

Subsistence Living and Eco-Positive Behaviour: Two Diametrically Opposed Concepts? A Case Study of Farmers' Perspectives in Sefiane, Algeria

مورد الرزق والسلوك الإيكولوجي الإيجابي: مفهومان متضادان؟
دراسة حالة عن مزارعي منطقة سفيان، الجزائر

Cheryl le Roux¹ and Tayeb Bouazid²

شيريل لي رو والطيب بوازيد

¹Department of Further Teacher Education, University of South Africa

AJH van der Walt Building 6-19, UNISA 0003, South Africa

E-mail: irouxcs@unisa.ac.za

²University Abderahmane Mira-Bejaia, Ain-Abessa, 19110 Setif, PO Box 36, Algeria

Abstract: This study focuses on the relationship between land degradation and human activities in a semi-desert region, the area of Sefiane in Algeria, whose inhabitants are typically rural farmers and agro-pastoralists depending almost exclusively on their natural environment for subsistence. The study aimed at determining Sefiane community's perceptions of the impact of desertification and land degradation on their community and to identify how this affects their way of life and means of survival. The study has shown that the population have a strong desire to be assisted in the development of guidelines for environmental education initiatives that would enable them as a community to deal with desertification and land degradation in an attempt to relieve poverty and develop a more sustainable lifestyle. The proposed environmental education program should not be limited to the development of biophysical resources, but must include also the support of societal and personal resources and capacities that are inherent to the community.

Keywords: Desertification, land degradation, rural farmers, sustainable development, environmental education.

المستخلص: تركز هذه الدراسة على العلاقة بين تدهور الأراضي والأنشطة الإنسانية في منطقة شبه صحراوية، وهي منطقة «سفيان» بالجزائر، والتي يعتمد سكانها على الفلاحة والرعي لتوفير قوتهم اليومي. هدفت الدراسة إلى تحديد وجهات نظر وآراء مجتمع سفيان حول تأثير التصحر وتدهور الأراضي على مجتمعهم وتعريف كيفية تأثير ذلك على طريقة حياتهم وأساليب البقاء. دلت نتائج الدراسة على أن سكان هذه المنطقة لديهم دافع قوي وبحاجة للمساعدة في مبادرات لتطوير برامج تعليمية بيئية بإمكانها مساعدتهم للتعامل مع التصحر وتدهور الأراضي لتخفيف الفقر والتوجه نحو أسلوب حياة أكثر استدامة مستقبلاً. ويجب أن لا يقتصر محتوى البرنامج التعليمي البيئي على تطوير الموارد الحيوية والفيزيائية فقط، بل يجب أن يشمل إعطاء أهمية كبرى لتطوير قدرات الفرد والمجتمع التي تمتلكها المنطقة.

كلمات مدخلية: التصحر، تدهور الأراضي، مزارعي الأرياف، التنمية المستدامة، التربية البيئية.

INTRODUCTION

In developed countries, the extent to which soil is protected is influenced by farmers' response to socioeconomic factors (Boardman, *et al.* 2003). However, among the poor, the soil is their subsistence mainstay through which the requirements of food and fuel are met. Invariably, these people are obliged through circumstances beyond their control to exploit the soil and its vegetation merely to survive. Under such circumstances, exploitation to the point of degradation is inevitable, unless some form of intervention or support is introduced to set up alternatives to halt the vicious circle.

Desertification and drought are problems of a global dimension that affect more than 900 million people in 100 countries – some of them among the least developed in the world (World Bank, 1997). Algeria is among the countries most affected by these threats. As a result of desertification, large tracts of land in Algeria formerly used to cultivate crops and graze herds have become barren and devoid of vegetation and many people living in the affected areas are struggling to survive. Estimates by Abdelgawad (1997) already indicated that about 83% of Algeria's land area was desertified, and an additional area of about 10% was, and continues to be vulnerable to desertification.

Over the past two decades, initiatives have been launched in Algeria (Eden Foundation, 1989; MED Forum, 2000; UNCCD, 2002; Sefiane Local Socio-Development Corporation Programme, 2005; Meshgan, 2005) to study and address desertification as a critical environmental issue. Abahussain, *et al.* (2002) pointed out that despite the various efforts to combat desertification, little has been achieved, and consequently, the livelihood and survival of many people remain at risk. Among the constraints identified in this research, it is pointed out that lack of adequate and validated information on the different aspects of the phenomenon in individual areas, lack of sustainable development plans for desertified areas, lack of active awareness raising campaigns, 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.

In Algeria, one of the regions that is adversely affected by land degradation, rangeland destruction and desertification is the Sefiane rural community (population 11,700) in Batna province (population 247 500) (Statoids, 2002), situated south-east of Msila (Figure 1). The region falls within the Algerian Steppe, which encompasses more than 20 million hectares. 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 and predominantly follow a subsistence lifestyle.



Fig. 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>.

The aim of this research was to determine Sefiane community's agro-pastoralists' perceptions of the impact of desertification and land degradation on their community and to identify how this affects their way of life and means of survival. The research consequently investigated the causes and effects of desertification and determined the dangers this phenomenon has for the agricultural, social and economic life of the Sefiane community. The results of this step were then used to decide on strategies that could

be suggested to address the problems which ultimately hinder this community to conduct a sustainable livelihood.

To enable the researchers to achieve the aims of the study, the following more specific objectives were identified to direct the study: 1) To determine how the environment and natural resources are used by farmers in the Sefiane community; 2) To establish how the community perceives the issue of environmental degradation and desertification; 3) To expose practices that contribute to land degradation and desertification in the Sefiane rural areas and determine the impact of these practices on the environment; 4) To identify environmental educational needs of the Sefiane community in relation to combating environmental degradation and desertification; and 5) To design a framework for a non-formal, voluntary participation environmental education programme that will enhance rural farmers' environmental awareness and enable them to take action to combat land degradation and desertification which will in turn support them in making a sustainable living.

The prime contribution of the study lies in the support it proposes for rural subsistence farmers and agro-pastoralists to help them understand the significance of ecological and environmental cycles and to take steps to preserve their natural environment through appropriate, contextually relevant strategies. The proposed support takes the form of an environmental programme developed to meet identified community needs and raise environmental awareness, increase knowledge and develop skills to decide on and implement appropriate action to address the issue of land degradation in their community.

MATERIALS AND METHODS

The underlying assumption of the study (based on the premise of the International Union for the Conservation of Nature and Natural Resources (IUCN)) was that environmental education is a tested strategy that can be used with success to address environmental problems. Environmental education initiatives of the past decades have been based on the IUCN definition of environmental education (EE) as being (IUCN, 1971):

"... the process of recognizing values and clarifying concepts in order to develop skills and attitudes necessary to understand and appreciate the interrelatedness among people, their culture and their biophysical surroundings. Environmental education also entails practice in decision making and self formulation of a code of behaviour about issues concerning environmental quality."

The core principles of this definition are that it regards as essential the: 1) interrelatedness of people with their biophysical surroundings; 2) the fact that people hold values and attitudes that relate to the environment and how they behave towards and within the environment; and 3) the fact that actions which include decision making are part of human interaction with the environment.

To acquire the required data to answer the above research questions, a qualitative research study of the community in question was designed. The qualitative research approach was predominately interpretative and descriptive of the experiences and perceptions of Sefiane agro-pastoralists and pastoralists. Since the Sefiane farming community is widely dispersed a non-probability snowball sampling technique (Galloway, 1997) 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 was selected on the basis of accessibility and relative permanency of residence to represent the research population. Basic characteristics of the respondents are tabulated in Table (1).

Interaction with and observation of the research 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 from the Sefiane community – people whose livelihoods are inextricably linked to the soil – were the primary respondents.

Table 1. Basic characteristics of the research population.

	Farmers	Agro-pastoralists
Age	Between 25 and 49	Between 22 to 55
Income	Inconsistent, based on their sale of local products which are mainly dairy products and farming-subsidies	Inconsistent, dependent on animals they breed, sale of produce in the towns, and farming subsidies
Social status	Subsistence, independent farmers, working in cooperatives	Herders, livestock breeders
Gender	Male and female	Male and female

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 of almost a year in duration that comprised of a series of visits at frequent intervals to the region were undertaken. 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 the activities and interactions of those being observed.

Analysis of the observation data was used to set up the qualitative question schedules used in the questionnaires and interviews. The completion of the open-ended, qualitatively designed questionnaires was guided by the researcher in instances where literacy levels were low. Individual 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 interview was conducted towards the end of the research period with a representative from the local authority.

RESULTS

The findings from the field research are summarised in Table (2) according to farmers' perceptions of the changed state of

the environment over the past decade; farmers use of and impact on the natural environment and farming practices that contribute to land degradation and desertification in Sefiane community. The Table indicates how the environment and its natural resources are used and affected by farmers.

In terms of Farmers' perception of changes to environmental conditions and the extent of degradation of the environment, the farmers were asked to provide their views on the current state of the environment compared to the conditions ten years previously. Table (3) provides insight into farmers' opinions on this issue.

Since there are differences in the way which the agro-pastoralists and pastoralists use the environment, the activities which contribute to land degradation and desertification are summarised individually and are outlined in Table (4) and Table (5) for the pastoralists and agro-pastoralists, respectively.

DISCUSSION

Farmers are aware that the environment is becoming increasingly degraded and that the threats of desertification are very real. In their comparison of the current state of the environment to that of a decade previously, significant changes that indicate serious deterioration of the environment were mentioned. Farmers are entirely dependent on the environmental resources to sustain themselves and their households. They are aware of the type of activities that contribute to land degradation that leads to desertification, and admitted that in many instances their farming practices are contributing to the degradation of the land upon which they depend for survival. Inability and powerlessness to take action to avert the process of land degradation due to their need to exploit the environment to the maximum to ensure the survival of their households and their herds was continuously mentioned. Subsistence living and practicing eco-positive behaviour are in this sense diametrically opposed.

Although the farmers did not have suggestions of how to cope with their situations and alter their actions that lead to land degradation, they realise that there is an

Table 2. Farmers use of and impact on the natural environment.

	Agro-pastoralists	Pastoralists
Use of natural environment	Agriculture predominates and most of the community depend on small-scale subsistence-oriented crop cultivation. To meet the animal husbandry needs, farmers depend mainly on the natural vegetation, which includes trees, grass and wild shrubs for grazing their herds.	Herds graze on the natural vegetation; grazing is supplemented by cutting grass from surrounding areas as an alternative to fresh grazing.
Care of natural environment and environmental resources	Traditional agricultural and animal husbandry methods are followed. The environment is utilised to the full to ensure basic survival and few attempts are made to follow sustainable practices such as allowing for lands to restore through allowing fallow time or applying crop rotation agricultural methods. There are no fixed grazing patterns which renders certain areas vulnerable to trampling and degradation.	A nomadic lifestyle is followed. There are no fixed grazing patterns and consequently there is no control over the amount of grazing allowed before herds need to be moved. Consequently many areas – especially those close to water points – are overgrazed, trampled and the soil is left denuded. Vegetation is not given time to recover which makes the exposed soil vulnerable to erosion and land degradation. In instances where herders try to give the vegetation time to recover, other herders move in, the young shoots that have just emerged are eaten and the attempt is thwarted. Most pastoralists treat their diseased animals with herbs and decoctions that have been known and used over the ages and do not rely on veterinary services.
Effect of drought conditions on use of environmental resources	In times of drought and scarcity, farmers need to buy fodder and chaff from other farmers for their animals. The additional fodder is generally harvested from the environment and reduces land cover of these areas with the consequence that the soil is rendered vulnerable to degradation. At times it is necessary to graze their animals in other areas when the local vegetation is insufficient. This is done without taking the vulnerability or precariousness of marginal habitats into consideration.	Farmers follow a nomadic lifestyle in search of grazing due to the reduction of vegetative cover for their herds brought about by increased herd sizes and lack of grazing to support their herds. Areas of concentrated grazing become excessively trampled and soil conditions deteriorate rendering restoration of vegetation near impossible. Marginal habitats are not restricted from being used as grazing.
Impact on the environment	Range land destruction is common when areas are cleared for cropping. No fixed grazing pattern is followed and this leads to grazing of marginal habitats increasing vulnerability to desertification	More sheep and goat breeders have moved into the area and consequently the area is becoming over stocked and seriously degraded due to overgrazing and trampling. Vegetative cover is destroyed and the land is exposed to wind and water erosion rendering it vulnerable to desertification.
Water availability	Agriculture is dependent upon a constant source of water. However, water sources are becoming more scarce and unreliable.	Water sources are drying up and herdsmen find it increasingly difficult to find natural water sources for their herds.

Table 3. Perceived changes to the state of the environment.

Farmers' views of the state of the environment	
General state of the environment	Conditions have deteriorated significantly
Extent of desertification	Increased evidence of soil deterioration and desertification
Frequency of droughts	Droughts are more common and water supply is under serious threat
Condition of vegetative cover	Trees that were previously planted to green the environment have in recent times been chopped down indiscriminately to clear land for crops, for fuel or for material for building shelters for animals and fences to protect crops

Table 4: Pastoralists' activities that contribute to land degradation.

Activity	Explanation of and justification of action
Overgrazing	Finding food for their animals' survival is a priority that surpasses all others; food is scarce and what there is has to be used to the limits
Congregation around watering points and consequent soil erosion and degradation	Water is a scarce resource and is essential for their animals' survival, moving away from the area to better grazing does not mean drinking water will be available.
Exceeding carrying capacity	Vegetation in other regions has been seriously depleted and herders move into Sefiane community in search of grazing. All farmers are forced to a level of subsistence farming and live hand to mouth.
Deforestation	Enclosures are needed to protect their animals from predators and the elements. The wood is also used for fuel.

Table 5. Agro-pastoralists' activities that contribute to land degradation.

Activity	Explanation of and justification of action
Deforestation	Shrubbery is used to fence off gardens, crops and yards and is the only affordable source of material for these purposes. Fuel has to be taken from the environment as the farmers cannot afford electricity. Land clearance is required to increase cropping area. Although soil erosion is evident, new vegetation is not being planted due to a lack of resources – saplings and water. Natural wind breaks and barriers to soil and wind erosion are being lost due to deforestation, yet clearing land for cropping and for securing material for fencing is of prime concern.
Impoverishment of the soil	The nutrient balance of the soil is disturbed by deforestation since the organic layer that assisted in water retention and shelter to bacteria aiding the decomposition process is lost. Although this is realised by the farmers, their need to clear land and use the vegetation for enclosures overrides the need to refrain from felling the vegetation.
Unsustainable cultivation practices	Irrigation of crops through canals and flooding results in severe loss of water, soil erosion, leaching the soil of nutrients and soil compaction, however, this is the most affordable and convenient option available. Inadequate tillage, fertilisation and drainage methods are used because of a lack of access to and the ability to pay for resources required for improving current practices. Furthermore, due to the nature of the terrain it is difficult to use mechanised farming implements. Fallow time is reduced/ or not practiced because arable land is scarce. Consequently, soil nutrients are sapped and the fertility of the land is reduced. This impacts on the quality and quantity of the crops that can be raised.
Cultivation of marginal lands	Although the soil quality of marginal lands tends to be poor, this is often the only land conveniently available to farmers to raise crops.

immediate need to find ways to improve their situation. They acknowledged that their role has to change from consumer and exploiter to contributor, problem solver and initiator to remedy the economic, farming and survival problems that are escalating and threatening their lifestyle and livelihood. This observation hints not at a lack of will, but at a lack of impetus to initiate restorative change.

Since desertification is a man-made phenomenon, its control requires modifications on the way in which man uses the environment (Grainger, 1986). Environmental education that enhances environmental literacy and provides the required knowledge, skills and ability to make informed decisions and take action in dealing with environmental issues and risks has been substantially documented as a tried and tested way of ensuring ways to address serious environmental problems. Various researchers have indicated the success of environmental education in specifically addressing land degradation and desertification issues (Hidayat, 2009; Bethune and Schachtsneider, 2004; Winslow, *et al.* 2004; Darkoh, 2000; Stern, 2000; Van Rooyen (1998); Warren, 1995; Annorbah-Sarpei, *et al.* 1993) and it was with this substantial research backing that the researchers of the Sefiane community propose intervention of an educational nature.

Any intervention to find a solution to the modification of the behavior that is contributing to land degradation among the Sefiane farming community would need to be tailored specifically to the identified needs. The intent of the intervention strategy would be to enhance rural farmers' environmental awareness, skills, and knowledge, and to enable them to take steps to combat land degradation and desertification. A program of this nature should enable them to better utilize and protect their environment in a bid to enable them to cultivate sustainable living practices.

The program should focus on both communities, the needs and expectations of the farmers, as well as the agro-pastoralists, as identified from the research. An intervention program framework, as suggested in Table (6), could be used as a starting point for an environmental training program to increase environmental

literacy and address desertification issues in the Sefiane community.

The general purpose of the proposed framework is to ensure a better quality of life for the community and to enable them to practice their farming activities in such a way that the human and livestock needs for food, water and shelter are met in a way that is not detrimental to the environment. The purpose of the intervention programme is to empower the Sefiane community itself to take charge of the development and management of their land resources in a socially equitable and ecologically sound way. A participatory approach should be followed to foster individuals' commitment to the project and encourage involvement in and the development of improvement plans. However, the community would need expert technological advice and support provided by external organisations or bodies to ensure that the programme could be successfully implemented. Financial assistance should be sought to support intervention initiatives since the community itself is not financially strong enough to contribute to project costs.

Specific assistance required would include: helping the Sefiane rural community to seek recognition, approval and assistance from their community leaders in order to gain protection and support for their actions and initiatives; exploring financial support options and securing financing for the project activities; identifying individuals and organisations that may offer free assistance; identifying administrative and managerial experts to support the community to organise themselves into operational groups and deal with group dynamics and conflict resolution; devising action plans that will engage all participants in group projects that benefit all the members equally; opening up lateral communication routes to all community members – young and old – ensuring that these opportunities are available to women to contribute in the economic development of the community; emphasising respect, equality and social justice among the members of the society without any distinction; and putting in place disaster and emergency plans (in cases of acute desertification and drought).

Table 6. Proposed environmental education program framework for Sefiane community.

Introduction to the environmental education programme [Informal discussions / meetings with local farmers]	
Suggested presentation format and content focus	Proposed outcomes and contribution
The role and purpose of participatory intervention programmes.	Enhance environmental resilience through exploitation of local skills, knowledge and partnerships. Recognise that science and technology can be used to guide rather than dominate intervention strategies and should not curb community initiatives.
Prevailing environmental issues in the community with specific reference to land degradation and desertification issues.	Raise awareness of dependency of the community on environmental resources.
Local farming practices and their impact on the environment	Increase understanding of ecological cycles and human/environmental interaction and how these affect living conditions and the ability to survive.
The process of desertification and its impact on sustainable living	Draw attention to the link between sustainable living practices and poverty alleviation.
Introduction to the key environmental and sustainability concepts [Information session / presentation with practical contextually relevant examples]	
Suggested presentation format and content focus	Proposed outcomes and contribution
Introduction to and clarification of concepts such as environment, ecology, ecological cycles, and sustainable development and sustainable development practices.	Increase comprehension of the holistic nature of the environment and the need for living within the carrying capacity of the environment. Enhance understanding of the need to conserve environmental resources and to co-exist in a responsible manner with others and the environment. Appreciate the economic, social and spiritual benefits that can be achieved through following a sustainable lifestyle. Understand the relationship of these concepts and how current farming practices affect the ecological balance, the health of the environment and the ability to follow a sustainable lifestyle.
Land use and land degradation [Practical fieldwork / on-site visits to local farmers]	
Suggested presentation format and content focus	Proposed outcomes and contribution
Identification of framing activities that benefit and which are detrimental to the environment.	Identify ways in which the environment is managed sensibly and suggest strategies to strengthen pro-environmental practices. Reflect on own farming practices to weigh their impact on the environment. Identify and diagnose problems through dialogue with others. Identify practices that contribute to land degradation. Identify localised community based solutions building on local knowledge and resources. Increase local self-reliance and cooperative support and interaction.

Table 6. Cont.

Strategies to combat desertification – focus on pastoralists, agro-pastoralists and farmers in general [Information session / workshops with practical demonstrations, activities and field trips]	
a. Pastoralists: Livestock husbandry, care and health issues	
Suggested presentation format and content focus	Proposed outcomes and contribution
Assessment of the impact of pastoralists' herds on the environment.	Enable pastoralists to identify animals' impact on the environment and natural resources
Conserving and improving grazing.	Facilitate strategies to set up and manage grazing rotation schemes to reduce the impact on the environment. Recognise the grazing needs of various animal species and establish ways to reduce their impact on the environment. Set up food production for animals to supplement grazing. Improve pasture establishment and management Establish shrubs to serve as an additional source of fodder for animals.
Animal health and care	Gain appreciation for the need to set up and manage breeding programmes. Exploit local knowledge regarding care for and treatment of sick or diseased animals
b. Agro-pastoralists: Soil quality, cultivation, cropping and restoration of soil	
Selection of land for agricultural purposes	Identify land that is suitable to cultivation and avoid the cultivation of marginal land.
Sustainable crop cultivation practices	Practice composting and use of manure to increase soil quality. Understand the principles of and apply contour ploughing, strip cropping, multi-cropping, companion planting, constructing planting pits that aid plant growth.
Cropping and food production	Experiment with various cultivars to determine what is most suited to the environmental conditions. Cultivate drought tolerant short cycle crops
Crop management	Identify which plants are suited to the local environment and could be successfully propagated. Recognise and be able to use vegetation for treatment of ailments and disease and manage the collection of the plant material. Use natural pesticides both as a measure to conserve the environment and to reduce financial outlay.
Water	Practice conservative and effective irrigation methods such as drip irrigation or burying clay pots of water underground.
c. Farmers in general: Resource conservation and management	
Sustainable vegetation management	Understand the role of plants in the ecological cycle and the need to protect vegetation from destruction. Know the various conditions required by plants to flourish. Identify local plant species and recognise their uses. Be familiar with the nutrient value of various plants and preferences of livestock for certain vegetation.

Table 6. Cont.

Cultivation and revegetation of plants and trees	<p>Establish nurseries for seedlings that can be transplanted to revegetate denuded areas.</p> <p>Establish woodlots to serve as sources for building materials and fuel.</p> <p>Explore alternative materials for heating and cooking such as gas so that vegetation can be used as a source of food for livestock.</p> <p>Plant windbreaks that can act as a deterrent against soil erosion.</p> <p>Explore alternative materials for constructing animal shelters and crop protection barriers.</p>
Water	<p>Apply water conservation and management practices.</p> <p>Protect water sources so that they are not degraded by human or animal activity.</p> <p>Construct water storage facilities and harvest rainwater.</p>
Control and prevention of soil erosion	<p>Plant windbreaks, construct rock barriers to prevent erosion and excessive trampling by animals.</p>

CONCLUSION

Through the undertaken research, the researchers attempted to identify and explain the tendency that both agro-pastoralists and farmers in the Sefiane community to contribute to land degradation and desertification. Farmers are aware that their current activities are causing serious harm to the environment, yet survival in the most basic form overrides all other concerns. Subsistence living and eco-positive behaviour are in this sense diametrically opposed. It is clear that unless a strategy is decided upon to enable the community to act in an environmentally responsible way, this community faces increased levels of poverty and the inability to be self-supporting. The research has indicated that these farmers are not averse to following sustainable living practices – as their forefathers did – but that they cannot initiate this process on their own. External intervention and support is required to institute environmental programmes and to offer the necessary resources and access to information and support structures that could help the community identify and implement alternative farming practices which are more environmentally sustainable. Farmers should be given the forum to share and practice their own knowledge of sustainable environmental practices and make a livelihood from their

environment while following a conscious philosophy to build up a sustainable co-existence with the environment to help the next generation to live harmoniously and with stability. The Sefiane environment is their home; they have no other place else to go.

REFERENCES

- Abahussain, AA, Abdu, AS, Al-Zubari, WK, El-Deen, NA, and Abdul-Raheem, M** (2002) Desertification in the Arab Region: analysis of current status and trends. *Journal of Arid Environments* **51**:521-545.
- Abdelgawad, G** (1997) Deterioration of soil and desertification in the Arab countries. *Agriculture and water* **17**:28-55.
- Annorbah-Sarpei, AJ, Dube, N, Rugumayo, E, Schearer, SB, and Tomlinson, J** (1993) *The importance of participatory approaches for dry land management and anti-desertification programs. Based on case studies from Burkina Faso, Ghana, Kenya and Zimbabwe*. New York: Synergos Institute.
- Bethune, S, and Schachtsneider, K** (2004) How community action, science and common sense can work together to develop an alternative way to combat desertification. *Environmental monitoring and assessment* **99**:161-168.

- Boardman, J, Poesen, J, and Evans, R** (2003) Socio-economic factors in soil erosion and conservation. *Environmental Science and Policy* **6**: 1-6.
- Darkoh, MBK** (2000) *Desertification in Botswana. Rala Report 200*. www.rala.is/rade/ralareport/darkoh.pdf (accessed 17 February 2009).
- Eden Foundation** (1989) *Edible perennial plants native to hot deserts - the solution to the invading sand desert*. <http://www.eden-foundation.org/project/semmoroc.html>, (accessed 5 February 2008).
- Galloway, A** (1997) *Non-probability samples*. <http://www.tardis.ed.ac.uk/~kate/qmcweb/s8.htm#Snowball> (accessed 23 January 2007).
- Grainger, A** (1986) *Desertification*. Russell Press, Nottingham.
- Hidayat, H** (n.d). *Social forestry and empowering communities in north Bengkulu – south Sumatera. IGES international workshop*. <http://enviroscope.iges.or.jp/modules/envirolib/upload/1508/attach/1ws-16-hidayat.pdf> (accessed 17 February 2009).
- IUCN** (1971) *International Working Meeting of Environmental Education in the School Curriculum*. Reading and IUCN. University of Reading Press.
- MED Forum** (2000) *Programme of the Mediterranean NGOs for Sustainable Development. Draft version directed by Paolo Bifani and coordinated by Rafael Madueño* www.medforum.org/documents/agenda2000/a2000 (accessed on 19 November 2007).
- Meshgan, M** (2005) *Press release .Bonn. Dubai Second Festival of Cultures and Civilisations*.
- Sefiane Local Socio-Development Cooperation Programme** (2005) *Bureau de zone de la Wilaya de Batna.AADL.Seggana.Algeria*
- Statoids** (2002) <http://www.statoids.com/yz.htm> (accessed 12 February 2009).
- Stern, PC** (2000) Towards a coherent theory of environmentally significant behaviour. *Journal of social issues* **56**(3):407-424.
- UNCCD** (2002) *Combating Desertification in Africa*. Eden Project Canada. <http://www.unccd.int/> (accessed on 13 June 2007).
- Van Rooyen, AF** (1998). Combating desertification in the southern Kalahari: connecting science with community action in South Africa. *Journal of arid environments* **39**:285-297.
- Warren, A** (1995) Changing understandings of African pastoralism and the nature of environmental paradigms. *Transactions of the Institute of British Geographers* **20**(3):193-203.
- Winslow, M, Shapiro, BI, Thomas, R. and Shetty, SVR** (2004) *Desertification, drought, poverty and agriculture: research lessons and opportunities*. International Centre for Agriculture Research in the Dry Areas. http://www.iwmi.cgiar.org/Assessment/files/Synthesis/Land%20Degradation/DDPAARLO_text.pdf (accessed 18 February 2009).
- World Bank** (1997) *Protecting our planet: Securing Our Future*. UNEP/U.S. NASA/ UNEP World Bank, Nairobi.

Ref. No. 2493

Rec. 07/09/2008

In-revised form: 27/3/2009