

Local Innovation and Participatory Extension

Developing and spreading Sustainable Land Management Practices in the Maghreb: adding value to the Green Water Credit methodology?

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1. **Introduction**

This paper examines the potential for making use of local innovation and novel extension arrangements for the spread of soil and water conservation/ sustainable land management technologies linked to the 'Green Water Credit' (GWC) concept (see Figure One). Though the principles of the approaches are relevant to various countries in Africa and elsewhere, this study looks especially at the situation and potential in the Maghreb given the current exploratory project[1] being undertaken in Algeria. The starting point for the Green Water Credit studies so far carried out, has been to base calculations and scenarios on 'best practice' technologies already under use in the areas under study – or to delve into the WOCAT database (www.wocat.net) to identify alternative measures.

With respect to extension systems – and the means of spreading these technologies with associated good practices - GWC has, by default, assumed that a combination of the existing national extension services and market forces would ensure rapid uptake. In this paper, the potential for land users to develop their own technologies, and methods of exchanging knowledge is examined. While the exploratory GWC studies are justified in basing their calculation and assumptions on well-known technologies and convention practices of 'transfer of technology' (ToT), when such mechanisms are established in the field, there is an argument to say that more suitable technologies can be developed, and better uptake mechanisms introduced by encouraging farmer innovation and farmer-to-farmer learning. That is the premise of this paper.

2. Traditions in Soil and Water Conservation and Water Harvesting

Farming has been practiced for over 10,000 years, and for all but the last 200 years or so, the breeding of plants and animals, production systems, soil and water conservation and irrigation have all been developed by farmers themselves. Furthermore, the exchange of ideas has been the preserve of farmers too: sharing knowledge at markets and observing other farmers' practices while travelling was the precursor of what we now term 'extension systems'. While manufacturing industries can conceal processes of production indoors, or within a protected area, farmland is in the open, and what farmers practice is clear to the observant eye.

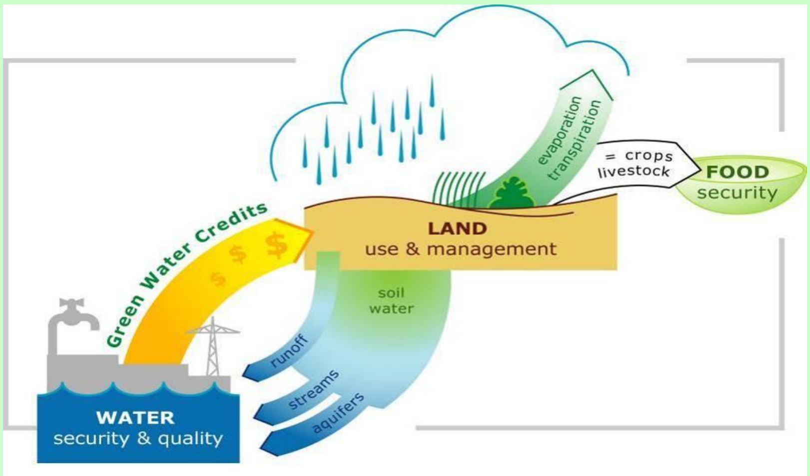
[1] Green Water Credit Pilot Project, Algeria. ISRIC, Wageningen, The Netherlands

Green Water Credits: the concepts

***Green water, Blue water*, and the GWC mechanism**

Green water is moisture held in the soil. *Green water* flow refers to its return as vapour to the atmosphere through transpiration by plants or from the soil surface through evaporation. *Green water* normally represents the largest component of precipitation, and can only be used *in situ*. It is managed by farmers, foresters, and pasture or rangeland users.

Blue water includes surface runoff, groundwater, stream flow and ponded water that is used elsewhere - for domestic and stock supplies, irrigation, industrial and urban consumption. It also supports aquatic and wetland ecosystems. *Blue water* flow and resources, in quantity and quality, are closely determined by the management practices of upstream land users.



Green water management comprises effective soil and water conservation practices put in place by land users. These practices address sustainable water resource utilisation in a catchment, or a river basin. *Green water* management increases productive transpiration, reduces soil surface evaporation, controls runoff, encourages groundwater recharge and decreases flooding. It links water that falls on rainfed land, and is used there, to the water resources of rivers, lakes and groundwater: *green water* management aims to optimise the partitioning between *green* and *blue water* to generate benefits both for upstream land users and downstream consumers.

Green Water Credits (GWC) is a financial mechanism that supports upstream farmers to invest in improved *green water* management practices. To achieve this, a GWC fund needs to be created by downstream private and public water-use beneficiaries. Initially, public funds may be required to bridge the gap between investments upstream and the realisation of the benefits downstream.

The concept of green water and blue water was originally proposed by Malin Falkenmark as a tool to help in the understanding of different water flows and resources - and the partitioning between the two (see Falkenmark M 1995 Land-water linkages. FAO Land and Water Bulletin 15-16, FAO, Rome).

Figure One. Green Water Credits: The Principle

The Maghreb has a reputation as having a very rich history of tradition in farming – and especially in water harvesting and irrigation. For example in Tunisia, an ancient system for growing olive trees is reported by El Amani (1977; 1983). The *meskat* system was apparently in use during the Arabian Middle Ages, and at the time of study, there were some 200,000 hectares still under *meskats.* However the same author reports the catchment sizes of the *meskats* to be gradually growing smaller due to land pressure – and thereby depriving the olives of adequate runoff water. Hillside bench terraces systems in parts of Morocco function in a similar way: these help channel water to olive trees and collect and conserve it on the terraces. Once again these are ancient systems, developed by farmers themselves (Kutsch, 1982).

Much of the North Africa and the Middle East had a widespread tradition of cross-*wadi* walls which acted as water spreading technologies, but Gilbertson notes the '*unhappy fact that on many occasions in the past such schemes have been abandoned'* (Gilbertson, 1986). However recent data produced by FAO (FAO-AQUASAT, 2010) suggest that there may be still quite significant areas of land under such 'spate irrigation' in the Maghreb, with 56,000 ha in Algeria, 27,000 ha in Tunisia and 26,000 ha in Morocco. Nevertheless an FAO expert meeting in Cairo in 2008 suggested that while the figure for Algeria was still valid, that for Morocco was a large underestimate and the data for Tunisia was exaggerated. Steenberger *et al* (2010) acknowledge that a substantial uncertainty exists on the extent of spate irrigation, but emphasise that many economically marginal people depend upon it for their livelihoods, and though there is indeed a reduction in area in some countries, in others it is on the upsurge '*for instance in the Horn of Africa'*.

In an overview of indigenous soil and water conservation in Africa (Reij et al, 1996), several ancient thriving examples from Morocco are cited. Worth noting is the conclusion to their chapter on 'Mountains, Foothills and Plains' by Chaker and colleagues:

> "The oldest structures seen in the highlands may date back hundreds of years, yet they are still in place and some of them have never needed to be maintained or renovated. The soils built up behind the structures are thick and, therefore, represent a heritage to be safeguarded. The reason for building such structures is not the immediate gain derived from the improved field; rather investment of labour is seen as something from which the family will benefit in the future, each generation marking its passing with additions to these SWC structures, such as by raising the height of old terraces or planting trees along new ones" (Chaker et al, 1996)

This conclusion brings in three interesting and related elements: first the longevity of SWC structures (here the authors are referring mainly to stone terracing); second the long-term objective of the investment; and third, the cultural connotation implicit in passing down the tradition from generation to generation – leaving an historical mark.

More recently, an update on the status of indigenous knowledge and water harvesting in the Maghreb shows how important these ancient systems remain in three countries – namely Tunisia, Morocco and Libya (Oweis et al, 2004). In Tunisia, Mechalia and

Ouessar (2004) discuss the traditional systems of *meskat* microcatchments for olives, *mgoud* systems of spate irrigation, and *jessour* which are found in water courses in the mountains. Water harvesting techniques (almost all traditional) are said to cover one million hectares and remain the backbone of rainfed (i.e. non-irrigated) agriculture. But as we have already noted El Amani (1977; 1983) was already pointing out how many of these structural measures were on the decline, often due to out-migration of labour. Mechalia and Ouessar state the case for combining both old and new water harvesting techniques to maintain this effective method of 'magnifying' rainfall.

In Morroco, Karrou and Boutfirass (2004) note that water resources are becoming increasingly scarce, and around two thirds of the country's rainfed cropland is located in the arid and semi-arid region. Once again, the authors cover a wide variety of traditional forms of water harvesting – but also describe the introduction of more modern technologies of water harvesting, including microcatchments and contour bunds. Here again there is evidence of a combination of 'ancient and modern' and a growing interest by the scientific community. Finally, in Libya, Alghariani (2004) also stresses the severe constraints of water availability. He describes traditional systems, some built by the Romans. For the most part these technologies are all closely related to systems found elsewhere in the Maghreb: it is question of conjecture whether they evolved independently, or were observed and copied by travellers – or (most likely) a combination. Alghariana (ibid) concludes by stressing the potential of small-scale water harvesting systems for the future as *'they are the most appropriate in relation to land and water rights'.*

Critchley et al (1994) draw four lessons regarding the evolution and survival of indigenous soil and water conservation. First it has often evolved where moisture limits the production of crops or fruits; second it may have been also triggered by the need to cultivate on hillsides with thin soils – where people settled to avoid marauding plain-dwellers; third population pressure may simply have obliged people to conserve their resources of soil and water more efficiently; fourth structural SWC may, possibly, have led to staking a claim on land: along the lines of *"if I build a series of terraces on no-man's land then that plot belongs to me".*

The same authors then suggest four principle causes of traditional systems falling into abeyance. First is the exodus of labour from areas where terracing and other structures require considerable upkeep. The second they noted was where rainfall patterns have changed (and this is obviously likely to be more important with the clearer evidence of climate change now compared with when they wrote their paper); the third cause was given to be a move away – in some areas – from hand hoeing to mechanised cultivation, whether by oxen plough or tractor. And the fourth cause they state is *'ironically where projects have ignored the existing traditions and constraints, and superimposed new structures over the old'* (Critchley et al, 1994). As we will discuss in the next section, it may well be that traditions are not entirely lost, but modified by modern innovation: local innovation being the mother of tradition.

3. Local Innovation in Sustainable Land Management[2]

Since the time that agriculture began, some 10,000 years ago, it has been shaped and spread through farmers and herders themselves. For almost all of that period there was no "scientific" research as we recognise it today. Neither were there advisory or extension services. This may sound obvious – but it is very often forgotten or ignored. Farmers came up with ideas, carried out experiments and arrived at their own conclusions. Innovations that proved to be effective thrived. In this way crops and animals were selected and bred; tools were made and modified; farming systems were developed, and sustainable land management practices – including terraces and water harvesting systems – were established.

Farmers learned from each other and turned innovations into common practice, and then these practices became embedded traditions. They bought and bartered improved crop seeds and better livestock from the breeders, and they copied farming systems that worked well. Travel must have been a great teacher – and local market places doubled up as focal points for exchange of ideas. In this way traditions were developed and spread. Indeed it could be said that innovation was the dynamic process that led to the development of traditions in farming. These "small steps of innovation" have continuously improved farming practice over time, and still do so now: but they are rarely recognised or acknowledged.

Many of the practices and traditions – including varieties of crops and breeds of animals remained localised: for example the *Charolais* breed of cattle from France only became popular in Britain in the 1970s, and the *Texel* breed of sheep from the eponymous island in The Netherlands is only becoming widespread in Britain today. Farmers didn't travel the world, in fact didn't travel very far within their own countries. Most still don't. Thus many traditions stayed at home with them, and new ideas existed that they never saw or experienced. Furthermore, some traditions were not appropriate elsewhere. A particular cereal variety or breed of goat, for example may have been developed for certain conditions, and stayed there. More obviously climatic conditions and soils determined what was successful. The local availability of loose stone has, over the millennia, had a profound impact on structural measures of soil and water conservation.

In some countries, during the Middle Ages, religious communities – especially monasteries – had large estates which they farmed. The monks opened up new land, carried out trials and began new systems of farming and forestry. Later, universities began to play a role in agricultural experimentation and teaching. But it was not until the 1800s that the first official research and advisory services were established in Europe. Already there had been huge advances in farming practices in these countries – driven by the farmers themselves. The first official research institutions had their own stations and carried out carefully controlled trials according to the interests of the researchers. Then, in the middle of the 20th century, there was a technological leap in Europe and America as scientific knowledge accelerated, crop and animal breeding advanced, agrochemicals were introduced and fossil-fuelled tractors took

[2] This section is adapted from Critchley, W. 2007. *Working with Farmer Innovators.* CTA, Wageningen

over from draught animals. Advisory or 'extension' services were established under Ministries of Agriculture, to pass on research findings to farmers.

This is the basis for the systems of research and extension that still prevail in the Maghreb and much of the Middle East and Africa today. It was this "transfer of technology" model – with a top-down, almost military, element to it – that was exported. Research institutes were set-up and advisory services were established. Where the conditions were favourable, the production systems often based on irrigation (in the semi-arid and arid regions of focus here) and the crops or animal products had a good market, success followed an elite of producers.

In the Maghreb, where modern irrigation could be introduced and practiced during the 20th century there were notable advances in production (as in Asia with the "green revolution" during the 1970s). These were based on scientific research, high yielding varieties and efficient and organised extension services. However in areas with difficult access, low rainfall, few irrigation possibilities and infertile soils – and where there existed traditional forms of water harvesting, poorly understood by 'scientists', there has been no equivalent technological leap.

Since the 1980s, public agricultural research and extension have been increasingly coming under fire for not delivering new technological leaps. A crisis of confidence in conventional research and extension services has resulted - and funding has dried up. Several alternatives have been proposed: one of the current favourite options is semi-privatisation of services, catering to "common interest groups" of farmers. However many observers doubt that the poorest farmers will benefit from such arrangements. Extension will be discussed in greater detail in the section that follows.

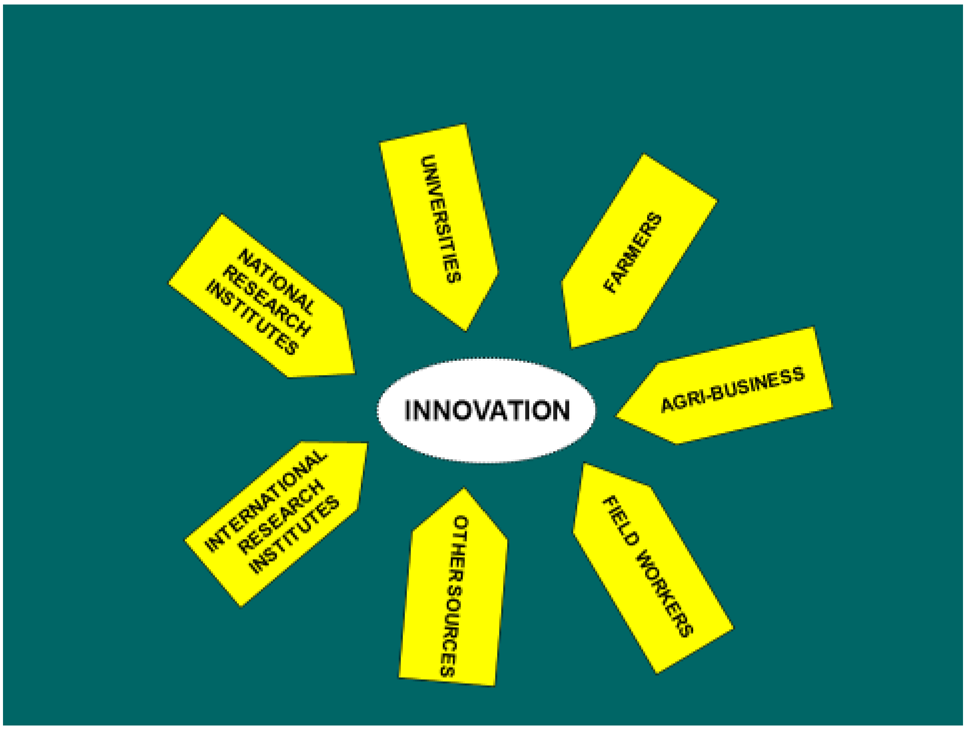


Figure Two. Innovation in agriculture comes from a variety of sources

It is very important to remember that farmers continue to experiment, and they still learn from each other. Farmer innovation occurs everywhere. This offers hope, especially in those mountainous areas of the Maghreb countries where "scientific answers" are few and the traditional systems prevail: here farmers themselves are the great untapped resource. It is probably true that the process of innovation is self-stimulated where communities are isolated. Local innovation can be a means of helping farmers and communities out of poverty, and also as we search for suitable adaptation to environmental change – especially climate change. "Innovativeness" is helpful everywhere: once people are encouraged to innovate, many will come up with their own solutions.

Obviously farmer innovation is not enough on its own – otherwise there would be no problems with agricultural development. Not only do we still need conventional research, but *farmer innovation* needs to be stimulated and *farmers' innovations* often need to be improved through participatory innovation development processes. Farmer innovation initiatives have an important role to play in a country's overall agricultural innovation system. There will always be research stations and extension services. However farmer innovation and farmer-led extension can add value *to* these, and should be recognised and supported *by* these.

Figure Three, below, demonstrates one way in which it is possible to arrive at new, improved, "best bet" technologies in terms of sustainable land management for GWC.

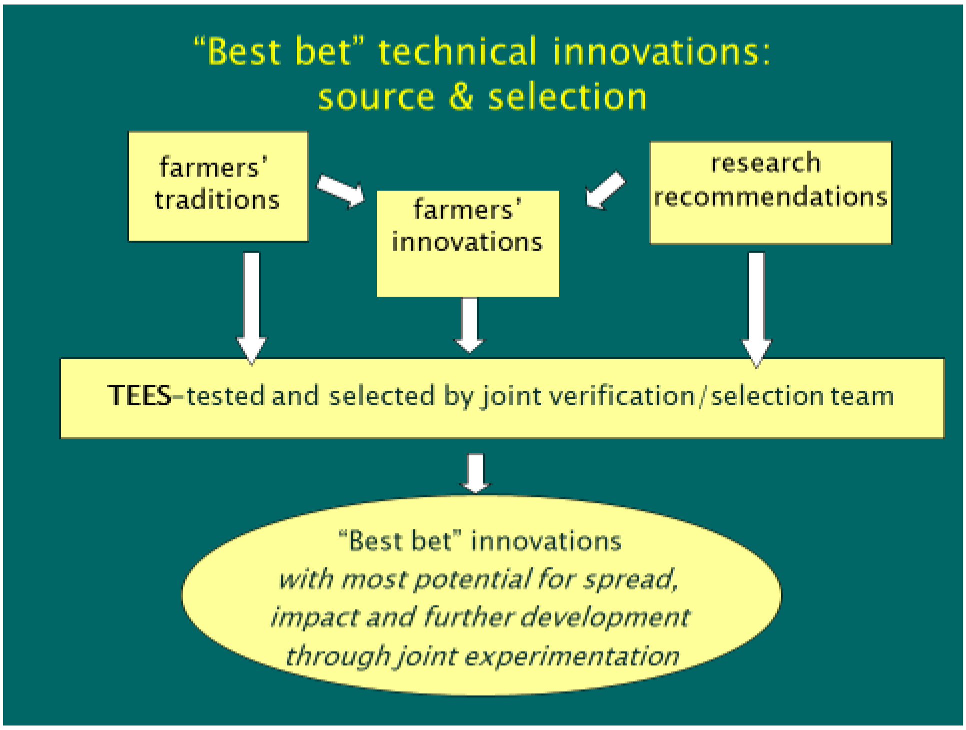


Figure Three. Best Bet Sustainable Land Management Technologies:
Combining tradition, innovation and research

Both traditions and recommendations from research may be direct sources of these technologies. Or, as Figure Three demonstrates they may be further developed through farmer (or community) innovation. Or they may come directly from such innovation.

When possible candidate technologies have been identified (see Critchley, 2007 for detailed methodological steps), they should then be verified by a dedicated team using a 'TEES-test'. In brief the 'TEES-test' comprises the four criteria set out in Box One against which a technology is measured (Critchley, 2007). The TEES-test[3] acts as a preliminary filter.

Naturally the new measure should perform well ***T****echnically*; in relation to GWC this will imply its ability to increase green water transpiration (thus both improving crop performance and reducing overland flow and erosion). The measure must also make ***E****conomic* sense to the land user: even if there are credit flows from a GWC-type arrangement, sustainability can only be ensured if there are benefits that exceed the direct costs. As has been pointed out regularly in the literature[4], initial costs may need to be subsidised – for example terracing incurs considerable investment, and returns take time to offset these costs and provide a profit.

E*nviromentally* the measure must be 'friendly'. A plastic much used on vegetables, for example, may be technically effective and also bring immediate economic returns, but the disintegration of the plastic brings pollution problems with it. ***S****ocial* acceptability is a rather more specific criterion and but applicable in many cases and should always be applied. Here we are looking for technologies that do not offend or interfere with other farmers. For example, is water abstracted for supplementary irrigation that denies others their supply? Is mulching material gathered from a common resource area? Can specific measures be practiced under female headed households?

During a training session on innovation, a useful exercise is to ask participants to come up with innovations that they are aware of, (or technologies that they think might add value in a specific situation) and then require them to filter each through the TEES-test. This can be a rewarding and effective exercise.

Box One. The 'TEES-test'

Technical effectiveness:	*Does it work well? Is its performance as good or better than current alternatives?*
Economic validity:	*Do the benefits outweigh the costs? Is it affordable to the target group?*
Environmental friendliness:	*Are there any negative environmental impacts? Is off-site pollution or land degradation caused?*
Social acceptability:	*Is it anti-social? Has it good potential to spread to others? Does it benefit women as well?*

Source: Critchley, 2007

[3] Conveniently the acronym 'TEES' remains the same in French
[4] Eg WOCAT, 2007

4. Community Innovation[5]

Moving on from the theory of local innovation, it is useful to look briefly at a UNEP-Global Environment Facility project which is currently coming to a close – and is documenting its (largely successful) experience in a book on which this section is based (see footnote).

The project, "Stimulating Community Initiatives in Sustainable Land Management" (SCI-SLM) looks not just at farmer innovation in general, but focusses on community innovation (the 'initiatives' in the project title refers to innovation) *and* the way these innovations/ initiatives can be both stimulated and shared. The author of this current paper was not only involved in the design of the project, but was also a member of the technical advisory team guiding its progress, and is one of the co-editors/ authors of the book – currently under preparation - covering SCI-SLM's experience.

What makes this project's experience particularly pertinent here is the involvement of one of the Maghreb countries, namely Morocco. During project design it was that country that specifically requested the chance to benefit from 'South-to-South' learning and it was clearly stated that a knowledge bridge between the Maghreb and sub-Saharan Africa could be very valuable. The other aspect of the project that is important here is the emphasis on upscaling, both directly and immediately, through community to community visits, and sustainably, through institutionalisation.

SCI-SLM focuses on identifying innovative forms of land management amongst communities in four countries in Africa: namely Ghana, Morocco, South Africa and Uganda. The premise is that there are local community innovations succeeding in combating desertification where formal research recommendations have often failed. The common denominator is initiatives, regarding land, water or plant resources, which have emanated from the communities themselves, demonstrating their capacity to come up with solutions to problems of land degradation internally.

The project is designed, and endeavours to, add value to these initiatives – through research partnerships - as well as stimulating these communities to go forward with their efforts. SCI-SLM is documenting the initiatives and encouraging other communities to learn from these focal points through, amongst other ways, cross-visits. Thus cross-learning between communities – and between countries - is a key element. Establishing flow lines of communication about successful initiatives and "innovativeness" is a central issue. At a higher level SCI-SLM seeks to institutionalise the concept and mechanisms of such an approach, in relevant Government Ministries, and other important organisations.

It is already possible, from the forgoing, to see how such an approach could be attached to a Green Water Credit programme. The role of the community initiative project would be to feed ideas into the GWC programme and to help it accelerate uptake.

[5] This section is drawn from drafts of Mudhara et al (in prep) *Stimulating Community Initiatives*

Box Two: Specific objectives of "Stimulating Community Initiatives in Sustainable Land Management"

"To refine ways of stimulating the further improvement and spread of community-based SLM initiatives, while simultaneously developing a methodology to upscale and institutionally embed SCI-SLM approaches at local and regional level in four pilot countries in Africa. The project will contribute to the SIP's Development and Global Environment Objectives in terms of implementation of policies and on-the-ground investments towards upscaling SLM aligned with national and SIP priorities and reduction of impacts of land degradation on ecosystem functions and services in SIP investment areas. South to South exchange and learning between strategically positioned countries is a key element of project design."

Its four components were articulated as follows:

1. Identification and analysis of community initiatives in SLM (including M&E).
2. Stimulation and upscaling of community initiatives.
3. Awareness raising amongst policy makers.
4. Development of methodology for upscaling and institutionally embedding SLM initiatives.

SCI-SLM was targeted at the Global Environment Facility because of its dedicated focus on combatting land degradation through sustainable land management. The GEF's land degradation focal area came into being around the time of project formulation, and with SCI-SLM's emphasis on upscaling this made a perfect match with GEF-LDFA. The project document states:

> "The project fits with the new GEF-4 land degradation focal area strategy and will contribute to its strategic objective 2 (SO2) on "upscaling of sustainable land management investments that generate mutual benefits for the global environment and local livelihoods". The project will contribute to improving and sustaining the economic well-being of people and the preservation and / or restoration of ecosystem functions and services under different socio-economic conditions. SCI-SLM further emphasizes partnerships with small farmers – as part of communities - to identify and demonstrate, under field conditions, environmentally friendly and socio-economically viable land management practices that will enhance soil fertility and make more effective use of water. The activities of the project will primarily be carried out by recipient country research institutions and will be up-scaled within the four pilot countries. The project will also support the LDFA's strategic programme no. 1 'Supporting Sustainable Agriculture and Rangeland Management' and LDFA's strategic programme no. 3 'Investing in New and Innovative Approaches to SLM'."

GEF finance under the Land Degradation Focal Area requires that, alongside immediate local benefits of improved productivity, global environmental benefits are delivered, especially carbon sequestered in the land – in the soil and in living vegetation - through sustainable land management. Fortunately sustainable land management automatically delivers GEBs alongside local benefits: good SLM leads to a build-up in soil organic matter and greater primary productivity. Thus carbon is 'pumped' into the land making for better yields and less carbon dioxide in the atmosphere. While GWC focusses on water, it could *equally* be said that sustainable land management, designed to deliver GEBs, will also have a simultaneous and positive effect on water use efficiency. Here is one more reason why such a project would make a good match with a GWC initiative.

This paper will not pre-empt the findings of the book – which is (at time of writing; early 2015) still in preparation – but can at least say that (a) community initiatives in SLM were found in each of the countries; (b) there was very considerable interest when members of communities with their respective scientific/ academic facilitators travelled to the partner countries; and (c) in at least one country (Uganda) the methodology pioneered under SCI-SLM is the basis for the national SLM programme (Stephen Muwaya, *pers comm*.)

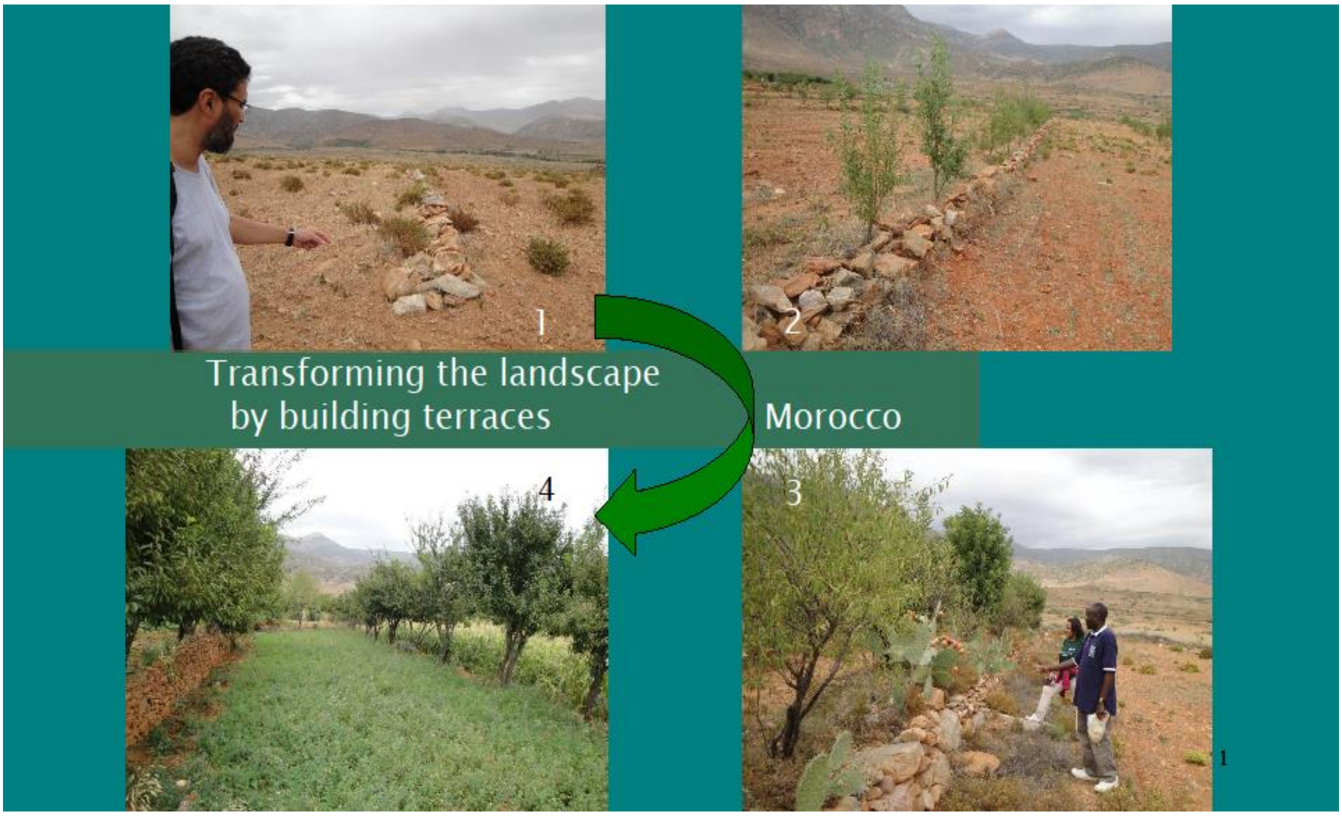


Figure Four. A community initiative in Morocco: rehabilitating degraded land through terracing in stages (1-3) and then irrigating (4) from a well – visitors from Uganda and South Africa pictured

(Source: W. Critchley, Sustainable Land Management course. VU-Amsterdam, 2014)

5. Participatory Extension Methodologies

As we have noted earlier, the first official research institutes characteristically had their own farms or research stations, and carried out controlled trials – usually according to the agenda and interests of the researchers themselves. Their research recommendations were then typically passed on to advisors within extension services – and then transmitted to farmers. This was through a top-down 'transfer of technology' (ToT) mechanism, with little or no feedback loop. This type of research and extension systems was exported by colonial regimes to tropical countries within their control.

However, ToT fails where there are no simple parameters to be investigated and no easy solutions to improve performance of agricultural systems. It is also (a) costly, (b) the researchers' own agenda and academic interests may not be relevant to the needs of farmers, and (c) extension staff then may not have a good or convincing enough supply of recommendations to pass on. The other important problem of ToT is that often the feedback loop, from farmers to researchers is weak or doesn't exist. Researchers then cannot, and do not, listen to farmers (see Figure Five).

Over the past few decades there have been various developments within research and extension (R&E). These have included the 'training and visit' extension systems and 'farming systems research and extension'. While these, and others, were appropriate in certain conditions, there has been a recent crisis in R&E in many countries – both developing and developed. This has been for various reasons including political changes, conflict, globalization, downsizing (mainly due to structural adjustment programmes), reduction in government expenditures and the drying up of aid and donor support for R&E. The last two decades have resulted in the emergence of participatory R&E methodologies (PR&E). In some countries there has also been a move towards demand-driven systems with emphasis on privatised service delivery and competitive grants to support the process.

A 2014 workshop at CIHEAM-Bari, Italy under the "Feeding Knowledge Programme" included, amongst a total of eight counties from the Mediterranean region, Tunisia and Morocco. It was clear that most of the countries were facing quite serious challenges in terms of their extension systems. Most had not yet made the transition to participatory systems, and funding was a constraint in all. The conclusions at the workshop were summarised as follows[6]:

- There is a transition/ evolution of extension services in all countries: one clear example is decentralization and "market oriented" approach.
- Another example of change (in most countries) is pluralism: extension coming from a variety of courses. The incorporation of the private sector in extension through public-private partnerships is especially prevalent.

[6] Proceeding of the workshop on National Extension Systems under the "Feeding Knowledge Programme" February 2014. CIHEAM-Bari, Italy (co-facilitated by W. Critchley)

- Surprisingly there is little articulated connection between extension and food security. More attention is given to market orientation – but the potential for this to undermine food security needs to be kept in mind.
- Another gap is climate change. No national extension service appears to have given adequate consideration to the potential impacts of a changing climate, and how the advisory series can help build resilience and adaptation capacity.
- ICT is very much in the ascendancy. All agree that it has currently, and will increasingly have, a role to play in extension management and delivery.
- The sharing of experience amongst the countries represented at the workshop is invaluable and has acted to stimulate reflection and the development of plans for the future.
- A reinforcement on traditional and innovative extension methodologies to find proper solutions to the faced challenges at this regard seems to be a primary need for the NES.

PR&E is part of a larger 'participatory development' movement towards involving farmers, livestock keepers and other end users in charting the course for their own development. PR&E is different from ToT because it (a) takes the end user's own priorities as a starting point and (b) they are involved in both research and extension. PR&E is especially important where ToT has failed to deliver significant goods and services, and has not led to the transformation of the sector or improvement in livelihoods. PR&E was first promoted by NGOs but has now become a mainstream approach in many countries.

As will be recollected from the discussions on farmer innovation, one of the most effective ways of disseminating technologies, and, just as importantly, ideas, is through farmer-to farmer exchange visits. Naturally these need to be guided by extension workers, but their role under this paradigm is to facilitate rather than dictate. One variation of farmer-to-farmer visits is the 'Farmer Field School'. Farmer Field Schools were devised (or rather named, as there have always been versions of them) in the 1980s with a specific target of promoting integrated pest management. They have been adopted and supported strongly by the Food and Agriculture Organisation (FAO). Their characteristics are summed up in Box Three and an example of a FFS in action is shown in Figure Six.

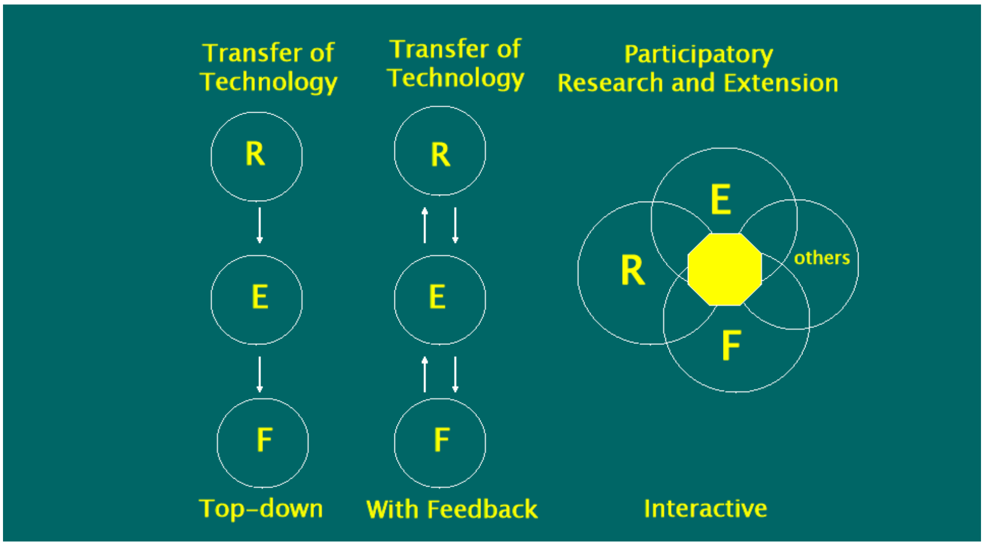


Figure Five. Comparing Transfer of Technology (ToT) with a Participatory Approach to Research and Extension (R = researcher/ E = Extension worker/ F = Farmer)
(Source: W. Critchley, Training Course on Research & Extension, CIHEAM-Bari, 2011)

Figure Six. A Farmer Field School in sub-Saharan Africa
(Source: W. Critchley, Training Course on Research & Extension, CIHEAM-Bari, 2011)

Box Three. Farmer Field Schools – a Summary of Points

(Source: W. Critchley, Training Course on Research & Extension, CIHEAM-Bari, 2011)

Background

- FFS = 'school without walls' for farmers
- non-formal adult education in the field over one season
- groups of people with a common interest
- they convene on a regular basis to study the 'how and why'
- emphasis on testing & validating technologies
- adapted to field study for hands-on skills & understanding

Details

- local group meets regularly (weekly) at 'host' farmer
- these groups may be specially formed, may be existing
- study plot within the field: also shaded area to sit
- facilitator guides school: usually extensionist who has received training (ToT)
- then a local FFS graduate
- (ToT) Training of Trainers (for facilitators) course usually takes about 14 days
- lessons are hands-on in the field, not lectures
- some presentations from members who have travelled
- curriculum: normally follows one full season from 'seed to seed' or 'egg to egg'
- SLM-oriented FFS may evolve into NRM/ catchment committees
- emphasis on testing and validation of technologies
- end of season members graduate and are given certificates

Process

- needs assessment of common interest groups
- Training of Trainers
- FFS participants volunteer
- site/ host farmer chosen
- FF School set-up
- weekly meetings over the season
- field days
- graduation and certificates awarded

Some issues

- cost and sustainability - may be up to $100 per member
- leadership: who coordinates national programme?
- what about institutionalisation and sustainability?
- does FFS fit into the national extension system?
- FFS are sometimes lacking technologies to test, so link to innovation system

6. Concluding discussion

The Green Water Credit pilot programme (in the Maghreb – as elsewhere) has not yet gone into details of how to improve and disseminate appropriate sustainable land management practices. The assumption has been that there are enough technologies 'on the shelf' – either locally available or accessible through the WOCAT database at www.wocat.net. From the extension aspect, the starting point will be the national extension programme – supported perhaps by NGOs buying into the process. Naturally uptake of practices is projected to be supported by the credits provided under the GWC process itself. It could also be surmised that the private sector – or whoever the downstream beneficiaries are – might also invest in technology development.

It is certainly true that at this stage the focus must be on the basic process of GWC, and acceptance of the concept. However, if, and when, a GWC initiative becomes active, it would be potentially profitable to look at the concepts raised in this paper: namely farmer and community innovation, as well as participatory extension methods including Farmer Field Schools. This is one way of adding extra value to GWC, and embedding it more firmly in the community, as well as tapping into local creativity. Over the next decade it is highly likely that there will be more international interest in these processes as methods to develop and spread SLM to increase resilience to climate change. GWC can learn from these experiences – and eventually benefit from them.

References

To be added