demands great physical effort. Agriculture predominates and the residents depend on small-scale subsistence-oriented cultivation of crops to feed their families. Any excess produce is sold to generate income for other necessities. Nomadic pastoralism is also practised by a significant proportion of rural farmers and many combine agriculture and animal husbandry in order to subsist. Each member of the family plays an active part in the farming. The youth tend to follow in their parents' footsteps since few have had the opportunity to attend school and find other means of employment.

The potential stocking rate in the region would be about 8 ha per sheep. Currently the actual stocking rate is 0.78 ha per sheep. The number of livestock is therefore 10 times greater than the number the pasture should carry. This is only possible because of the high level of concentrated feeding, which supplements natural forage. However, the impact of the livestock on the natural vegetation is enormous. Due to overstocking the best grazing and areas around water points are badly trampled and the soil is compacted, which leads to loss of soil quality, lower water permeability and increased run-off. This considerably increases vulnerability to erosion.

Overgrazing also affects the vegetation. Good grazing plant species are eaten before they have time to set seed or form regrowth for the coming season. Overgrazing results in the root system of the plants dying. The plants disappear entirely and only unpalatable species such as *Atractylis serratuloides* and *Peganum harmala*, both of which are characteristic indicators of pasture degradation, remain (URBT, 1978). The result is a reduction in vegetative diversity. Overgrazing also causes a decrease in the cover of perennials and of the biomass and ultimately this leads to the degradation of soil quality.

### **Impact of respondents' actions on the environment**

Activities among the agriculturalists that have significantly contributed to land degradation and consequent vulnerability of the land to desertification include:

- deforestation and devegetation to clear the land for crop cultivation;
- deforestation to build windbreaks or crop enclosures;
- cultivation of marginal lands and fragile ecosystems;
- overcultivation and reduction of fallow time;
- poor agricultural practices, such as inappropriate use of fertilisers, which contributes to the build-up of salts;
- improper tillage and drainage, which leads to soil compaction;
- unsustainable use of water, which is a limited resource; and
- inability to follow their better judgment due to pressure to produce adequate resources to sustain life.

Practices that lead to land degradation and desertification of which evidence was found among pastoralists include:

- overgrazing;
- failure to reestablish or restore grazing;
- allowing herds to trample emerging shoots without giving them time to develop;
- remaining in an area for so long (because it is close to a watering point) that the area is denuded of vegetation, the soil is compacted and becomes desertified; and
- deforestation to create shelters and enclosures for herds, leaving the land bare and exposed to wind and water erosion.

Several of the respondents acknowledged that their actions contribute to land degradation and that they are thus contributing to desertification, yet they feel there is no alternative: they have to produce food for their families and for their livestock to survive. Although it is obvious to all that natural resources are under stress, survival remains the foremost issue – not necessarily the standard of survival, neither the sustainable utilization of the environment.

### **Programme framework for increasing environmental literacy to address land degradation and desertification issues**

The purpose of developing and implementing a programme to address desertification and to introduce sustainable living initiatives in the Sefiane community is to improve the level

of comprehension and appreciation of the problem, to reduce poverty and to enable the community to establish sustainable agricultural and pastoral patterns based on sound ecological principles. To alleviate their plight, the farmers need to adopt farming practices that nurture the land and that do not degrade the environment, rendering it incapable of supporting their families or their herds.

### *Suggested Programme Approach to Address Further Desertification and Improve Livelihoods*

#### **General programme design**

Based on the data analysis above, a programme approach is proposed here. Initiatives that enable the local community to better utilise and protect their environment are crucial to addressing the problem of desertification. The level of environmental literacy needs to be improved through education to empower the community to take charge of their resources in an ecologically sound manner. A participatory approach could be followed since this is likely to foster individuals' commitment and encourage involvement in and the development of local democratic forms of organisation.

Based on this premise, the proposed programme could give participants the opportunity to engage in an informal environmental educational programme where they can experiment, take on responsibilities, interact, develop their knowledge and skills, and learn to work together and to practice democratic negotiation and decision-making while dealing with environmental and sustainable development issues.

Integrating environmental education into the different aspects of farmers' and pastoralists' lives could encourage them to take a more active interest in the environment they live in. Based on the contextual analysis reported above, the issues experienced by the farmers suggested intrinsic conditions needed to inform the design, development, presentation and implementation of the programme are that it should:

- draw on the community's unique local knowledge relating to farming and existing sustainability issues;
- strengthen the existing knowledge base, information and monitoring systems;
- be participatory and interactive;
- promote shared responsibility for and contribution to the programme;
- empower individuals and the community at large; and
- support participants to become self-sufficient in combating desertification and following sustainable development principles.

To achieve this, presentations may be needed that are descriptive, informative, explanatory, practical and interactive. Although a firm theoretical basis is essential for all learning, learning should be through lively and stimulating practical explanatory presentations. Displays, practical demonstration and participatory activities should be given preference since this could assist farmers to try out new more sustainable practices. Learning interactions could include seminars, sensitising meetings, information sessions, use of posters, leaflets, local conferences, social

gatherings and informal yet structured exchange of opinions, with mini lessons presented orally and supported by illustrated leaflets using accessible language, since the literacy level of the participants is low. Field trips to different farming enterprises where various farming approaches, methods and techniques are used could be organised to allow for farmer-to-farmer knowledge exchange.

### **Key content issues**

Any intervention to find a solution to the land degradation practices among the Sefiane farming community (as outlined above) would need to be tailored specifically to the identified knowledge and skills limitations, and thus be both contextually situated, and make use of other sources of information that may not be available in the existing community context. Three key areas of content that could be introduced into the programme through locating the content in context, include the following:

*Land degradation, desertification and sustainable agricultural practices:* As indicated above, soil degradation is a major contributing factor of desertification. It is generally acknowledged that the planting of trees and other plants that retain water and maintain soil quality has an important role to play in addressing this matter. To curb desertification and withstand the creeping sand, the Sefiane community needs to have the skills to ensure appropriate management of existing natural vegetation in areas not yet affected by desertification. This will secure the conservation of biodiversity, protect water sources and promote the sustainability of agricultural development and pastoralism. The rehabilitation of desertified dry lands for productive use for agropastoral/agroforestry purposes necessitates soil and water conservation, soil rehabilitation and the increase of vegetative cover through afforestation and reforestation. It is essential to reduce wood-fuel consumption and explore alternative sources of energy. The development of and dissemination of knowledge about sustainable agricultural methods is essential to reduce the causes of desertification. It is important to reduce pressure on marginal lands, reduce overgrazing of rangelands, control the use of chemicals, rehabilitate degraded lands and reforest deforested areas.

Specific aspects that need to be covered in the proposed programme include:

- an analysis of actual practices in the community that is dependent on and makes use of environmental resources;
- clarification of ecological, environmental and sustainable development concepts;
- relation between the above issues and farming practices;
- factors that contribute to environmental degradation and desertification and the effect of desertification on the life of the community;
- means of dealing with and combating environmental degradation and desertification and reducing stress on the environment, which could include knowledge and skills related to revegetating denuded areas, planting living windbreaks that have more permanency, establishing perennial and drought-resistant plants between the windbreaks (later to be replaced with locally adapted large and needle-leaved trees), establishing

- green-belt plantations, ensuring the protection of existing forest reserves, establishing communal woodlots and introducing soil conservation measures;
- ways to facilitate sustainable development within the community, such as learning about food cycles through the practical process of planting, growing, harvesting, composting and recycling, establishing soil balance through crop rotation, use of natural insecticides and pesticides, and using manure and compost to replenish soil nutrients and as an alternative energy source;
  - farming methods that best suit the prevailing circumstances and that take cognisance of the vulnerability of the environment; identification of suitable crops for cultivation; multi-cropping and employing sustainable cultivation and irrigation methods;
  - identification of areas best suited to agriculture/pastoralism and the appropriate use and management of these areas;
  - developing and implementing alternative strategies for water conservation such as harvesting rainwater instead of relying solely on established water sources, using drip irrigation and other water-conservative measures such as burying clay pots underground to provide plants with water instead of using the traditional method of flood irrigating, which is prone to large-scale evaporation, and using planting pits and cross-furrowing; and
  - developing and implementing strategies to manage and monitor initiatives that address desertification and sustainable development.

*Sustainability issues and sustainable livelihoods:* What is sustained in a sustainable community is not economic growth or development, but the entire web of life on which long-term survival depends. A sustainable community is designed in such a way that its ways of life, business, economy, physical structures and technologies do not interfere with nature's inherent ability to sustain life (Capra, 2001:21). One of the key challenges of sustainable development – and a reason why it is so difficult to achieve – is that so many interrelated, complex factors need to be taken into account. The types of interactions required in the Sefiane community can be classified as:

- ecological integrity, ensuring that livelihood activities do not irreversibly degrade natural resources within an ecosystem; and
- social equity, which suggests that livelihood opportunities are more equally distributed.

The initiatives to improve livelihood systems in the Sefiane and similar communities should aim to enable the rural population to sustain their lifestyle and make it ecologically and financially viable. Due to the intrinsic constraints of impoverished communities such as the Sefiane to establish initiatives and infrastructure to combat desertification, government and NGOs should be tasked with developing commercial, agricultural or economic systems that enhance the means of survival and relieve pressure on the environment. Projects should aim to build local capacity through planning and implementing rural development at the grass-roots level by targeting the most underprivileged. Initiatives should aim to contribute to increasing, diversifying and guaranteeing stable incomes through the provision of sustainable access to financial services for target-group members. To support the sustainability of any projects

introduced into communities like the Sefiane, community members could take (and be assisted to take) the following specific actions:

- seek recognition, approval and assistance from their community leaders in order to gain protection and support for their actions and initiatives;
- devise strategies to amicably resolve any problems among group members;
- devise plans of action that will engage all participants in group projects that benefit all the members equally;
- put in place disaster and emergency plans (in cases of acute desertification and drought);
- identify individuals and organisations that might offer free assistance;
- open up lateral communication routes to all community members – young and old – ensuring that these opportunities are available to women to contribute to the economic development of the community; and
- emphasise respect, equality and social justice among the members of the community.

Farmers need to form working teams and foster relationships with one another. The experienced could help others profit from their experience, exchange ideas, share costs in project work, raise questions and solve them together. The government could encourage farmers and agro-pastoralists by subsidising budgets, investing in common projects, and supporting profit sharing through partnerships.

*Programme management:* In current community development initiatives, the necessity to adopt a consultative managerial approach to ensure local community members' involvement and commitment to the initiative is no longer contested. Local people's opinions need to be heard and their voices considered in the design and implementation of any strategies devised to address issues within their communities. A decentralisation policy mandates individual communities to deal with their unique environmental problems themselves. Up to now, interventions at local level by government or local authorities' initiatives were insufficient to achieve any meaningful success. Previous research indicates that if local communities are empowered through environmental education processes to take local collective action, the initiative is more likely to be sustainable. These collective actions in impoverished communities need to be adequately supported by government and NGO infrastructures through technical and financial support.

### *Closing Comments*

Desertification reflects and contributes towards social problems, such as poverty, underdevelopment and lack of food security which implies that fighting desertification is integral to eradicating poverty and ensuring sustainable living (Annan, 2003). However, for mere survival purposes, many people feel they have no option but to engage in environmentally unsustainable activities which further contribute to desertification and perpetuate the cycle. It is imperative that this cycle be interrupted. An established means is through appropriate and effective educational interventions.

A sustainable system is a dynamic entity that integrates both the opportunities and the assets available to a group of people to ensure their survival. However, this system is influenced by interactions with and exposure to a range of ecological, social, economic and political permutations that may support or hinder the group's capacity to make a living. The recommendations which emanated from this study are an attempt to set up and maintain such a system, which would be part of the solution to the problem of desertification which faces the Sefiane rural community in Algeria and several others in vulnerable semi-arid regions globally.

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