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**FAO LESOTHO  
EMERGENCY & RESILIENCE PROGRAMME  
MID TERM EVALUATION**



**12 March 2014**

Christo Fabricius, James Gambiza and Charlie Shackleton

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12 March 2014

## Disclaimer

The British Government's Department for International Development (DFID) financed this work as part of its contribution to FAO Lesotho Emergency and Resilience Programme (ERP) during the period 2012-2013. However, the views and recommendations contained in this report are those of the consultants. FAO and the ERP donors are not responsible for, or bound by the recommendations made.

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## 1. Executive summary

Our Terms of Reference were to conduct a mid-term assessment of the relevance, effectiveness, efficiency, impact and sustainability of the FAO Lesotho Emergency and Resilience programme, two years after its inception, using a social-ecological systems perspective.

We used a combination of desk-top studies, interviews with key informants, focus group discussions with farmers participating in the program, personal observations and synthesis over a period of 25 person-days from 12 January to 10 March 2014.

First, we conducted a formal programme evaluation, using the headings (section A):

- Programme relevance
- Programme effectiveness
- Programme efficiency
- Programme impact
- Programme sustainability:

Next, we used a resilience framework to assess eight characteristics of resilience proposed by Biggs et al. (2012) (section B):

- 1) **Social-ecological systems concept.** What does the whole system, with all its social, ecological and economic elements look like? Adopt a social-ecological systems viewpoint - strive to understand the whole system.
- 2) **Slow changes.** Which factors change slowly, but can have major impacts when crossing a tipping point? Look for slow changes, and feedbacks across scales
- 3) **Thresholds.** What evidence is there of past thresholds? Look for 'tipping points' in the main influencing factors
- 4) **Connectedness.** How connected, or disconnected, are the important influencing factors? How good are the connections between social and ecological, and between local and national? Assess the connectedness between social and ecological elements, as well as between ecological, and between social and their knock-on effects.
- 5) **Diversity.** How diverse are the livelihood strategies and production systems? Look for diversity of production systems, livelihood strategies, governance systems, institutions and social networks, not just productivity
- 6) **Learning and adaptive management.** How do the stakeholders learn together? How do they monitor change? Evaluate the level of learning and experimentation taking place
- 7) **Participation.** What is the level of participation? Find out how broad and inclusive participation is
- 8) **Livelihood assets.** How strong are the many types of 'capital' that make up a livelihood? View 'livelihoods' as multi-faceted.

Our assessment and recommendations are summarized below.

### A. PROGRAMME EVALUATION

#### Programme relevance

- The mission "*To support Basotho increase their resilience and recover from food and agricultural emergencies through integrated sustainable agriculture and natural resources management*" signals a tension between the objectives of emergency support, which is reactive, and building resilience, which is mostly proactive and forward-looking. The Emergency and Resilience Programme (ERP) has, however, been able to manage this tension exceptionally well.
- Resilience means not only *recovering* from shocks, but also the capacity to adapt, innovate and transform. The ERP has acknowledged this by focusing on the long term sustainability of the resource base, its numerous innovations and strong focus on training. A more appropriate wording would thus

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be “to increase the adaptive and innovation capacity” which is what the Programme in reality aims to achieve<sup>3</sup>.

- The Programme’s activities and outputs are entirely consistent with the triple goals of emergency support, strengthening the capacity for adaptation and innovation, and opening the doors to transformation and new beginnings.
- The Programme’s governance systems and processes have to comply with FAOs systems and processes. The Programme benefits from very supportive leadership, and our impressions were that there is a culture of learning, reflection, listening and adaptation at all levels. This accommodating style, coupled with strong attention to detail, has created the foundations for good governance in the Programme.
- An issue that needs to be addressed is continuity and job security amongst ERP staff. While this is not affecting their motivation levels, it does affect their ability to plan and continue with long term innovations.
- In our view, the ERP has the potential to become an example in FAO of linking the goals of short term emergency relief and long term adaptive and transformative capacity development. For that reason, it is recommended that FAO persists with this ‘experiment’ for as long as practically feasible.

### **Programme effectiveness**

- We found that all the programme objectives had been met, and some have been exceeded, e.g. the appointment and training of 600 Lead Farmers, and capacitating and training 530 MAFS officials and extension officers as well as chiefs and councillors. The delivery of training materials that would promote Conservation Agriculture across all role playing organizations also exceeded the stated goal. In short, the ERP could have delivered substantially less without having failed in achieving its objectives.
- Where targets were not achieved to the extent originally envisaged (e.g. unexpected poor performance of some batches of seeds provided by ERP in 2012; phasing in of fruit trees; training materials for home gardens; Land Cover Change assessment), this was due to factors beyond the Programme’s control, e.g. delivery, logistical and supply chain challenges; unavailability of funding; and unforeseen natural events such as droughts and pest outbreaks.

### **Programme efficiency**

- The Programme has received \$ 4.8 million and spent more than 99% of this allocation. This amounts to a full cost of just US\$260 per household, or \$52 / individual with an assumption of five people per household.
- Staff costs are a mere 10% of expenditure, and programme overheads are below 25% which is quite remarkable – in most community development programmes overheads can account for more than 50% of programme costs.
- The Programme is on track with achieving its objectives. The strategy to collaborate closely with MAFS and other NGOs, involvement of Lead Farmers as intermediaries, and linking its activities to agricultural resource centres has worked well.
- Resource centres could be more effectively used as demonstration sites and sources of information and training, other ministries could be drawn in, and academic institutions could be more directly involved in monitoring and innovation. This is something to consider for the next phase of the project.

### **Programme impact**

- The Programme has benefited 18 500 households and 92 500 individuals, trained 600 Lead Farmers and 530 extension officers, produced quality training materials for use by other role players.
- It has had positive impacts on 69 resource centres in 10 districts.
- It has established strong and functional links with MAFS, and is on track to have an important impact on how challenges of small-scale agriculture are being addressed in Lesotho.

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<sup>3</sup> This is not a criticism of the Programme but rather a call for clarity on the notion of ‘resilience’ in development.

- The Programme has moved beyond an emergency relief focus towards delivering long term benefits.
- Beneficiaries at all localities visited have informed us that the Programme has had a positive influence on their lives. Non-beneficiaries are not yet practicing CA, although this seems to be the case in villages where a large number of beneficiaries are involved. This suggests that 15 households per village might not be enough to create a broader impetus for CA, and that the aim should be to double this number.
- Spill over effects are evident in villages where FAO, MAFS and other NGOs (e.g. Catholic Relief Services) are active. The active involvement of extension officers and MAFS officials and collaboration with other NGOs can be seen as a spill-over effect.

#### **Programme sustainability**

- The question: “*will you continue with CA and home gardens after project inputs have ceased?*” was discussed with beneficiaries in all villages. All beneficiary groups unanimously agreed that they would continue with CA and home gardens, even when input support stops.
- The sustainability of the Programme will to a large extent hinge on its ability to draw in a critical mass of farmers who are able and willing to practice CA, and who are producing food from home gardens.
- Factors which could affect movement towards such a tipping points include:
  - The Programme’s ability to demonstrate meaningful improvements in crop yields, and to a lesser extent significant reduction in soil erosion
  - The buy-in and support of councillors and chiefs
  - The development of local rules to regulate livestock movements and areas open for cultivation
  - Continued support and buy-in of MAFS, across all directorates
  - The ability to secure follow-up funding
  - The phasing in of labour-saving technologies such as ox-drawn planters and mechanized scooping of hollows or ‘basins’ for planting.

#### **Recommended areas for research**

##### *Understanding and promoting the uptake of CA and home gardens*

1. Analysis of factors influencing the uptake and scaling up of conservation agriculture amongst a) smallholder farmers; and b) government officials, councillors and traditional leaders.

##### *Understanding and implementing thresholds and tipping points to sustainability*

2. Development of methods to assess slow changes in land cover, soil fertility, farmer capacity and governmental capacity.
3. Assessment of thresholds of potential concern in a) available productive land and b) soil fertility.
4. Development of simple and affordable methods to monitor and assess soil fertility and soil stability.
5. Assessment of the interaction, interdependence and competition between livestock, rangelands and crop fields in different agro-ecological zones in Lesotho.

##### *Understanding and implementing improved agricultural efficiency and sustainable livelihoods*

6. Development and testing of an adaptive management framework and adaptive strategies for agricultural sustainability through CA.
7. Evaluation of different crops and crop varieties in different agro-ecological contexts, with an emphasis on high-value, intensively cultivated crops with export potential, for example organic foods, aromatic oils.
8. Evaluation of intensive protected agriculture (e.g. greenhouses and drip irrigation) to increase yields and conserve natural resources.
9. Assessment of alternative livelihood strategies and opportunities to complement small-scale agriculture in rural areas in Lesotho, with an emphasis on community tourism and payments for ecosystem services.

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10. Assessment and development of mechanisms to improve small-holder farmers' marketing and access to markets.

*Documenting the impacts of conservation farming*

11. Assessment of the impact of land reclamation through conservation agriculture on rural livelihoods and people's quality of life in Lesotho.
12. Assessment of coarse scale decadal land cover change at national scales using remote sensing methods.
13. Assessment of local and district scale land cover change, at five year intervals, using a combination of aerial photographs, ground truthing and local knowledge.

*Promoting improved governance of natural resources*

14. Assessment, development and testing of Village Resource Management Plans (VRMPs) as workable multi-level governance systems to promote sustainable land management in communal farming areas in Lesotho.
15. Development of participatory monitoring systems, linked to adaptive management and VRMPs, for improved agricultural production.
16. Assessment of the potential of resource centres as focal points for demonstration, information, and technical knowledge about agriculture and livelihoods in rural areas.

*Developing capacity for sustainable land use*

17. Development of effective training and capacity development programmes for smallholder farmers and agriculture officials in Lesotho.
18. Development of systems and processes to monitor the impacts of capacity development programmes in rural smallholder agriculture in Lesotho.

## **B. RESILIENCE ASSESSMENT**

### **SOCIAL-ECOLOGICAL SYSTEMS PERSPECTIVE**

The ERP has successfully adopted a social-ecological systems approach, and has excelled at building the capacity of resource users, restoring natural resources, and working closely with public infrastructure providers (government officials and NGOs). The programme has been exceptionally good at building linkages with government officials at middle management level.

*Components of the system that should be strengthened include:*

- ..facilitating improved access of extension officers to facilities and equipment
- ..improvements to infrastructure at agricultural resource centres
- ..more attention to governance systems, in particular
  - improving the understanding of traditional leaders and councilors at village level of the threats of resource degradation, and getting their buy-in. While ERP started this effort in 2013 with the training of 600 lead farmers and local leaders, there still appears to be resistance and lack of understanding of this amongst traditional leaders and councilors in many villagers and
  - strengthening the institutional arrangements and leadership structures of the Conservation Agriculture teams.

*We suggest that the Programme:*

- ..strategically and consciously adopts a social-ecological systems framework, tailor-made for the local context

- 
- ..develops strategies and lobbies for support to enable the development of long term (5-10 year) resilience, adaptive capacity and transformability plans
  - ..attends to improvements in infrastructure at resource centres (solar electricity; piped water; meeting and training facilities), and allocates funding outside the ERP to this
  - ..raises funds to improve the access of agricultural extension officers to basic equipment especially internet access, electrification, and access to basic monitoring equipment (soil testing kits; tape measures; notebooks and filing systems to record and store data)
  - ..focuses on developing the governance capacity of CA farmers at village level, by promoting a programme of institutional development, e.g.
    - institutionalizing conservation agriculture associations at village level
    - registering these as legal entities
    - enabling them to function as cooperatives for purchasing, marketing, sharing of equipment and labour
    - facilitating the development of their legal frameworks and constitutions
  - ..gives attention to the development of Village Resource Management Plans (VRMPs)
    - done in a participatory manner
    - involving local farmers, extension officers, NGOs, and senior government officials
    - developing the capacity of extension officers to mobilize communities and groups
    - integrating crops, livestock and rangelands
    - adopting the VRMPs as formal rules for natural resource management. Examples are in **Appendix 6**.

### MANAGING SLOW CHANGES

Because of FAOs ‘emergency relief’ role, the Programme has severe constraints in managing slow changes. Despite this, the Programme has been remarkably good at implementing strategies that have an impact on the slow factors, particularly long term capacity development and its emphasis on improving the long term capacity of the soil. In two years the Programme has trained more than 530 extension staff and 600 lead farmers and provided training programmes to many other role players in the CA Task Force. This is a great achievement. The Programme is on track to implement a land cover change assessment, and here it is important not to view it as a snap-shot and to aim for continuous assessment e.g. every 5 years<sup>4</sup>.

*Areas for improvement or adaptation include:*

- ..implementing additional monitoring systems that can track the slow changes
- ..involving all stakeholders in data collection
- ..including rangeland improvements in the suite of interventions.

*We suggest the Programme:*

- ..implements a long term monitoring project, aimed specifically at tracking slow changes in
  - climate change (using secondary data);
  - availability of arable land per household;
  - percentage uptake of CA and home gardens;
  - soil fertility and moisture holding capacity, yields
  - people’s capacity to adapt and change
  - long term impacts of economic and environmental change on livelihood assets
- ..implements a data storage and management system
- ..obtains the buy-in and support of additional relevant government departments
- ..involves the local university and agricultural college in design and implementation
- ..incorporates participatory monitoring, where farmers assist in collecting the data.

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<sup>4</sup> Programme staff commented that 5 years might be too short. However, the authors believe it is important to conduct assessments at shorter intervals to enable adaptive management and reflection, particularly in view of the rapid rate of global change and rate of land cover change in Lesotho

- 
- ..continues its focus on restoring the long term capacity of the resource base through CA
  - ..includes rangeland management in its impact and implementation mix.

### **THRESHOLDS AND TIPPING POINTS**

The notion of tipping points in the slow variables are not very well understood and reflected in the Programme. The Programme has significantly improved its monitoring, has conducted a baseline survey and regularly reports on crop yields and uptake of technologies and evaluation of training, which is commendable. The monitoring programme is not, however, accompanied by a clear conceptualization of *thresholds of potential concern*, and therefore does not inform decision making. It is aimed at evaluating progress but not systematic reflection, anticipation of tipping points and adaptation to slow changes. It is e.g. particularly important to understand what the tipping point in availability of arable land is, when people start cultivating unsuitable steep slopes. Tipping points in soil organic content, when yields start slowing major improvements, are also poorly understood and require further thinking and research. From a social perspective, the tipping points in proportion of people practicing CA, and tipping points in the strength of governance need to be understood and incorporated in interventions. Regular assessments of Land Cover Change will assist with overcoming this problem, if it is preceded by a good understanding of thresholds.

*Areas for improvement include* the development of decision support systems that include thresholds of potential concern, and tipping points, as goals for decision making. The recommendations under 'Learning and Adaptive Management' will expand on this.

*We suggest the Programme:*

- ..defines 'thresholds of potential concern' in key influencing factors, i.e.
  - availability of arable land
  - soil organic content
  - proportion of villagers taking up CA
- ..commissions additional research to calibrate these thresholds, using a combination of computer models and data.
- ..monitors slow changes in national and global factors, as recommended in the previous section.

### **CONNECTEDNESS**

The Programme has been exceptionally good at fostering connections between the different role players in CA, through its role as secretariat of the CA Task Force at national level. It has also performed remarkably well in working with government officials, linking agricultural extension officers to Lead Farmers and beneficiaries, and in developing capacity at all levels.

The inclusion of Lead Farmers and the training of 600 of them together with chiefs as role models is a significant innovation in the ERP. The structure of extension officers, lead farmers and village CA teams seems to work well.

Connectedness at the local level, despite the constraints of infrastructure and communication, is remarkably good. The Programme has performed well at promoting communication and information flow through its information sheets and training materials, which are excellent and therefore widely used. Connections and information flow between beneficiaries are very good and they have a strong sense of belonging.

CA is ideal to manage and restore ecological connectedness by improving the ecological functioning of the soil, connecting crop production to soil quality and soil moisture, and making the links between social and ecological components of the system.

*Areas for possible improvement include:*

- 
- ..strengthening the connections between conventional farmers, traditional leaders, councilors and CA farmers through village information days, and by facilitating the development of VRMPs as described earlier
  - ..strengthening connections between livestock management, rangelands and crop production
  - ..emphasizing the importance of connectedness in its extension programmes
  - ..strengthening the links between home gardens and CA fields in extension work and training, and view home gardens and CA as linked components of the same intervention rather than separate interventions.

*We suggest the Programme:*

- ..continues to develop its information materials by providing larger posters, in laminated form, to resource centres and developing the communication facilities and infrastructure at resource centres. It is understood that the Programme has already started making progress with this and that posters will be distributed soon
- ..continues with its helpful secretariat role in the CA Task Force
- ..proactively seeks stronger functional collaboration with other stakeholders, in particular NGOs, but also with MAFS, at a practical implementation level. This has relevance to the tipping point in the number of people involved in CA at village levels, and the need to establish a 'critical mass' of beneficiaries in each village
- ..aims to improve the linkages between home gardens, crop fields, rangeland management and livestock in future initiatives
- ..looks at ways to connect local people to markets for their products, and look into the possibilities of village cooperatives as elements of Village Resource Management Plans (VRMPs).

#### **DIVERSITY**

The Programme clearly recognizes the importance of diversity, and has strived to promote crop diversity, soil biodiversity and social diversity into its programme design. The diversity of seeds provided for home gardens is laudable. The Programme's collaboration and linkages with a variety of role players is one of its strengths, and from a stakeholder diversity point of view the inclusion of Lead Farmers as role models is a significant achievement. There are no major shortcomings, and yet there are several areas for possible improvement.

*Areas for improvement include:*

- ..striving to diversify the mix of beneficiaries, to also include established farmers who are not amongst the most destitute. They could act as role models for others, and supplement the 'role model' function of Lead Farmers (see above and under 'Connectedness')
- ..including a broader range of livelihood strategies (not only farming) in its interventions by forming links with NGOs who are mandated to work beyond agriculture
- ..diversifying interventions to include livestock and rangeland management.

*We suggest the Programme:*

- ..continues to consider diversity and not just productivity and yields in its interventions
- ..continues to work with a range of stakeholders
- ..explores links with NGOs mandated to work in economic development fields, to broaden village interventions beyond agriculture in an effort to diversify livelihood strategies
- ..diversifies the beneficiaries by, in addition to the Lead Farmers, including additional established farmers in each group
- ..diversifies its interventions, to include livestock, rangelands and animal health
- ..explores the possibility to diversity not only the types of crops being promoted, but also the seed varieties. It may, for example, be advisable to include a portion (40%) of drought resistant hybrid maize seeds in the package of seeds provided, while maintaining 60% OPV seeds. This will depend on FAOs flexibility in its policies.

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## LEARNING AND ADAPTIVE MANAGEMENT

Due to its mandate to provide emergency relief, the Programme faces challenges to optimally implement adaptive management, which requires time. Despite these constraints, the Programme is exceptionally adaptive and is characterized by learning and reflection and it is clear that FAO Lesotho has made an effort to improve monitoring and evaluation activities within the frame of ERP. Baseline studies have been conducted, questionnaires reviewed to provide a more comprehensive understanding, staff trained and a four-year cycle of follow implemented to track the evolution of ERP impact (should funding be available). Examples of adaptability in practice include changing seed varieties in response to reports from the field, quickly mobilizing pest control programmes, experimenting with cover crops, and adapting information materials to suit local needs. The Programme has also welcomed the fact that some farmers have used a portion of their seed allocations for conventional agriculture, because this allows farmers to experiment and compare. There are also unavoidable constraints in the availability of seeds, and FAOs procurement policies, which are hampering adaptive management. There are however a few areas for potential improvement:

*Areas for improvement include:*

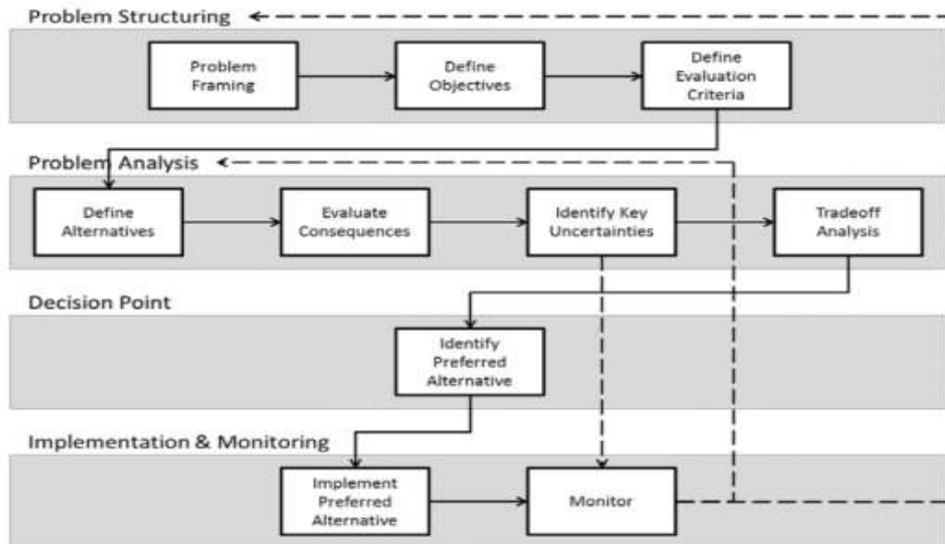
- ..strengthen the culture of experimentation, learning and reflection by more regularly and informally reflecting on good and bad practices, and consulting with local farmers and extension officers about these. This is in addition to the formal M&E cycle and will require an explicit mandate from FAO to be experimental
- ..setting targets, thresholds of potential concern, and implementing monitoring programmes to inform decisions<sup>5</sup>
- ..monitoring outcomes of capacity development more carefully and in a more focused manner by setting thresholds of potential concern, indicators and actions up front.
- ..promoting experimentation at resource centres, which can be used as learning and demonstration sites.

*We suggest the Programme:*

- ..continues to encourage farmers to experiment with different approaches and seed varieties
- ..builds a stronger and more targeted and deliberate learning cycle and '*structured decision making*' into its programmes, using the adaptive management framework: setting targets and TCPs-> implementation -> monitoring -> reflection -> learning -> adaptation -> implementation (see figure below). Designing and describing a systematic adaptive management project falls beyond the scope of this report and should be the topic of a more in-depth investigation. An example of a structured decision making framework (Marcot 2011) is copied below.

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<sup>5</sup> Programme staff have questioned whether the existing M&E programme hasn't already to some extent covered this aspect. The authors believe that, while this is to some extent true, the adaptive management component could be significantly strengthened beyond just M&E. We have not seen evidence of thresholds of potential concern being defined up front and believe this could improve the practice of adaptive management. If necessary, a training course in the principles of adaptive management of social-ecological systems, or separate action research project, may be necessary.



- ..investigates the possibility of setting up trials and demonstration plots at resource centres, in collaboration with extension officers. Buy-in and prior commitment from the Department to maintain these trials would be essential
- ..adapts its evaluation methods of training programmes, to enable it to learn from participants' responses about programme content that works and doesn't work.

### **PARTICIPATION**

Participation is one of the Programme's strengths, and is evident at every level, from the village to head offices in the Ministry. While participation is mostly active, the level of participation varies. At the village level this is to be expected because people still view the Programme as an emergency relief intervention and to a large extent see themselves as beneficiaries, which is unavoidable in a programme of this nature.

*Areas for improvement include:*

- ..encouraging more functional participation at village level and by extension officers in the design of the programme
- ..monitor the level of active, functional participation by all stakeholders.

*We suggest the Programme:*

- ..establishes participatory monitoring programmes to promote more functional participation by farmers and extension officers
- ..involves villagers in participatory mapping exercises to monitor land cover at the village level
- ..provide facilitators and extension with training in Participatory Learning and Action methods
- ..involves beneficiaries when making changes to programme design or implementing innovations, aided by the institutionalization of village CA associations and VRMPs (see previous section).

### **LIVELIHOOD ASSETS**

Envisioning livelihood assets as a portfolio or bundle, consisting of natural capital, financial capital, social capital, human capital and physical capital is a potential innovation for the Programme. These capitals change over time, and the goal of development is to grow all of them together.

In this Programme, the emphasis is on natural and human capital development, and to some extent social capital through the development of CA teams. The other capitals, especially financial and physical capital, are not as well developed with less of an emphasis in the Programme.

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We suggest the Programme:

- ..looks at ways to strengthen physical and financial capital amongst beneficiaries
  - ..e.g.:
    - loans to purchase machinery such as ox-drawn planters
    - consider loans to fence off CA fields. Solar-powered electric fences have been used in the commercial sector, but this brings new risks such as vandalism and theft
    - strengthening the training and communications infrastructure at agricultural resource centres
    - training in money management skills
    - working with government and postal services to set up savings schemes for beneficiaries
    - promoting the formation of savings cooperatives
    - assistance with setting up village cooperatives to strengthen people's collective marketing and buying power
    - making bursaries available for deserving villagers to study agriculture.
  - ..constantly explores ways to gradually move away from assistance and donations, to loans and long term capacity development.
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## 2. Introduction and background

FAO Lesotho, under its Emergency and Resilience Programme, has adopted a programme to mainstream the adoption of climate smart agricultural practices. The programme consists of five elements:

- Conservation Agriculture (CA)
- Home Gardening
- Nutrition and Food Use awareness
- Agro-forestry (fruit trees) – initially included in the design but no funds received for its implementation
- Rangeland Management awareness – foreseen for inclusion during 2014.

Cutting across these five elements, is a capacity development initiative, and the building of good working relations with other role players, including the Ministry of Agriculture and Forestry Services (MAFS).

More details about the programme are provided in **Appendix 1** (Terms of Reference).

The programme has now completed Year 2, and the authors were approached to conduct a mid term evaluation, taking into account:

- the attainment of objectives and planned results;
- assessment of sustainability of project results;
- achievement of outputs and activities;
- assessment of monitoring and evaluation systems; and
- assessment of processes that affected attainment of project results (coordination support, country ownership, stakeholder involvement, financial planning and delays).

In addition, we were tasked with recommending possible improvements to the programme, building on its existing strengths, focusing particularly on aspects that could affect community resilience. Programme staff stated that they were eager to learn from the evaluation, not only about the strengths of the programme and areas for improvement, but also about agricultural resilience in general.

The team spent a total of 25 person-days on the project. Activities included a field mission with FAO staff and a Ministry of Agriculture and Food Security (MAFS) official from 13-17 January 2014 (see itinerary in **Appendix 2**); assessment of relevant literature on Lesotho in general, and FAO's programmes in particular (57 reports, books and academic papers); synthesis; and report writing.

## 3. Methods

We used a combination of desk-top studies, interviews with key informants, focus group discussions with farmers participating in the program, and personal observations.

### 3.1 Key informant interviews

Key informants included

- four senior officials in the Ministry of Agriculture and Food Security

- two directors of NGOs working in the food security field in Lesotho
- two District Agricultural Officers (DAOs)
- eight extension officers and technical advisors
- six focus groups of 16-18 farmers each in the Thaba Tseka and Leribe districts, covering three agro-ecological zones: Mountains, Lowlands and Senqu Valley
- one Lead Farmer
- two FAO programme staff members, including the Coordinator.

Interviews and focus group discussions were semi-structured and open-ended, using a check-list to ensure that the key elements of the evaluation were covered. Where necessary, questions were used to prompt respondents. Questions were as open-ended as possible, to avoid them influencing participants' responses. Leading questions, and questions requiring only 'yes/no' answers were avoided.

Typical questions are included in **Appendix 3**.

### 3.2 Conceptual lens

We adopted the general principles of resilience, explained and outlined in **Appendix 4**. Our lens, or conceptual perspective, through which we assessed the project has eight elements (Table 1). These are also incorporated in a draft Resilience Dashboard which is under development and has been shared with FAO.

**Table 1. The eight elements of our conceptual lens**

Conceptual element	Explanation	Example
1) <b>Social-ecological systems concept.</b> What does the whole system, with all its social, ecological and economic elements look like? Adopt a social-ecological systems viewpoint - strive to understand the whole system rather than single components in isolation.	The resource base, resource users, their governance systems and institutions, public infrastructure and public infrastructure providers are all part of the same complex adaptive system, and constantly interact and influence each other.	For example, local norms and practices interact with government policies and projects (governance systems and institutions). These are connected to officials, international agencies and NGOs (public infrastructure providers) who provide roads and water, resource centres, and support services (public infrastructure). Rangelands, crops, water and soil (the resource base) are positively or negatively affected by governance systems, institutions, public infrastructure, public infrastructure providers and of course the behavior of farmers (the resource users). All these factors interact and influence each other, and these influences can change in many different directions over time.
2) <b>Assessing the slow changes.</b> Which factors or components change slowly, but can have major impacts when crossing a tipping point? Look for slow changes, and feedbacks across scales	Many influencing factors that may change slowly, but which may have profound and rapid impacts on local livelihoods when they reach a critical level. Events and processes happening at national and international levels interact with local processes, and events that happened in the past may still linger on as 'memory' of the social-ecological system.	For example, agricultural input costs are affected by international demands and the price of fossil fuel, and commodity prices by national and international demand. This influences the prices farmers get for their produce, which affects local livelihoods. Soil erosion which happens locally may influence the viability of large dams, through siltation, which affects water security nationally and internationally. National policies and guidelines affect what people may or may not do, and determine the quality of extension services, which affect local production

		systems. Local people's health and ability to work is affected by the HIV/AIDS epidemic, and the number of people in a village is affected by migration of e.g. labourers from South African mines, as well as local death and birth rates. This in turn influences the pressure on the local, regional and national resource base.
3) <b>Thresholds.</b> What evidence is there of past thresholds? Look for 'tipping points' in the main influencing factors	Thresholds are points of no return, beyond which change is rapid and often irreversible. Tipping points become evident when slow variables go beyond or below a critical value.	For example, the onset of rain may gradually become later and later under climate change until a threshold is reached, where most of the rain comes too late for farming with maize to be possible. This will necessitate a rapid shift to other staple crops. Soil degradation is another factor which doesn't change overnight, but when it has reached a certain threshold, crop production decreases sharply because people are forced to use unsuitable areas for their fields. The quality of agricultural extension services, affected by government budget allocations, may also reach a threshold whereafter production and livelihoods decline sharply.
4) <b>Connectedness.</b> How connected, or disconnected, are the important influencing factors? How good are the connections between social and ecological, and between local and national? Assess the connectedness between social and ecological elements, as well as between ecological, and between social and their knock-on effects.	Connectedness means how good information or other forms of capital 'flow' within the system, at the local level but also between international, national and local	In systems where connectedness is high, people are directly involved in managing the resource base, constantly monitor change and are 'in touch' with ecological changes. Connected social systems means that knowledge and information flows rapidly through the system, people readily assist each other and institutions and governance systems are well supported.
5) <b>Diversity.</b> How diverse are the livelihood strategies, support systems and production systems? Look for diversity of production systems, livelihood strategies, governance systems, institutions and social networks, not just productivity	While productivity and maximum sustainable yield remains a valid objective in agricultural systems, putting all resources into a small number of options creates vulnerability to droughts, sudden market fluctuations, pest outbreaks and availability of labour	For example, people plant several types of crop and seldom farm only with crops, or only with livestock and plant several types of crops at once, or own several livestock types. In addition, households augment and broaden their earnings through remittances, informal trade or jobs. At a community or higher scale, there is a diversity of opportunities.
6) <b>Learning and adaptive management.</b> How do the stakeholders learn together? How do they monitor and adapt to change? Evaluate the level of learning and experimentation taking place	Learning and experimentation promotes adaptive management, a well recognized way to manage complex systems. This involves monitoring, regular reflection on current practices, adapting conventional ways of doing things, trial and error and constantly taking note of lessons learnt.	Farmers for example change crop types when seasonal weather changes are predicted, assess how a particular seed is performing under given conditions, learn from that and use that information to inform the next planting cycle, and experiment with different types of livestock. Adaptations can be immediate, or can take place over several generations.
7) <b>Participation.</b> What is the level of participation? Find out how broad and inclusive participation is	Participation means people are not just receiving information, but also participate in generating and testing the usefulness of this information. People are not just consulted,	Passive participation is when people receive information, or are merely consulted. Active consultation is when people provide feedback, and when information is modified in response to their input. Functional participation is when solutions are co-

	but are actively involved in generating solutions	created, experiments and monitoring systems are jointly designed, and solutions are modified and adapted in response.
8) <b>Livelihood assets.</b> How strong are the many types of 'capital' that make up a livelihood? View 'livelihoods' as multi-faceted.	Livelihoods consist of at least five types of 'capital', namely natural, financial, human, social, and physical. These five capitals are of course seldom static and change over time. They also influence each other through feedbacks, but a sustainable and resilient livelihood has sufficient endowments across most of the five forms.	Natural capital: soils, water, crops, rangelands, livestock and wild animals Financial capital: assets that can be sold, bank balances or cash Human capital: people's skills, their capacity to work, and their capacity to make decisions and take action Social capital: the relationships between people, the sense of community, and people's willingness to help each other and work together Physical capital: infrastructure such as roads, buildings, water pipes, bridges, electricity.

### 3.3 Literature review

We received a baseline report and two monitoring and evaluation reports from FAO, and then trawled the literature for articles, books and reports on agriculture and Lesotho, as well as the general social history of Lesotho. The full list of references is in **Appendix 5**. Rather than including a separate literature review in the report, we chose to integrate our primary data with information gathered from the literature. The findings therefore consist of a combination of primary and secondary information. For ease of reading we chose not to include in-text references, except in Appendix 4.

## 4. Findings

### A. PROGRAMME EVALUATION

#### Programme relevance

The mission *"To support Basotho increase their resilience and recover from food and agricultural emergencies through integrated sustainable agriculture and natural resources management"* signals a tension between the objectives of emergency support, which is reactive, and building resilience, which is mostly proactive and forward-looking. The Programme has coped remarkably well in addressing both objectives.

The use of 'resilience' signals a goal to 'recover' or 'bounce back', whereas the real challenge in the target communities is to 'bounce forward' by transforming existing practices as reflected in the Programme's focus and activities. Resilience means not only *recovering* from shocks, but also the capacity to adapt, innovate and transform. The Programme acknowledges this by focusing on the long term sustainability of the resource base, its numerous innovations and strong focus on training. In that sense, it aims for transformation and innovation rather than merely recovery and coping. A more appropriate wording would thus be *"to increase the adaptive and innovation capacity"*. This is what the Programme in reality aims to achieve<sup>6</sup>.

Areas for improvement are summarized in the Resilience Assessment section of the report.

The Programme's activities and outputs are entirely consistent with the dual goals of emergency support, strengthening the capacity for adaptation and innovation, and opening the doors to transformation and new beginnings.

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<sup>6</sup> This is not a criticism of the Programme but rather a call for clarity on the notion of 'resilience' in development.

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*Emergency relief and capacity to recover* – the Programme has provided seeds, fertilizers and training to 18 500 farmers which includes open pollinated varieties (OPVs) of maize and beans (5kg each per family), fertilizers (NPK and LAN – 50 kg each per family) and vegetable seeds (6 varieties – 100 grams each per family) in year 1, and wheat (25 kg per family) and grazing vetch seeds (7kg per family) in year 2, as cover crops.

*Capacity development* - The programme has targeted 69 resource centres in 10 districts and have trained more than 530 extension staff, including 330 in control of army work infestations. These people have trained 600 lead farmers, local councillors and chiefs. FAO and MAFS conducted additional training on armyworm control for 150 extension staff and 57 community representatives (including community-based early warning systems) for one week. The project also trained formally, through selected trainers, 600 community leaders and farmers. Extension officers reached 80% of ERP beneficiaries in the 2012-2013 season.

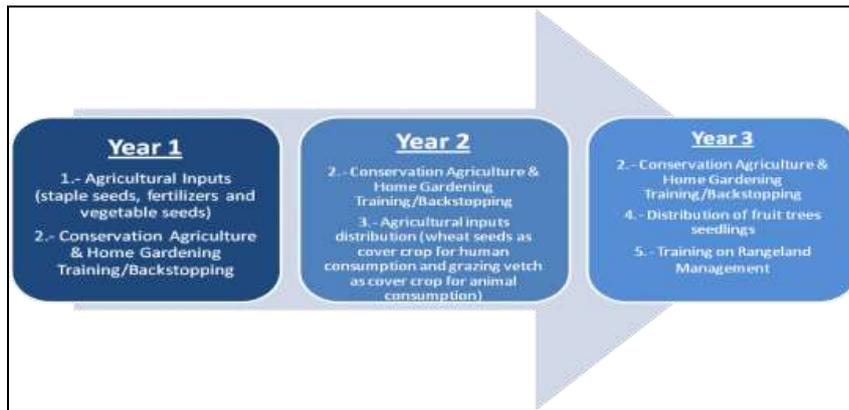
*Capacity for transformation and new beginnings* – the Programme’s focus on conservation agriculture and home gardens holds potential to transform agriculture in Lesotho. The efforts to scale up these efforts by working closely with government and other NGOs signals that these efforts, if continued, could contribute to a major shift in the way food is produced in Lesotho.

The Programme’s governance systems and processes have to comply with FAOs systems and processes. This necessarily creates constraints in flexibility and autonomy, which is unavoidable. The Programme benefits from very supportive leadership, and our impressions were that there is a culture of learning, reflection, listening and adaptation at all levels. This accommodating style, coupled with strong attention to detail, has created the foundations for good governance in the Programme. There are challenges related to the technical capacity of programme staff, and these are being developed through training. An issue that needs to be addressed is continuity and job security amongst programme staff. While this is not affecting their motivation levels, it does affect their ability to plan ahead.

In our view, the ERP has the potential to become a working example in FAO of the possibilities to address the dual goals of short term emergency relief, and building long term adaptive and transformative capacity in rural communities.

### **Programme effectiveness**

The programme’s objectives are summarized in Figure 1. The provision of training materials for home gardening, fruit trees for agroforestry, and conducting land cover assessment are subject to successful fund-raising for these activities. We found that all the stated objectives had been met, and some have been exceeded, e.g. the appointment and training of 600 Lead Farmers, and capacitating and training 530 MAFS officials and extension officers as well as chiefs and councillors. The delivery of training materials that would promote Conservation Agriculture across all role playing organizations also exceeded the stated goal. In short, the ERP could have delivered substantially less without having failed in achieving its objectives.



**Figure 1. Objectives of FAO Emergency and Resilience Programme (source: FAO ERP Terms of Reference)**

Where targets could not be achieved to the extent originally envisaged (e.g. training materials for home gardening; delivery of fruit tree seedlings; land cover change assessment), this was due to unavailability of funding, delivery of unsuitable inputs and unforeseen events such as pest outbreaks. Over-all, given the capacity challenges of its partners in government, the Programme has been remarkably efficient at meeting its targets. The dedication of Programme staff has played an important role in that regard.

### **Programme efficiency**

The Programme has received \$ 4.8 million and spent more than 99% of this allocation. This amounts to a full cost of just US\$260 per household, or \$52 / individual with an assumption of five people per household. This excludes the 900 officials and lead farmers who have benefited from training. Staff costs are a mere 10% of expenditure, and programme overheads are below 25% which is quite remarkable – in most community development programmes overheads can account for more than 50% of programme costs. Expenditure on training has marginally increased from year 1 to year 2 which is a good sign.

The Programme’s challenge is to gradually move away from direct support to more indirect support, and this is acknowledged in the programme. A potential improvement is to allocate a larger portion of the budget to monitoring, experimentation and learning through adaptive management.

The Programme is on track with achieving its objectives. Challenges such as unplanned pest outbreaks, delivery of unsuitable seeds and late arrival of inputs are dealt with adaptively. The Programme’s strategy to collaborate closely with MAFS and other NGOs, involvement of Lead Farmers as intermediaries, and linking its activities to agricultural resource centres has worked well. Resource centres could be more effectively used as demonstration sites and sources of information and training, other ministries could be drawn in, and academic institutions could be more directly involved in monitoring. This is something to consider for the next phase of the project,

### **Programme impact**

The Programme has benefited 18 500 households and 92 500 individuals, trained 600 Lead Farmers and 530 extension officers, produced quality training materials for use by other role players. It has had impact on 69 resource centres in 10 districts. It has established strong and functional links with MAFS, and is on track to have an important impact on the way small-scale agriculture is being developed in Lesotho. The Programme has moved beyond an emergency relief focus to having long term benefits.

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Beneficiaries at all localities visited have informed us that the Programme has had a positive influence on their well-being. The post-harvest report indicates that yields (Kg / Ha) in Conservation Agriculture fields are 264 Kg/ Ha compared to 130 Kg/Ha in conventionally cultivated fields. The exception is in the mountains, where yields in CA fields are lower than in conventional fields. Reasons for this require further investigation. Respondents cited weather-related factors and improved inputs as reasons, with a minority ascribing increases to Conservation Agriculture. Non-beneficiaries are not yet converting fields to CA although this seems to be the case in villages where a large number of farmers are practicing CA. This suggests that 15 households per village might not be enough to create a broader impetus for CA, and that the aim should be to double this number. Spill over effects are evident in villages where FAO, MAFS and other NGOs (e.g. Catholic Relief Services) are active. The active involvement of extension officers and MAFS officials can be seen as a spill-over effect.

### **Programme sustainability**

The question: “*will you continue with CA and home gardens after project inputs have ceased?*” was discussed with beneficiaries in all villages. All beneficiary groups unanimously agreed that they would continue with CA and home gardens, even when input support ceases. Beneficiaries asked for more training and technical support, including site visits, rather than more inputs, which is a positive signal.

The sustainability of the Programme will to a large extent hinge on its ability to draw in a critical mass of farmers who are able and willing to practice CA, and who are producing food from home gardens. A ‘tipping point’ needs to be achieved, where at least 20% of farmers are to some extent involved in these practices, for agricultural transformation through CA and home gardens to ‘take off’ and become popular. In our assessment, 15 farmers per village, especially if these are struggling farmers from the outset, is unlikely to achieve this. Factors which could affect movement towards such a tipping point include:

- The Programme’s ability to demonstrate meaningful improvements in crop yields, and to a lesser extent significant reduction in soil erosion
- The buy-in and support of councillors and chiefs
- The development of local rules to regulate livestock movements, and areas which are allowed to be cultivated
- Continued support and buy-in of MAFS, across all directorates
- The ability to secure follow-up funding
- The phasing in of labour-saving technologies such as ox-drawn planters and mechanized scooping of hollows / basins.

### **Recommended areas for research**

#### *Understanding and promoting the uptake of CA and home gardens*

1. Analysis of factors influencing the uptake and scaling up of conservation agriculture amongst a) smallholder farmers; and b) government officials, councillors and traditional leaders.

#### *Understanding and implementing thresholds and tipping points to sustainability*

2. Development of methods to assess slow changes in land cover, soil fertility, farmer capacity and governmental capacity.
3. Assessment of thresholds of potential concern in a) available productive land and b) soil fertility.

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4. Development of simple and affordable methods to monitor and assess soil fertility and soil stability.
  5. Assessment of the interaction, interdependence and competition between livestock, rangelands and crop fields in different agro-ecological zones in Lesotho.

*Understanding and implementing improved agricultural efficiency and sustainable livelihoods*

6. Development and testing of an adaptive management framework and adaptive strategies for agricultural sustainability through CA.
7. Evaluation of different crops and crop varieties in different agro-ecological contexts, with an emphasis on high-value, intensively cultivated crops with export potential, for example organic foods, aromatic oils.
8. Evaluation of intensive protected agriculture (e.g. greenhouses and drip irrigation) to increase yields and conserve natural resources.
9. Assessment of alternative livelihood strategies and opportunities to complement small-scale agriculture in rural areas in Lesotho, with an emphasis on community tourism and payments for ecosystem services.
10. Assessment and development of mechanisms to improve small-holder farmers' marketing and access to markets.

*Documenting the impacts of conservation farming*

11. Assessment of the impact of land reclamation through conservation agriculture on rural livelihoods and people's quality of life in Lesotho.
12. Assessment of coarse scale decadal land cover change at national scales using remote sensing methods.
13. Assessment of local and district scale land cover change, at five year intervals, using a combination of aerial photographs, ground truthing and local knowledge.

*Promoting improved governance of natural resources*

14. Assessment, development and testing of Village Resource Management Plans (VRMPs) as workable multi-level governance systems to promote sustainable land management in communal farming areas in Lesotho.
15. Development of participatory monitoring systems, linked to adaptive management and VRMPs, for improved agricultural production.
16. Assessment of the potential of resource centres as focal points for demonstration, information, and technical knowledge about agriculture and livelihoods in rural areas.

*Developing capacity for sustainable land use*

17. Development of effective training and capacity development programmes for smallholder farmers and agriculture officials in Lesotho.
18. Development of systems and processes to monitor the impacts of capacity development programmes in rural smallholder agriculture in Lesotho.

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## B. RESILIENCE ASSESSMENT

### 4.1 Social-ecological systems concept

The resource base, resource users, their governance systems and institutions, public infrastructure and public infrastructure providers are all part of the same complex adaptive system, and constantly interact and influence each other. For example, local norms and practices interact with government policies and projects (governance systems and institutions). These are connected to officials, international agencies and NGOs (public infrastructure providers) who provide roads and water, resource centres, and support services (public infrastructure). Rangelands, crops, water and soil (the resource base) are positively or negatively affected by governance systems, institutions, public infrastructure, public infrastructure providers and of course the behavior of farmers (the resource users). All these factors interact and influence each other, and these influences can change in many different directions over time.

Agriculture, food security and resilience in Lesotho can be conceptualized as having five linked elements (see Appendix 4):

#### **Resource users**

In the case of this report, resource users are the primary role players: farmers participating in the Emergency and Resilience Programme, i.e. 18 500 families supported in the ERP who receive an integrated package of conservation agriculture, home garden and nutritional support. Major characteristics of the resource users, particularly the beneficiaries in this project, are:

- They are poor in four of the five capitals (financial – cash flow problems and lack of capital to invest; natural – limited access to land, livestock, seeds, arable soils; physical – limited access to equipment; human – shortage of healthy and skilled labour). Thanks to the Programme's focus on groups, social capital within the groups is being strengthened, but less so between them and other villagers.

*"Our highlight is to work in small groups"*(CA farmer, Liphakoeng village)

- They have a high level of awareness of the benefits of CA and home gardening, and, thanks to the Programme, the threats of resource degradation.
- They are motivated to improve their livelihoods
- They are willing to innovate and experiment with new methods such as CA, but are lacking certain critical assets such as finances, animal traction, mechanized implements, and access to markets.

*"We learn when we work together in groups"*

*"Government should take us on study tours and exchange visits so we can see what others are doing"* (CA group, Liphakoeng village)

- They are actively involved, but don't yet feel completely empowered to implement all the elements of CA

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*“Since we did not do so well with CA last season, we reduced our CA fields. But now we are ready to expand again” (CA farmer, Liphakoeng Village)<sup>7</sup>*

- They are hard working and motivated.

Key factors that are within their ability to influence are:

1. Their choice of production systems – crop and livestock selection; modes and methods of farming; use of available labour and technologies
2. Their diversity of livelihood strategies
3. Their risk perceptions, and perceptions of their adaptive capacity
4. Their social networks and social capital
5. Their own social institutions, i.e. the codes of conduct within the CA teams.

External factors, which are difficult to control (in order of manageability):

1. Soil fertility – nutrient content and rain use efficiency
2. Availability of equipment and animal traction
3. The number of livelihood options available to them, to choose from
4. Availability of on-farm labour
5. Health
6. Climate (rainfall amount, timing and intensity; frequency and intensity of cold spells and snow; extreme temperatures)
7. Local population density
8. Local governance systems and social institutions at the level of the village and beyond
9. Agricultural input costs
10. Availability of skills development programmes, and quality of extension services
11. Financial and material assistance from government and NGOs.

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<sup>7</sup> This comment might be related to the unexpected poor performance of some batches of seeds provided by ERP in 2012, leading to redistribution of improved varieties in 2013 among those communities affected

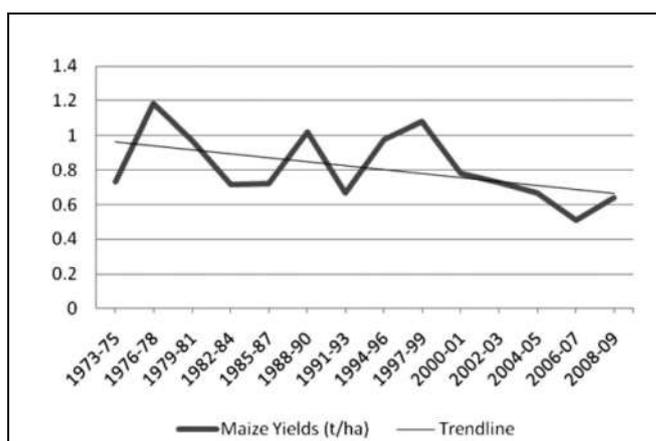


**The ERP not only benefits direct resource users, but also their extended families of up to five members per household. This means that the involvement of 18 500 farmers could result in livelihood improvements to 92500 people, almost 21% of Lesotho’s rural population and 5% of its total population**

### **Resources**

Key resources are soils, water, livestock and crops, including seeds. Key characteristics are:

- Climatic extremes, becoming more variable and unpredictable
  - o Relatively high (mean of 700 mm/annum), but highly variable rainfall with frequent droughts and floods
  - o Extreme temperatures, especially extreme cold in the mountains and extreme heat in the low-lying areas
  - o Relatively abundant ground water in the form of springs and streams, although these frequently dry up
  - o Despite relatively abundant water, most farmers are reliant on rain-fed systems, with very little irrigation agriculture
  - o Negative trends in the suitability of climate and soils for current agricultural practices
- Erodible soils
- A history of land degradation and erosion
- Steep slopes with relatively few plains and valley bottoms
- Outdated cultivars and livestock breeds that may not be suitable for contemporary challenges.
- A gradual reduction in yields (Fig. 2).



**Figure 2. Maize yields in Lesotho, 1973 -2009 (Source: Silici et al. 2011)**

These factors are influenced (in order of manageability) by

1. Current farming strategies and practices, for example the use of CA (see Table 2 for contrasting yields)
2. Resource use intensity
3. Climate
4. Disease and pest outbreaks
5. Inherent characteristics of the resource base, e.g. topography, climate, soil structure and soil nutrient content
6. Availability / accessibility of technologies
7. Historical land use practices.

**Table 2. Impact of CA (*likoti*) on district average yields, 2005/2006 agricultural production season (Source: Silici et al. 2011).**

Location	Number of observations		Average yield (t/ha)	
	Likoti	Ploughed	Likoti	Ploughed
Makhoakhoeng (Butha-Buthe)	14	15	1.36	0.87
Tebellong and Tsoelike (Qacha's Nek)	21	n/a	0.73	0.2

**District average yields, 2005/2006 agricultural production season (Source: Silici et al. 2011)**



**When fields are cultivated against slopes using conventional agriculture the bedrock is soon exposed through erosion. Farmers respond by moving to new, even less suitable areas until these are also eroded, leading to a vicious cycle**

#### **Public infrastructure providers**

They are decision makers and officials in government, the private sector, NGOs, UN agencies and international donors. Characteristics are:

- Potential for synergy between NGOs, UN agencies and international donors, and good cooperation from Government
- Heavy reliance on and contributions by non-governmental support and capacity
- Strong role of NGOs, UN agencies and international donors in capacity development
- Eager and willing extension officers who have good contact with local farmers and provide crucial support to them.

Public infrastructure providers are influenced by:

1. National budget allocations, influencing availability of equipment, extension support and infrastructure
2. Skills and training
3. Attitudes of senior officials and politicians
4. Communication and coordination between ministries and departments
5. National policies
6. Global financial trends

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7. Economic trends in neighbouring countries
  8. International donor and financial institution policies
  9. National and regional political processes.



**MAFS officials are intimately involved in FAO's ERP and have good relations with FAO staff and beneficiaries**

#### **Public infrastructure**

These are factors such as road networks, availability of water reticulation and irrigation infrastructure, electricity supplies, buildings and facilities, as well as government support services. Characteristics of public infrastructure are:

- Relatively well developed road networks in low lying areas and along major arteries, but with poorly developed access roads in the mountains and to remote villages
- Availability of piped water and pit latrines
- Widespread agricultural resource centres which are weakly equipped with services such as electricity, water, equipment and knowledge systems such as maps, libraries, computers and internet access
- Weak access by farmers to markets, and poorly developed marketing mechanisms
- Strong reliance on South Africa for technology, but with many unexplored opportunities.

#### **Governance systems**

Governance systems are the public and social structures that make and implement decisions. Governance systems are not just government. They consist of local organizational structures such as farmer's groups, village committees, political organizations and local councilors, linked to national

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governance systems such as local and regional government. Churches and their organizational structures play a crucial role.

Characteristics of governance systems, of relevance to FAO, are

- Progressive national policies and regulations
- Weak capacity everywhere to implement them
- Relatively good decision making capacity at village level, but with some shortcomings in insights and understanding of natural resource management challenges
- Fragmented decision making at all levels
- Strong cultural norms and traditional governance systems
- A tug of war between traditional ways of doing, modern technology and innovation to conserve natural resources and increase soil fertility
- Governance systems are influenced by national and international political processes, and the capacity of officials to implement strategies and policies. Local capacity for self-governance is influenced by donor strategies and top-down projects which disempower local people. History and historical conflicts also play a role.



**Resource centres such as this one are potentially valuable nodes for experiments and information dissemination. They would benefit from improved equipment, services such as water and electricity, computer systems and extension equipment. Officials are highly motivated yet under-capacitated**

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## 4.1 Relevance to FAO's Emergency and Resilience programme: SOCIAL-ECOLOGICAL SYSTEMS PERSPECTIVE

The programme has successfully adopted a social-ecological systems approach, and has excelled at building the capacity of resource users, restoring natural resources, and working closely with public infrastructure providers (government officials and NGOs). The programme has been exceptionally good at building linkages with government officials at middle management level.

Components of the system that should be strengthened, are

1. Facilitating improved access of extension officers to facilities and equipment
2. Improvements to infrastructure at agricultural resource centres
3. More attention to local governance systems, in particular
  - a. improving the understanding of traditional leaders and councilors at village level of the threats of resource degradation, and getting their buy-in. While ERP started this effort in 2013 with the training of 600 lead farmers and local leaders, there still appears to be resistance and lack of understanding of this amongst traditional leaders and councilors in many villagers.
  - b. strengthening the institutional arrangements of the Conservation Agriculture teams.

### Recommendations

- Suggest the Programme strategically and consciously adopts a social-ecological systems framework, tailor-made for the local context (see conceptual diagram)
- Suggest the Programme develops strategies and lobbies for support to enable the development of long term (5-10 year) resilience plans
- Suggest the Programme attends to improvements in infrastructure at resource centres (solar electricity; piped water; meeting and training facilities), and allocates funding outside the ERP to this
- Suggest the Programme raises funds to improve the access of agricultural extension officers to basic equipment especially internet access, electrification, and access to basic monitoring equipment (soil testing kits; tape measures; notebooks and filing systems to record and store data)
- Suggest the Programme focuses on developing the governance capacity of CA farmers at village level, by promoting a programme of institutional development, e.g.
  - Institutionalizing conservation agriculture associations at village level
  - Registering these as legal entities
  - Enable them to function as cooperatives for purchasing, marketing, sharing of equipment and labour
  - Facilitate the development of their legal frameworks and constitutions
- Suggest the Programme gives attention to the development of Village Resource Management Plans (VRMPs)
  - Done in a participatory manner
  - Involving local farmers, extension officers, NGOs, and senior government officials
  - Developing the capacity of extension officers to mobilize communities and groups
  - Integrating crops, livestock and rangelands
  - Adopting the VRMPs as formal rules for natural resource management. Examples are given in **Appendix 6**.

## 4.2 Managing the slow changes

Many influencing factors may change slowly, but may nonetheless have profound and rapid impacts on local livelihoods when they reach a critical level. Events and processes happening at national and international levels interact with local processes, and events that took place in the past may still linger on as 'memory' of the social-ecological system. For example, agricultural input costs are affected by international demands and the price of fossil fuel, and commodity prices by national and international demand. While these factors may change rapidly, their underlying drivers such as dwindling oil supplies, population growth, consumption patterns and trends change slowly. Soil erosion which happens locally may influence the viability of large dams, through siltation, which affects water security nationally and internationally. National policies and guidelines affect what people may or may not do, and determine the quality of extension services, which affect local production systems. Local people's health and ability to work is affected by an international

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HIV/AIDS epidemic, and the number of people in a village is affected by migration of e.g. labourers from South African mines, as well as local death and birth rates. This in turn influences the pressure on the local, regional and national resource base.

*“In 1980, cereal production met about 80% of the national requirements; by the 1990s, it was contributing only 50%. By 2004, however, cereal production was estimated to contribute only 30% of national cereal requirements– and the percentage is still falling.” (Saha 2011, page 276).*

Slow changes that affect FAOs projects include:

### ***At local level***

#### **Resource degradation**

Resource degradation has always been one of Lesotho’s challenges, exacerbated by the steep topography, climatic extremes and high population density. The main changes, accumulated over decades or millennia, are in soil structure and texture, which affects moisture holding capacity; soil availability and depth; and soil nutrient depletion. Others relate to deforestation and changes in grass cover and composition.

#### **Changes in infrastructure and facilities**

Infrastructure in Lesotho’s rural area is gradually improving. This is, however, negatively affected by weak capacity for maintenance. The improvements in rural infrastructure are however not translating into broad-based improvements in agricultural production or efficiencies. Rural resource centres are a critical element of public infrastructure and have great potential as a tool for agricultural transformation in Lesotho. The centres are, however, poorly equipped and thus not meeting their true potential. Officials report that they “only have pens and desks” and many centres are without electricity, and some even without water. The reasons are complex, and relate to a reduction in the resilience of the system as a whole due to the reaching of tipping points in several of the major drivers / determining factors, discussed in the next section.

#### **Changes in capacity and skills**

The capacity to implement innovations is improving thanks to training programmes and influxes of labour, although much of the in-migrating labour is unskilled. FAO is making a strong contribution to the gradual development of skills of farmers and officials, but this is one of those slow changes which will not yield overnight results. Agricultural extension officers are motivated and well trained, although not meeting their full potential as knowledge brokers and ‘bridging agents’ between technical specialists and farmers. These former mine workers are however often ill and the gap left by the loss of remittances is larger than their contribution to rural agriculture. The ‘runaway cycle’ or positive feedback loop between HIV/AIDS and feed security is well described elsewhere. People who are ill have special nutritional needs, but are unable to contribute the labour required for agricultural production.

People in rural Lesotho are adaptable. They have to be, because there are many uncertainties which are increasing. Adaptive capacity needs to, however, be matched by innovation such as willingness to adopt new agricultural technologies and methods, willingness to experiment. But because there is so much at stake – even a minor crop failure can be disastrous for livelihoods - people adhere to methods and technologies which they understand and are familiar with.

### Population change

Population growth across Lesotho is slowing down, partly due to birth control and partly due to mortalities as a result of the HIV/AIDS epidemic. Rural population growth in Lesotho since 2008 is negative, while urban populations are growing at a rate of 3.5-4% (Table 3). This trend is bound to continue. The issue is not only how many people migrate from rural areas to cities, but which types of people. Migrants are normally more skilled, younger and more healthy than those who choose not to migrate. There are reports of many middle aged men being retrenched from South African mines returning to rural villages to farm. But, overall, a net migration affects labour availability, a key capital required for productive farming.

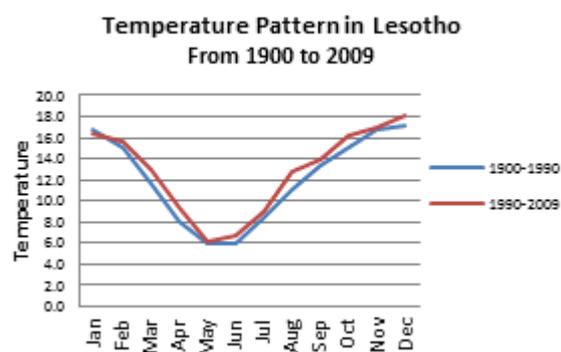
**Table 3. Population growth rates in Lesotho, 1960–2008 (percent) (Source: IFPRI 2013)**

Decade	Total growth rate	Rural growth rate	Urban growth rate
1960–1969	1.9	1.4	11.4
1970–1979	2.2	1.9	5.3
1980–1989	2.2	2.0	4.0
1990–1999	1.6	0.9	5.3
2000–2008	0.8	-0.1	3.8

### *At national and international levels*

#### Climate change

Climate change is already affecting agriculture across the world and especially in sub-Saharan Africa, where there is a large gap between yields and food requirements. In Lesotho this gap is widening, and climate change is one of the causal factors. Mean temperatures have increased since the onset of records and rainfall patterns have changed (Figures 3 and 4). The onset of reliable rains has shifted by almost a month, the frequency and intensity of snowfall and rainstorms has increased, and droughts have become more severe. All these factors are predicted to become worse over the next 50 years, with models predicting a drop in crop yields of up to 20% (Saha 2011). People's capacity to cope and adapt does not seem to have kept abreast of these challenges.



**Figure 3. Changes in mean monthly temperatures in Lesotho, 1900-1990; and 1990-2009. Source: FAO Lesotho ERP**

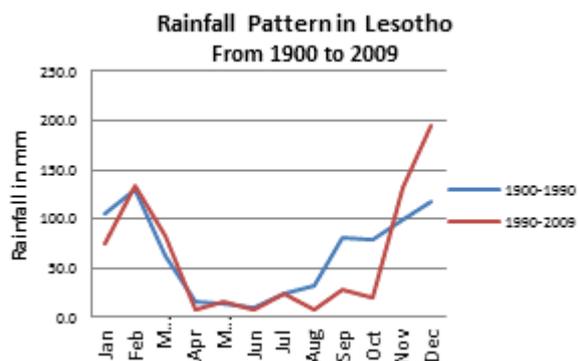


Figure 4. Mean monthly rainfall in Lesotho, 1900-1990; and 1990-2009 (Source: FAO Lesotho ERP)

#### Changes in global markets

Agricultural input costs and food prices have increased beyond people's capacity to adapt. This is partially driven by increases in fossil fuels, labour costs and import tariffs, and partly due to a higher demand for grain for renewable fuel and animal food. Global changes in the price of precious metals and diamonds, for example, lead to fluctuations in the demand for labour in mines with major implications for agricultural resilience at the local level, due to its influence on household financial and human capital. Retaining the country's competitiveness in the international garment trade, for example, is key to retaining the more than 45 000 jobs held in that industry. Agriculture contributes between 7 and 9% to GDP (Table 3; Figure 3), however, the percentage of the population who are, in some way or another, directly involved in agriculture may be as high as 80%.

*"Lesotho's outlook remains vulnerable, however. Agriculture production is still susceptible to weather shocks such as those experienced in 2011 and 2012. Other risks include global economic uncertainty and the euro crisis, which may negatively impact Southern African Customs Union (SACU) receipts, as well as the demand for diamonds and textiles, Lesotho's key exports. Finally, risks of social unrest and retrenchments are likely to affect Basotho miners from Lesotho working in South Africa. This would have negative implications on remittances, which are an important source of income for Basotho households. These risks underline the need to safeguard the exchange rate peg by building sufficient gross international reserves" {Outlook, 2013 #2935}*

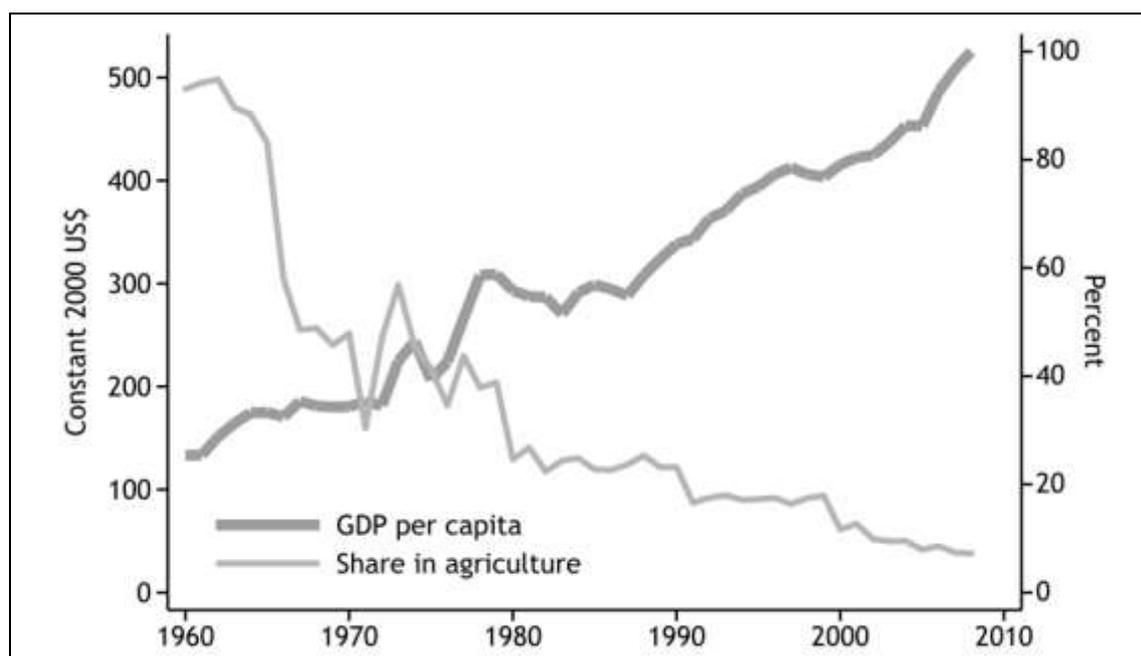


Figure 5. Changes in per capita GDP, and agriculture's contribution to GDP, 1960-201 (Source: World Bank)<sup>8</sup>

Table 4. Lesotho GDP by Sector, 2007 and 2011 (percentage of GDP) (source: African Economic Outlook 2013)

	2007	2011
Agriculture, hunting, forestry, fishing	7.7	8.6
Construction	4.3	6.5
Electricity, gas and water	4.6	4.7
Finance, real estate and business services	20	19.8
Manufacturing	19	12.8
Mining	8	7.9
Other services	9.8	11.5
Public Administration, Education, Health & Social Work, Community, Social & Personal Services	11	12.5
Transport, storage and communication	6.4	6.7
Wholesale and retail trade, hotels and restaurants	9.2	9.1

### International relations

Relations with South Africa do not change overnight and are an important element of Lesotho's resilience. There is however much room for collaboration and mutually beneficial partnerships. This could range from technology exchange, training and technical assistance to exchange programmes. Such initiatives would however require high level negotiations, and high level capacity on both sides to not only make agreements on paper but also to implement them.

*“Lesotho’s monetary policy is therefore closely linked to South Africa’s. Monetary policy in 2012 was more expansionary than in 2011, largely reflecting the lower interest rates adopted in South Africa to stimulate its economy. As a result, money supply broadly defined grew by 12.3% in 2012 compared to the 1.1% recorded the previous year. ....Neighbouring South*

<sup>8</sup> Despite agriculture's decreasing contribution to GDP, many poor families still depend on agriculture to complement their livelihood strategies. Inequality is high in Lesotho and the vulnerable families do not always benefit from new growth sectors

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*Africa continues to be Lesotho's dominant trading partner in Africa and in the context of regional integration. ...regional integration is essential to the country's economic development, poverty reduction efforts and progress towards achieving the Millennium Development Goals (MDGs)." African Economic Outlook, 2013*

### **Donor funding , priorities and policies**

Donor funding has become one of the cornerstones of agricultural resilience in Lesotho. Available funding and priorities are however constantly changing, and keeping track of these trends is essential.

### **Shocks and surprises**

In Lesotho, shocks and surprises at the local level include (Saha 2011; Silici 2013):

- floods,
- landslides,
- pest outbreaks (Saha 2011)
- crime (Turner 2001)
- risks to important public infrastructure, essential for agriculture (IFRI 2013)
- livestock mortalities (Turner 2011)
- human mortalities (IFPRI 2013) and
- social conflict (Bharwani et al. 2007).

At national and international levels, surprises may include (African Economic Outlook 2013):

- sudden changes in government spending priorities,
- sudden changes in costs of inputs and produce (exacerbated by currency exchange fluctuations)
- political change and unrest and
- political and economic shifts in neighbouring countries.



**Multi-national developments such as the Lesotho Highlands Water Scheme could have profound impacts on local markets and livelihood strategies. These impacts and opportunities are not well understood or incorporated in agricultural development strategies**

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## 4.2 Relevance to FAO's Emergency and Resilience programme: MANAGING SLOW CHANGES

Because of FAOs 'emergency relief' role, the Programme has severe constraints in managing slow changes. Despite this, the Programme has been remarkably good at implementing strategies that have an impact on the slow factors, particularly long term capacity development and its emphasis on improving the long term capacity of the soil. In two years the Programme has trained more than 530 extension staff and 600 lead farmers and provided training programmes to many other role players in the CA Task Force. This is a great achievement. The Programme is on track to implement a land cover change assessment, and here it is important not to view it as a snap-shot and to aim for continuous assessment e.g. every 5 years<sup>9</sup>. This initiative, which is not yet funded, will contribute significantly to our understanding of slow changes.

Areas for improvement or adaptation include

- a. Implementing additional monitoring systems that can track the slow changes
- b. Involving all stakeholders in data collection
- c. Including rangeland improvements in the suite of interventions.

### Recommendations

- Suggest the Programme implements a long term monitoring project, aimed specifically at tracking slow changes in
  - Climate change (using secondary data);
  - availability of arable land per household;
  - percentage uptake of CA and home gardens;
  - soil fertility and moisture holding capacity, yields
  - people's capacity to adapt and change
  - Long term impacts of economic and environmental change on livelihood assets
- ..implement a data storage and management system
- ..obtain the buy-in and support of the relevant government departments to continue maintaining assets provided by the Programme
- ..involve the local university and agricultural college in design and implementation
- ..incorporate participatory monitoring, where farmers assist in collecting the data, analyzing and interpreting the results and responding to new information.
  
- Suggest the Programme continues its focus on restoring the long term capacity of the resource base through CA.
- Suggest the Programme includes rangeland management in its impact and implementation mix.

## 4.3 Thresholds

Thresholds are points beyond which change is rapid and often irreversible. They become evident when slow variables go beyond or below a critical value. For example, the onset rain may gradually become later and later until a threshold is reached, where most of the rain comes too late and farming with maize becomes impossible. This will necessitate a rapid shift to other staple crops. Soil degradation is another factor which doesn't change overnight, but when it has reached a certain threshold, crop production decreases sharply because people are forced to use unsuitable areas for their fields. The quality of agricultural extension services, affected by government budget allocations, may also reach a threshold whereafter production and livelihoods decline sharply.

Critical thresholds in the drivers affecting agricultural resilience in Lesotho are:

At the household level:

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<sup>9</sup> Programme staff commented that 5 years might be too short. However, the authors believe it is important to conduct assessments at shorter intervals to enable adaptive management and reflection, particularly in view of the rapid rate of global change and rate of land cover change in Lesotho

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*Availability of agricultural land per household*, as measured by the ratio of households to hectares/ acres of arable land. If land holdings drop below a threshold level then people start cultivating unsuitable lands against steep slopes, or fields become too small to provide enough produce.

*Soil organic matter*. Soil fertility in the mountains is generally good due to the basalt soils. These soils lose their moisture holding capacity quickly when organic matter drops below a threshold. Nutrient retention also weakens and soils rapidly lose their fertility when organic matter becomes too low.

*Household labour availability*. CA is labour intensive. When household labour drops below a threshold then people's ability to participate in the agricultural cycle is compromised.

*Available financial capital*. People rely heavily on purchased food, fertilizer and other agricultural commodities. When household income drops below a critical level then people cannot meet their nutritional requirements, let alone purchase essential agricultural inputs.

*Social relationships with other villagers*. People are very dependent on assistance for e.g. work parties, borrowing of livestock for traction or help during times of famine. This is especially relevant to the well-being of the poorer households. When social relations drop below a threshold level, conflicts and crime escalate quickly, while the general well-being of the poor declines rapidly.

At the *village* level, thresholds include:

*Livestock density and stocking rates*. Beyond a critical stocking rate, livestock impact on soil structure and quality in the fields and people's ability to practice CA. On the other hand, livestock ownership is one of the few ways to accumulate wealth and savings – a ticket out of extreme poverty. Therefore, people are acting rationally when they keep lots of livestock. This unfortunately affects soil stability and the ability of others to plant crops, although livestock is also a source of manure and traction.

*Strength and quality of governance and decision making, adherence to rules*. Village decision making is crucial to prevent overstocking, regulate animal movements and regulate where and how people cultivate. If decision making goes below a minimum threshold, e.g. when community meetings take place less than once a month, decision making falters with consequences for the natural resource base and many other local factors.

*The number / proportion of people who practice conservation agriculture*. When a tipping point of participants in conservation agriculture is reached then it becomes much easier for the other villagers to switch to CA. There are also more people who learn together and share information.



**In Lesotho, livestock, crops and livelihoods are inseparable. Local rules to govern these interactions can be strengthened through Village Resource Management Plans (VRMPs).**

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### 4.3 Relevance to FAO's Emergency and Resilience programme: THRESHOLDS

The notion of tipping points in the slow variables are not well understood and reflected in the Programme. The Programme has made improvements in its monitoring, has conducted a baseline survey and regularly reports on crop yields and uptake of technologies and evaluation of training, which is commendable. The monitoring programme is not, however, accompanied by a clear conceptualization of thresholds of potential concern, and therefore does not inform decision making. It is aimed at evaluating progress but not systematic reflection, anticipation of tipping points and adaptation to slow changes. It is e.g. particularly important to understand what the tipping point in availability of arable land is, when people start cultivating unsuitable steep slopes. Tipping points in soil organic content, when yields start slowing major improvements, are also poorly understood and require further thinking and research. From a social perspective, the tipping points in proportion of people practicing CA, and tipping points in the strength of governance need to be understood and incorporated in interventions. Regular assessments of Land Cover Change will assist with overcoming this problem, if it is preceded by a good understanding of thresholds. FAO, with the support of the UN Trust Fund for Human Security (UNTFHS) and DFID provided laboratory equipment to MAFS to strengthen their capacity for soil testing.

Areas for improvement include the development of decision support systems that include thresholds of potential concern, and tipping points, as goals for decision making. The recommendations under 'Learning and Adaptive Management' will expand on this.

#### Recommendations

- Suggest the Programme defines 'thresholds of potential concern' in key influencing factors, i.e.
  - Availability of arable land
  - Soil organic content
  - Livestock density
  - Proportion of villagers taking up CA.
- Suggest the Programme commissions additional research to calibrate these thresholds, using a combination of computer models and data.
- Suggest the Programme monitors slow changes in national and global factors, as recommended in the previous section.

### 4.4 Connectedness

Connectedness means how good information or other forms of capital 'flow' within the system, at the local level but also between international, national and local. In systems where connectedness is high, people are directly involved in managing the resource base, constantly monitor change and are 'in touch' with ecological changes. Connected social systems means that knowledge and information flows rapidly through the system, people readily assist each other and institutions and governance systems are well supported.

Characteristics of ecological connectedness:

- Rangeland and soil degradation have disrupted ecological processes, and many connections between plant species, wild herbivores, pollinators and nutrient cycles have been lost as a result
- Below-ground connectedness between soil microorganisms, and between them and plants have been eroded
- Hydrological cycles have been disrupted due to rapid water run-off and siltation.

The characteristics of *social* connectedness in this project are:

- At the local level, people are very interconnected through kinship links and, most importantly, through the knowledge they share in the CA teams

- Connections between local farmers and extension workers are working, and there are frequent communications. Lead Farmers are a significant link in the 'chain'.
- Local people are in touch and well connected with changes in the resource base, the weather, agricultural input costs and other issues affecting their livelihoods.
- At the national level, communication and collaboration between government and international donors and NGOs are strong and relations are very good.

#### **4.4. Relevance to FAO's Emergency and Resilience programme: CONNECTEDNESS**

The Programme has been exceptionally good at fostering connections between the different role players in CA, through its role as secretariat of the CA Task Force at national level. It has also performed remarkably well in working with government officials, linking agricultural extension officers to Lead Farmers and beneficiaries, and in developing capacity at all levels.

The inclusion of Lead Farmers and the training of 600 of them together with chiefs as role models is a significant innovation in the ERP. The structure of extension officers, lead farmers and village CA teams seems to work well.

Connectedness at the local level, despite the constraints of infrastructure and communication, is remarkably good. The Programme has performed well at promoting communication and information flow through its information sheets and training materials, which are excellent and therefore widely used. Connections and information flow between beneficiaries are very good and they have a strong sense of belonging.

CA is ideal to manage and restore ecological connectedness by improving the ecological functioning of the soil, connecting crop production to soil quality and soil moisture, and making the links between social and ecological components of the system.

Areas for possible improvement include:

1. Strengthening the connections between conventional farmers, traditional leaders, councilors and CA farmers through village information days, and by facilitating the development of VRMPs as described earlier.
2. Strengthening connections between livestock management, rangelands and crop production.
3. Emphasizing the importance of connectedness in its extension programmes.
4. Strengthening the links between home gardens and CA fields in extension work and training, and view home gardens and CA as linked components of the same intervention rather than separate interventions.

#### **Recommendations**

- Suggest the Programme continues to develop its information materials by providing larger posters, in laminated form, to resource centres and developing the communication facilities and infrastructure at resource centres. It is understood that the Programme has already started making progress with this and that posters will be distributed soon.
- Suggest FAO Lesotho continues with its helpful secretariat role in the CA Task Force.
- Suggest the Programme proactively seeks stronger functional collaboration with other stakeholders, in particular NGOs, but also with MAFS, at a practical implementation level. This has relevance to the tipping point in the number of people involved in CA at village levels, and the need to establish a 'critical mass' of beneficiaries in each village.
- Suggest the Programme aims to improve the linkages between home gardens, crop fields, rangeland management and livestock in future initiatives.
- Suggest the Programme looks at ways to connect local people to markets for their products, and look into the possibilities of village cooperatives as elements of Village Resource Management Plans (VRMPs).

#### **4.5 Diversity**

While productivity and maximum sustainable yield remains a valid objective in agricultural systems, putting all resources into a small number of options creates vulnerability to droughts, sudden market fluctuations, pest outbreaks and availability of labour. For example, people plant several

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types of crop and seldom farm only with crops, or only with livestock and plant several types of crops at once, or own several livestock types. In addition, households augment and broaden their earnings through remittances, informal trade or jobs.

Livelihood diversity amongst rural farmers is a necessity and all farmers have multiple livelihood strategies. Almost everyone owns livestock and has crop fields, and most people have multiple types of livestock. Not only do people plant multiple crop types and varieties, they also cultivate several different land parcels, starting with keyhole gardens right next to the house, and slightly larger home gardens which they are able to irrigate. They also have larger fields where most of them plant multiple crops in the same field through intercropping.

Most families have sources of finance other than farming. This comes in the form of labour remittances, sales of livestock and seasonal sales of crops, including crops from home gardens.

Indigenous knowledge systems are an important component of people's resilience and add to the diversity of knowledge and livelihood strategies. Rituals are invariably associated with food and cooking and thus contribute to food security. Indigenous rangeland management practices allow for rest periods of rangelands and demarcate areas which may not be grazed.



**Diversity is an important element of resilience, adaptive capacity and transformability. Lead farmers such as these add to the diversity of role players. Note the diversity of crops being cultivated in the foreground.**

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#### **4.5 Relevance to FAO's Emergency and Resilience programme: DIVERSITY**

The Programme clearly recognizes the importance of diversity, and has strived to promote crop diversity, soil biodiversity and social diversity into its programme design. The diversity of seeds provided for home gardens is laudable. The Programme's collaboration and linkages with a variety of role players is one of its strengths. The inclusion of Lead Farmers as role models is a significant innovation to increase diversity. There are no major shortcomings, and yet there are several areas for possible improvement.

Areas for improvement include:

1. Striving to diversify the mix of beneficiaries, to, in addition to Lead Farmers, also include established farmers who are not amongst the most destitute. They could act as role models for others.
2. Including a broader range of livelihood strategies (not only farming) in its interventions by forming links with NGOs who are mandated to work beyond agriculture.
3. Diversifying interventions to include livestock and rangeland management.

#### **Recommendations**

- Suggest the Programme continues to consider diversity and not just productivity and yields in its interventions.
- Suggest the Programme continues to work with a range of stakeholders.
- Suggest the Programme explores links with NGOs mandated to work in economic development fields, to broaden village interventions beyond agriculture in an effort to diversify livelihood strategies.
- Suggest the Programme diversifies the beneficiaries by, in addition to Lead Farmers, including at least one established farmer in each village in each group.
- Suggest the Programme diversifies its interventions, to include livestock, rangelands and animal health.
- Suggest the Programme explores the possibility to diversity not only the types of crops being promoted, but also the seed varieties. It may, for example, be advisable to include a portion (40%) of drought resistant hybrid maize seeds in the package of seeds provided, while maintaining 60% OPV seeds. This will depend on FAOs flexibility in its policies.
- Disseminate these lessons and experiences widely are farmers' days, resource centres and via posters.

#### **4.6 Learning and adaptive management**

Learning and experimentation promotes adaptive management, a well recognized way to manage complex systems. This involves monitoring, regular reflection on current practices, adapting conventional ways of doing things, trial and error and constantly taking note of lessons learnt. Farmers for example change crop types when seasonal weather changes are predicted, assess how a particular seed is performing under given conditions, learn from that and use that information to inform the next planting cycle, and experiment with different types of livestock. Adaptations can be immediate, or can take place over several generations.

Examples of learning are that farmers learn from previous seasons' successes and failures and adapt their crop types and planting seasons accordingly. Many farmers take advice from agricultural extension officers on drought and flood predictions and pest outbreaks and change their practices. At the village level, one of the most important innovations of small farmers is the formation of learning groups which enables them to share ideas, but also to work collaboratively by pooling their labour.

Conservation agriculture promotes learning through training courses, promoting learning groups and promoting interaction between officers and villagers. Traditions and reluctance to experiment with new ideas because of the risks involved are an impediment to adaptive management and will take a long time to overcome.



**The practice of constant reflection, not only through formal monitoring and evaluation programmes but also informally, through comparative site visits and study groups, is essential for adaptive management. Simple score sheets that can be completed in the field during every site visit would be useful to provide structure to the learning process. Resource centres are potentially useful experimental sites for adaptive management.**

## 4.6 Relevance to FAO's Emergency and Resilience programme: LEARNING AND ADAPTIVE MANAGEMENT

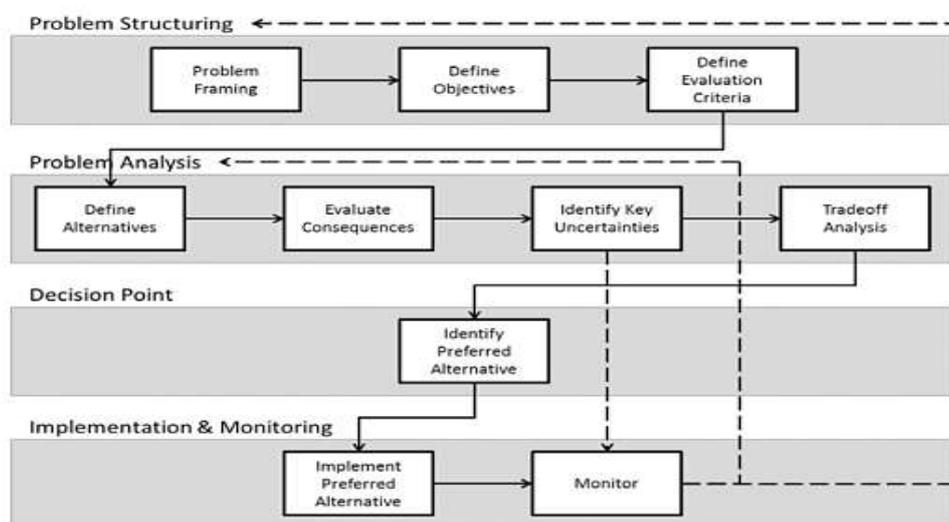
Due to its mandate to provide emergency relief, the Programme faces challenges to optimally implement adaptive management, which requires time. Despite these constraints, the Programme is exceptionally adaptive and is characterized by learning and reflection. Examples include changing seed varieties in response to reports from the field, quickly mobilizing pest control programmes, and adapting information materials to suit local needs. The Programme has also welcomed the fact that some farmers have used a portion of their seed allocations for conventional agriculture, because this allows farmers to experiment and compare. There are also unavoidable constraints in the availability of seeds, and FAOs procurement policies, which are hampering adaptive management. There are however a few areas for potential improvement:

Areas for improvement include:

1. Strengthen the culture of experimentation, learning and reflection by constantly reflecting on good and bad practices, and consulting with local farmers and extension officers about these. This will require an explicit mandate from FAO to be experimental.
2. Setting targets, thresholds of potential concern, and implementing monitoring programmes to inform decisions.
3. Monitoring outcomes of capacity development more carefully and in a more focused manner by setting thresholds of potential concern, indicators and actions up front.
4. Promoting experimentation at resource centres, which can be used as learning and demonstration sites.

### Recommendations

- Suggest the Programme continues to encourage farmers to experiment with different approaches and seed varieties
- Suggest the Programme builds a stronger and more targeted and deliberate learning cycle and '*structured decision making*' into its programmes, using the adaptive management framework: setting targets and TCPs-> implementation -> monitoring -> reflection -> learning -> adaptation -> implementation. Designing and describing a systematic adaptive management project falls beyond the scope of this report and should be the topic of a more in-depth investigation. An example of a structured decision making framework, from Marcot et al (2011) is copied below



- Suggest the Programme investigates the possibility of setting up trials and demonstration plots at resource centres, in collaboration with extension officers. Buy-in and prior commitment from the Department to maintain these trials would be essential.
- Suggest the Programme adapts its evaluation of training programmes, to enable it to learn from participants' responses about programme content that works and doesn't work.
- Work with participants to document coping strategies in the face of shocks and surprises in different agro-ecological zones.

## 4.7 Participation

Participation means people are not just receiving information, but also participate in generating and testing the usefulness of this information. People are not just consulted, but are actively involved in generating solutions. Passive participation is when people receive information, or are merely

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consulted. Active consultation is when people provide feedback, and when information is modified in response to their input. Functional participation is when solutions are co-created, experiments and monitoring systems are jointly designed, and solutions are modified and adapted in response.

In Lesotho participation at the village level is good and people regularly interact with agricultural extension officers. It is however evident that local people's views are not incorporated in district level planning. There is for example no forum where local people can help inform funding and spending priorities, and the views of local extension officers are seldom incorporated into national plans and spending priorities. The unavoidable problem with incorporating local views is that the more people are consulted, the more their expectations are raised. It is also true that local people do not necessarily raise issues of strategic and long term importance and rather emphasize short term and material benefits, especially when they participate as project beneficiaries.

#### **4.7 Relevance to FAO's Emergency and Resilience programme: PARTICIPATION**

Participation is one of the Programme's strengths, and is evident at every level, from the village to head offices in the Ministry. While participation is mostly active, the level of participation varies. At the village level this is to be expected because people still view the Programme as an emergency relief intervention and to a large extent see themselves as beneficiaries, which is unavoidable in a programme of this nature.

Areas for improvement:

1. Encouraging more functional participation at village level and by extension officers in the design of the programme.
2. Monitor the level of active, functional participation by all stakeholders.

#### **Recommendations**

- Suggest the Programme establishes participatory monitoring programmes to promote more functional participation by farmers and extension officers.
- Suggest the Programme involves villagers in participatory mapping exercises to monitor land cover at the village level.
- Suggest facilitators and extension officers receive training in Participatory Learning and Action methods.
- Suggest the Programme involves beneficiaries when making changes to programme design or implementing innovations.
  - This will be aided by the institutionalization of village CA associations and VRMPs (see previous section)

#### **4.8 Livelihood assets**

Livelihoods consist of at least five types of 'capital': natural, financial, human, social, and physical. These five capitals are of course seldom static and change over time. They also influence each other through feedbacks. Natural capital: soils, water, crops, rangelands, livestock and wild animals. Financial capital: assets that can be sold, bank balances or cash. Human capital: people's skills, their capacity to work, and their capacity to make decisions and take action. Social capital: the relationships between people, the sense of community, and people's willingness to help each other and work together. Physical capital: infrastructure such as roads, buildings, water pipes, bridges, electricity.

Overall it seems as though the levels of these capitals have been eroded over time, and that most people are now poorer in almost every type of capital than they were in the past. While it is true that per capita GDP in Lesotho has increased over the past decade, people seem to be worse off in other indicators of well-being.

Lesotho and South Africa's Human Development Indicators are linked (Figure 4), but have started lagging behind those of the rest of the world and sub-Saharan Africa.

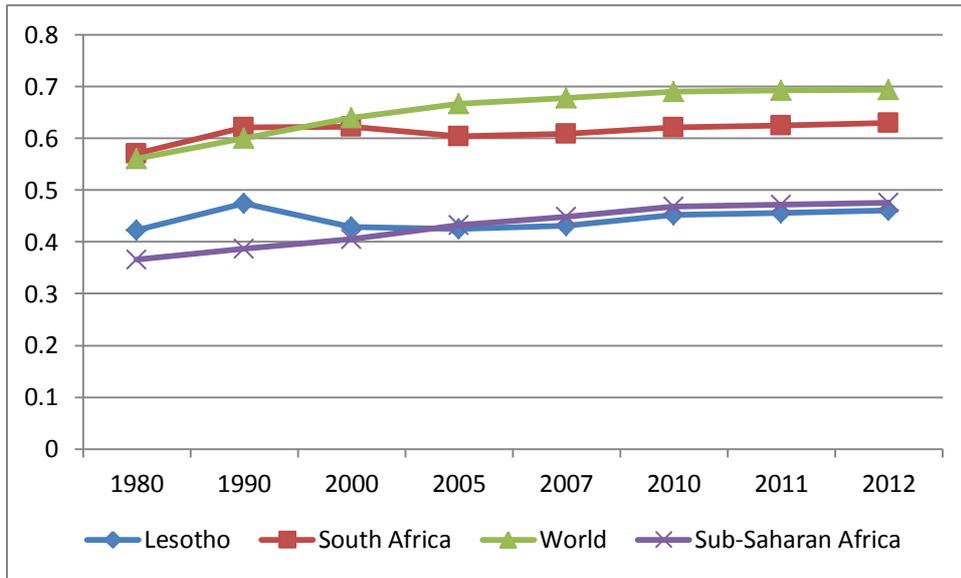
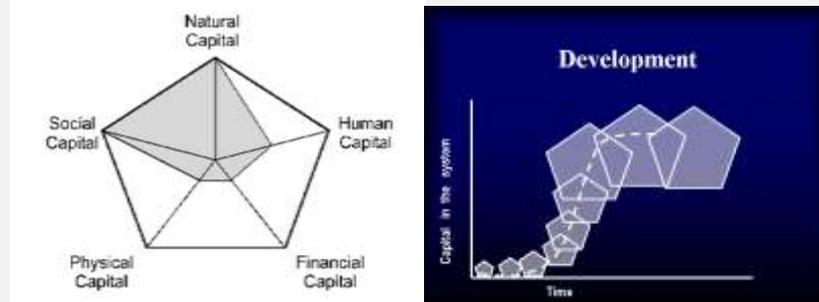


Figure 6. World Development Index for Lesotho compared to that of South Africa and sub-Saharan Africa from 1980-2012

## 4.8 Relevance to FAO's Emergency and Resilience programme: LIVELIHOOD ASSETS

Looking at livelihood assets as a portfolio or bundle, consisting of natural capital, financial capital, social capital, human capital and physical capital is a potential innovation for the Programme. These capitals change over time, and the goal of development is to grow all of them together. [The figure below is a conceptual example and does not reflect any data collected].



In this Programme, the emphasis is on natural and human capital development, and to some extent social capital through the development of CA teams. The other capitals, especially financial and physical capital, are not as well developed with less of an emphasis in the Programme.

### Recommendations

- Suggest the Programme looks at ways to strengthen physical and financial capital amongst beneficiaries
- This could include:
  - Loans to purchase machinery such as ox-drawn planters
  - Consider loans to fence off CA fields. Solar-powered electric fences have been used in the commercial sector, but this brings new risks such as vandalism and theft.
  - Strengthening the training and communications infrastructure at agricultural resource centres
  - Training in money management skills
  - Working with government and postal services to set up savings schemes for beneficiaries
  - Promoting the formation of savings cooperatives
  - Assistance with setting up village cooperatives to strengthen people's collective marketing and buying power
  - Making bursaries available for deserving villagers to study agriculture
- Suggest the Programme constantly explores ways to gradually move away from assistance and donations, to loans and long term capacity development.

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## APPENDIX 1. TERMS OF REFERENCE

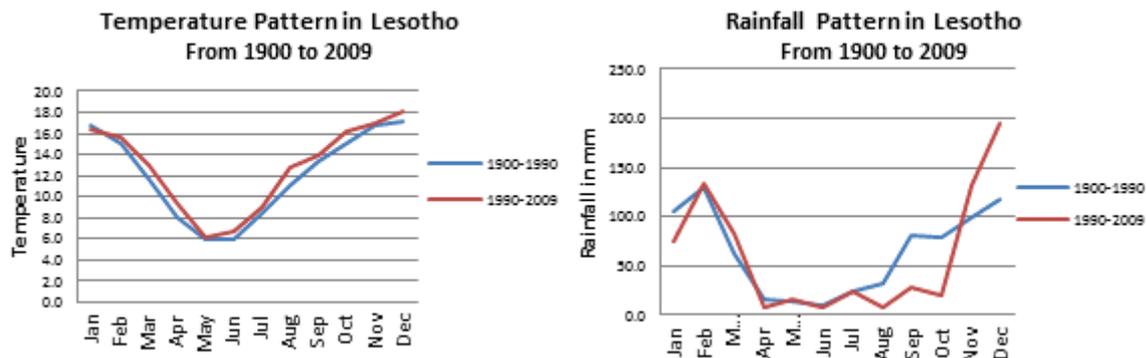
### TERMS OF REFERENCE

FAO LESOTHO  
EMERGENCY & RESILIENCE PROGRAMME  
MID TERM EVALUATION

#### Country Background

Lesotho's food security has declined, reaching in 2012 the highest ever recorded number of households in need of humanitarian aid since the Lesotho Vulnerability Assessment Committee (LVAC)<sup>10</sup> started operating in Lesotho. The impact of drought and late rains in the cropping season 2011-2012 added to the increasingly vulnerable situation of the rural Basotho after a poor harvest in 2010-2011 due to heavy rains. Up to 725,000 individuals (equivalent to 1 out of 3 Basotho) was considered to be in need of external emergency aid to meet livelihood requirements.

The cumulative impact of changes in rainfall and temperature patterns, with increased average temperatures and reduction of rains in the onset of summer crop planting operations (see graph below), has exacerbated a worsening environmental and agricultural context.



Climate Change related phenomena are compounded by the following environmental and social challenges to sustainable production, nutrition and food security in Lesotho:

- Severe land degradation, including severe soil erosion caused by water run-off and overgrazing. Lesotho, with the area of approximately 44,000 ha covered by forest, experienced the loss of average 200 ha of forest per year between 1990 and 2010. This has caused the exacerbation of soil erosion, carbon loss, and biodiversity degradation.
- Irregular rainfalls, abnormal temperature patterns, and drought frequently cause shocks to the agricultural sector.
- Overreliance on rain-fed agriculture – 99% of total cultivated land is rain-fed. 90% of farmers practice rain-fed subsistence agriculture which is vulnerable to drought and erratic rains/temperatures.

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<sup>10</sup> Lesotho Vulnerability Assessment Committee

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- Lack of arable land - proportion of arable land in Lesotho has declined from 13% to below 10% as a result of urban encroachment, soil erosion and other forms of environmental degradation.
  - Lack of agricultural diversity and poor crop husbandry methods.
  - Lack of access to yield enhancing technologies and inputs.
  - The HIV/AIDS pandemic which is drastically reducing labor available for cultivation

However, agricultural sector in Lesotho, despite its declining contribution to the GDP, remains important for rural livelihoods. 50% of the rural population relies on farming as their main livelihood source (90% of these are subsistence farmers) and up to 80% of Lesotho's population engage in some form of agriculture related activity, including on-farm casual work. The three main food crops in Lesotho are: maize, wheat and sorghum, but with an average 70-80% of total production, maize is the preferred staple food. More than 95% of households engaged in agricultural production do not produce sufficient quantities to meet their own food requirements, and thus purchasing in the open market is one of main strategies to access food. Between 2000-2010, 44% of total household expenditure was spent on food. Food prices are currently around 60% higher than in 2005.

Estimates by the GoL and development agencies show widespread poverty with 56% of households living below the national poverty line, of which about 40% are extremely poor. Extreme poverty is concentrated in rural areas due to scarce income earning opportunities and a declining agricultural sector. The population in the Mountain areas are generally poorer than in the Lowlands due to the remoteness of communities, distance to urban centers, and reliance on smallholder rain-fed farming with relatively low productivity.

### **FAO LESOTHO Emergency & Resilience Programme background**

Climate Smart Agriculture involves activities that deliver sustainable food security and development benefits together with Climate Change adaptation and mitigation. All in an attempt to thwart the anthropogenic effects on the environment degradation. The FAO Lesotho Emergency and Resilience Programme has been designed to achieve combined adaptation and mitigation outputs by using focused approaches for sustainable and integrated agriculture practice, resulting in increased resilience of targeted communities.

Land management is the bases for all crop and livestock production systems. Achieving long-term food security, better nutrition and poverty alleviation is dependent on the use of land and good agricultural practices. Sustainable crop production based on conservation techniques include reduced soil disturbance, protection of soil with organic residue or cover crops and use of viable rotations. These techniques have the added benefit of storing carbon in agricultural soils.

Based on the presented country context above, the FAO Lesotho Emergency and Resilience Programme has been designed aa mainstreaming adoption of Climate Smart Agriculture practices in order to acquire sustainable agricultural outcomes, as per the following mission statement: "To

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*support Basotho increase their resilience and recover from food and agricultural emergencies through integrated sustainable agriculture and natural resources management”.*

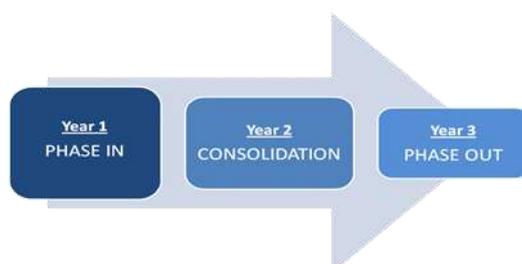
The programme is partly designed in support of the “Strategy for up scaling CA in Lesotho” prepared by the LNTFCA<sup>11</sup> and approved in April 2013.

In order to attain an integrated and sustainable agriculture approach, the programme combines capacity development through training and technical support to vulnerable households with the distribution of quality agricultural inputs in order to promote the adoption of the following technologies and improved practices:

- Conservation Agriculture (CA)
- Home Gardening
- Nutrition and Food Use awareness
- Agro-forestry (fruit trees) – foreseen for inclusion from 2014
- Rangeland Management awareness – foreseen for inclusion from 2015

The program takes into account that improvements in food security for vulnerable households will not transpire unless serious efforts are made to promote sustainable production techniques which also address the management of natural resources. The massive loss of topsoil due to excessive erosion is depleting the nutrients and thus reducing its productivity. To halt the high rate of soil erosion and reverse the soil fertility loss, the programme promotes production practices that conserve soils while also improving their structure and fertility mainly through CA.

Since the effective promotion and adoption of new production technologies require sustained support, FAO Lesotho Emergency and Resilience Programme is structured around a three year cycle which provides support to each beneficiary household:



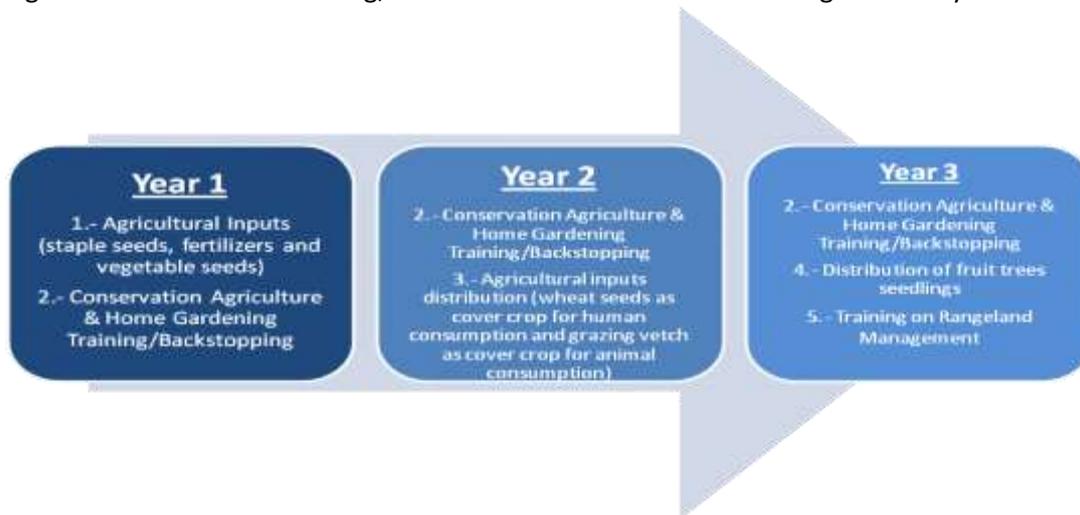
Training and technical support on CA and Home Gardening, Nutrition and Food Utilization are constant activities throughout the three years in partnership with the Unified Extension System in Lesotho. However agricultural inputs are provided within the first and second years (during “Phase In” and “Consolidation” stages). The inputs provided during year one are staple (maize and beans OPV – 5kg each per family), fertilizers (NPK and LAN – 50 kg each per family) and vegetable seeds (6 varieties – 100gr each per family). This package allows start practicing CA and intercropping while diversifying the production with homestead vegetable production and improved nutrition practices.

Year two inputs are wheat (25 kg per family) and grazing vetch seeds (7kg per family) which allow adopting cover crops, one of the most challenging aspects of CA in Lesotho as indicated in the “Strategy for up scaling CA in Lesotho”.

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<sup>11</sup> Lesotho National Task Force for Conservation Agriculture

In Year 3, FAO Lesotho is exploring additional technologies to be introduced such as fruit trees and rangeland management awareness (see graph below). No funds for these activities have been secured yet. As indicated above, extension services will continue to provide technical support and training on CA and Home Gardening, Nutrition and Food Utilization during the third year.



FAO Lesotho and the Ministry of Agriculture and Food Security (MAFS) started this phased “rolling programme” in 2012, with 11,000 households assisted with “Year 1: Phase in” package. In 2013, FAO has continued to assist these 11,000 households with “Year 2: Consolidation” package. Besides, additional 7,500 new households have been assisted in 2013 with “Year 1: Phase In” package.

FAO Lesotho, through the CATF has developed visual training material on CA for farmers to be used by extension staff improving the efficacy and efficiency of the training. In 2012 over 200 extension staff were trained on CA and Home Gardening/Nutrition while in 2013 over 330 extension staff underwent the same training plus armyworm awareness. Additionally, 30 extension staff members from all districts have been trained in 2013 on improved extension practice to promote CA. These trainers conducted trainings for 600 lead farmers, local counselors and chiefs in July/August 2013.

The development of training materials on home gardening, nutrition and food utilization has started in early 2013 and it is planned to assist the Ministry of Forestry and Land Reclamation with visual training material for communities in their areas of work, particularly Rangeland Management in 2014 (subject to fund availability).

FAO Lesotho also assists the Ministry of Agriculture and Food Security (MAFS) improving its capacity of research to test soil quality<sup>12</sup>, particularly organic matter and carbon contents and has procured mechanical CA equipment<sup>13</sup> for demonstration purposes among commercial and semi commercial farmers through MAFS.

The main target groups of the FAO Lesotho Emergency and Resilience Programme are selected based on vulnerability criteria of the head of household (women, elder, orphan, chronically ill) and members of household categories (chronically ill -often HIV AIDS affected, though not exclusively- elders, orphans, children under five and pregnant or lactating mothers).

Furthermore, vulnerable active farmers are selected in groups of 15 households approximately per village involving extension services, local representatives and communities. These groups will select

<sup>12</sup> Laboratory equipment, glassware and chemicals

<sup>13</sup> 4 Tractor-drawn planters and 15 ox-drawn planters

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a lead farmer in coordination with MAFS who will act as a mentor for the group and will also receive training and inputs from the project on the condition of being interested in practicing the new technologies and sharing his/her knowledge with the community. **Lead farmers** are part of the Unified Extension System for Lesotho and play a significant **modeling role** among farmers, an important consideration in the promotion of new techniques.

### **Objectives of Evaluation:**

The Emergency Response (ER) Programme has reached its second year of implementation and FAO Lesotho is interested in conducting a Mid Term Evaluation (MTE).

The MTE will analyse the **relevance, effectiveness, efficiency, impact and sustainability** of the ER (see details below under "Scope of Evaluation"). The MTE will take into account:

- the **attainment of objectives and planned results;**
- assessment **of sustainability** of project results;
- achievement of **outputs and activities;**
- assessment of **monitoring and evaluation systems;**
- assessment of processes that affected attainment of project results (**coordination support, country ownership, stakeholder involvement, financial planning and delays**).

This MTE should advise FAO and the MAFS on any necessary **improvements to be introduced** in the programme as well as confirming the initiatives that should **continue to be supported** in the future.

FAO Lesotho M&E reports conducted so far will be made available to the MTE team (**Baseline 2012-2013, Post Planting 2012-2013, Post-Harvest 2012-2013 and Baseline 2013-2014**).

FAO is interested to undertake this MTE with academia institutions working on Resilience research and explore possibilities for more in-depth analysis that could come up from the MTE.

### **Scope of Evaluation:**

- 1) **ER Programme Relevance** will look into the extent to which the FAO Lesotho ER Programme is suited to the priorities and policies of the target group, GoL and donor(DFID). The following key questions should be used as a guideline:
  - a. To what extent **are the objectives of the programme valid?**
  - b. Are the **activities and outputs of the programme consistent with the overall goal and achievement of its objectives?**
  - c. Are the activities and outputs of the programme consistent with the intended impacts and affects? Are governance systems and processes congruent with objectives?
- 2) **ER Programme Effectiveness** will be a measure of the extent to which the ER Programme attains its objectives. The following questions should be considered as a guideline:
  - a. To what extent are/were the objectives achieved?
  - b. What are major factors influencing the attainment of project objectives?

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- 3) **ER Efficiency** in the evaluation will measure the outputs (qualitative and quantitative) in relation to the inputs. **Alternative approaches to achieving maximum outputs** should also be presented by evaluators (within final report). Key questions to consider are:
- Where activities **cost efficient**?
  - Where objectives achieved **on time**?
  - Ultimately, has the programme implementation taken the **most efficient route** compared to other possible alternatives?
- 4) **ER Impact** will examine the **positive and negative changes produced** by the proposed intervention in the program; directly or indirectly, intended or unintended. This analysis should provide the main impacts and effects resulting from the activity as it adheres to social, economic and environmental indicators.
- Key questions to consider are:
- What has happened** as a result of the programme so far?
  - What **difference** have activities made to the beneficiaries and non-beneficiaries?
  - How many people** have been affected?
  - What evidences of **spill over effects** can be assessed at this stage of the programme?
  - What kind of technical, social and cultural actions should be considered **to improve** the impact of the programme?
  - To what extent the programme is effectively improving resilience of target communities?**

The MTE will also consider gauging the impact of the program by understanding the degree to which beneficiaries have developed resilience to the chronic and drastic changes to ecosystem services and their surrounding environment. It is suggested to conduct this assessment through social ecological system analysis of selected targeted communities. This aspect of the evaluation may assist determining the **role of biodiversity and vulnerability of targeted communities as well as its effects on ecosystems services (livelihoods)** This analysis could possibly lead to further and more in depth research possibilities.

- 5) **The ER Sustainability** analysis of this evaluation will measure whether the benefits of activities are likely to continue after donor funding is withdrawn. Key question to guide the analysis are:
- To what extent benefits of the ER program can be expected to **continue after project** activities have ceased?
  - What are the **factors that are likely to influence the achievement** of sustainability of the programme?
  - What kind of **technical, social and cultural actions** should be considered to improve the sustainability of the programme once the three years cycle is completed?
  - What areas of research would be recommended** to assess critical points identified during the MTE?

## Methodology

- Desk Evaluation of country background documentation, programme documents and FAO EP programme M&E reports.
- Interviews to relevant stakeholders including MAFS staff at HQ and field level, beneficiaries, neighbours not benefiting from the programme, NGOs, Donors and FAO staff.
- Field trips to project sites

## Expected Outputs

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- Draft evaluation report with maximum of 25 pages in the main report (Annexes can be included as necessary).
  - Following feedback from FAO Lesotho and MAFS, a final evaluation report will be submitted.
  - Presentation summarizing the findings of the Mid Term Evaluation.

### **Preferred Duration & Time period**

25 days

### **Desired Educational Background, Skills and Profile Considerations**

- Advanced degree in Environmental Science, Rural Development, Economic Development, Social Sciences or related field
- Research expertise in social-ecological systems; adaptive co-management; resilience assessment; sustainable land management; rangeland ecology; rural development
- A background in Development Research, experience in agricultural development programmes for small scale farmers
- Ability to think critically and analyze complex issues
- Earlier work on themes relevant for this assignment is valuable

### **Other Considerations**

- The evaluator/s should not have been associated with the design and implementation of the project.
- The evaluator/s will work under the overall managerial supervision of the FAO Representative in Lesotho and the direct technical supervision of the Emergency and Rehabilitation Coordinator.
- Based on key findings of the MTE, there could be an opportunity to engage in integrating future research into programme design. This is in order to ensure opportunities for research to inform evidence based programming initiatives.

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## APPENDIX 2. FIELD MISSION ITINERARY

- Monday 13 Jan: Meetings with government officials and NGOs involved in CA in Maseru. Mr Lebeso Legonjane; Ms Mampho Thulo
- Departure from Maseru to Thaba Tseka (TT) – Night in TT
- Tuesday 14 Jan: TT -Visit of Sehonhong RC (Senqu Valley) in the morning and Mohlanapeng RC (Mountain) in the afternoon– 2 villages in each RC (one from year 1 and one from year 2) – Night in TT
- Wednesday 15 Jan: TT – Mantsunyane RC (Mountain) in the morning - 2 villages in this RC (one from year 1 and one from year 2); Trip to Leribe in the afternoon – Night near Leribe
- Thursday 16 Jan: Leribe – Mahobong (Lowland) in the morning- 2 villages in this RC (one from year 1 and one from year 2); Trip to Maseru in the afternoon – Night in Maseru
- Friday 17 January: meetings with government officials in MAFS, NGOs involved in CA. De-briefing with FAO.

This itinerary allowed us to visit eight villages, four with Year 1 beneficiaries and four with Year 2 beneficiaries from all three agro ecological areas.

### APPENDIX 3. TYPICAL OPEN-ENDED QUESTIONS

Questions were asked to the entire group of beneficiaries via an interpreter in an open-ended, conversational manner. Answers lead to more in-depth probing of the issues. Care was taken to avoid single groups or individuals dominating responses. At the first sign of people losing interest or getting tired, the group was asked to show us their fields, which re-energized them.

Target group	Topic	Purpose
<b>Extension officers</b>	Please tell me about your work	Open up a conversation
	Please show me your facilities and equipment	Determine if there are shortcomings
	What motivates you to do your work?	Determine how motivated people are
	How do you learn about your work?	Determine skills and capacity needs
<b>Beneficiaries</b>	Please tell me about your farming, and how you make a living	Put participants at ease, open up the conversation
	Tell me about the projects you are doing with FAO and MAFS	Open ended, record what is foremost on their minds
	How many of your neighbours practice CA?	Determine uptake of CA
	How many of your neighbours have home gardens?	Determine uptake of home gardens
	What are you receiving from FAO and MAFS?	Is their understanding complete? Do they appreciate the intangible benefits?
	If free inputs are taken away, then what would happen?	Determine whether the project can continue on its own after FAO
	What are the benefits of the project for you? How is your life affected? How is your harvest affected?	Determine how people saw the tangible and intangible benefits
	How are you learning about CA and home gardens?	Determine whether, and how, people learnt
	If your neighbour asks you: what are the secrets of doing CA, what would you tell them? What tips would you give them?	Determine whether beneficiaries are able to motivate and capacitate others
	What should FAO and MAFS do more of in the project?	Determine areas for improvement
	What should they stop doing?	Determine shortcomings
	What should they do differently? What fine tuning is necessary?	Determine areas for innovation
	What needs to happen for you to switch completely to CA and home gardens and abandon conventional agriculture altogether?	Determine what the obstacles are
	What needs to happen, for your neighbours to start getting involved in CA?	Determine what the obstacles are
<b>Lead farmers</b>	How did you become a Lead Farmer?	Open up the conversation
	What motivates you to be a Lead Farmer?	Find out why Lead Farmers are doing it

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	How do you see your role?	Determine whether Lead Farmers understand their responsibilities
	What have you achieved so far?	Determine how they see the outcomes of their work
	If it was entirely up to you, what changes would you recommend in the FAO/MAFS programme?	Determine areas for innovation
	What is going well in the Programme?	Evaluate the programme
	What do you think of the support provided by MAFS and FAO?	Evaluate the programme
	Can you remember a time when there was enough food for everyone? When was that and what happened then?	Determine whether there were thresholds in food production
	What are the main reasons for the food shortages since then?	Determine whether there were thresholds in food production

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## APPENDIX 4. A RESILIENCE PRIMER

(with acknowledgement to Allyson Quinlan and the Resilience Alliance [www.resalliance.org](http://www.resalliance.org))

Human activities alter ecosystems around the world from local to global scales, which in turn influences the array of options for coping with disturbances, adapting to change, and securing the natural resources necessary for human well-being. Broadly speaking, how societies manage and interact with their environment can either contribute to building resilience thus making it easier to deal with shocks and adapt when necessary, or our actions can erode resilience, constraining options and increasing vulnerability.

Resilience is defined as the amount of change a system can undergo (its capacity to absorb disturbance) and remain within the same regime – essentially retaining the same function, structure, and feedbacks. Implicit in this definition is the degree to which the system is capable of self-organization. Social-ecological resilience also includes the degree to which a system can increase its capacity for learning and adaptation. ([What is resilience? video](#))

Changes in one part of a social-ecological system can influence the system's overall function and have an impact on the goods and services people derive from their environment. At the same time, processes happening at larger scales outside of the system, can act as external drivers, triggering or amplifying change and affecting communities, economies, and regions elsewhere (e.g., climate change, biodiversity loss, and the growing interconnectedness of economies around the world). Indeed many of the challenges confronting sustainable development and natural resource management today are linked to rapid and on-going change in societies and ecosystems in different parts of the world. The boundaries of our planet's resources are being pushed and stressed as never before, and the impacts of these interactions are becoming increasingly difficult to predict. Understanding how different components of a system interact through feedbacks to influence the system as a whole is central to a resilience approach.

A major shortfall of conventional management approaches has involved focusing on system parts in isolation, assuming change happens linearly (i.e., no abrupt shifts), and relying on command and control approaches. The myth of control and single species/issue approaches may appear to work in the short term but do little to prepare a system for dealing with ongoing change and future disruptions. The resilience approach, in contrast, looks at social and ecological linkages from the level of a household through to that of a community, a region, and a continent. It accepts change and renewal as 'normal', acknowledges uncertainty, and aims to develop the capacity to adapt or if needed, to transform.

A resilience approach involves several common elements. The first element is to work with stakeholders to define key issues and provide a focus. If necessary, models can help to identify limits to acceptable change or thresholds, interactions between social and ecological components, and linkages across scales. These limits of acceptable change are important because they can indicate breakpoints and help stakeholders understand what factors need to be monitored, reinforced, or managed differently, if possible. Finally, the roles of decision making systems, customs, rules or regulations are probed for insights and options for building resilience and adapting to changing circumstances. Ultimately a resilience approach aims to assist in resolving specific human-environment issues without compromising the resilience and integrity of the system as a whole.

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## 1. KEY INSIGHTS GLEANED FROM A RESILIENCE APPROACH

with acknowledgement to Allyson Quinlan and the Resilience Alliance [www.resalliance.org](http://www.resalliance.org):

### **1. Most linked social-ecological systems (SES) have more than one state in which they can exist.**

For example, some irrigated agricultural systems are susceptible to salinization. Once an agricultural system shifts from a productive state to a salinized state, the structure, function and outputs from the system define a new, alternate state.

2. Many SESs change gradually over time and can experience abrupt shifts to alternative system states when a threshold has been crossed. E.g., A shift from a clear lake with fisheries to a murky lake without fisheries when a Phosphorus threshold is crossed. Other examples include: conversion of coral reefs to algae-covered rocks, and grass rangelands to shrub rangelands.

3. Once a threshold has been crossed it is often difficult or impossible to return to a previous state without major system inputs. Understanding and monitoring controlling variables in the system can inform awareness of important system thresholds allowing time to prepare for or possibly avert an undesirable shift in the system. For example, in the case of a shift to a salinized system state, salt concentrations in the plant root zone of the soil make it inhospitable to vegetation thus making it difficult or unfeasible to shift the system state back to one of a productive, irrigated agricultural system.

4. Many SESs experience common patterns of change which can be described by an adaptive cycle that involves phases of growth, conservation of resources, collapse, and reorganization. Understanding which phase a system is in can inform management options.

**5. Systems are often linked across scales in ways that can constrain or encourage innovation and re-organization.** When systems become overly-connected they can be more vulnerable to the cascading effects of shocks such as was seen recently with the rippling effect of economic crises across much of Europe. Maintaining a degree of modularity can help prevent the rapid transmission of shocks. At the same time, ensuring that feedbacks to the focal system like those along a supply chain are not too distant and weak can help to ensure that appropriate signals are being received, allowing for needed adjustments.

6. Institutions and governance arrangements that allow a degree of redundancy and therefore ways of responding to change, and work with a mix of common and private property rights can influence the resilience of SESs. Adaptive governance allows for and encourages this flexibility along with experimentation, collaboration, and innovation. Enabling innovation in turn can create new opportunities and options but for this to happen change must be embraced. For example, small-scale innovations in rainwater harvesting and conservation tillage in Makanya, Tanzania have increased on-farm productivity and a variety of other ecosystem services that benefit the people who live there.

7. Sustaining diversity and working with ecological variability as opposed to attempting to control natural variation contributes to resilience. For example, in Indonesia, the predominance of a single rice cultivar, increases the system's vulnerability to pests, potentially repeating shocks that have happened in the past, and decreasing the resilience of the rice sector at a larger landscape level.

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Similarly, attempts to dampen the natural variability of wildfire regimes or insect outbreaks can potentially lead to less frequent but more catastrophic disturbance events.

8. Including ecosystem services that are either un-priced or have no market value in decision-making can help to make tradeoffs more transparent. The increased use of agricultural fertilizers in past decades has led to declines in other non-agricultural ecosystem services such as fisheries, flood regulation and recreational opportunities. Considering bundles of ecosystem services and managing agriculture as part of a larger landscape can inform decision-making.

9. Social capital in the form of trust, strong networks, leadership, and other aspects is linked to the capacity of people to respond effectively to change or disturbance and thus the resilience of a SES.

## **2. Resilience thinking and the management of agricultural systems**

Resilience thinking may assist in broadening our understanding of the processes involved in land degradation and transformation. The concepts of non-linear change, cross-scale feedbacks, hysteresis, thresholds and transformation (Walker et al. 2006) (Biggs et al. 2012) to assess challenges and develop solutions could complement more conventional models.

### **2.1 Agriculture as a social-ecological system**

Constant feedbacks and co-adaptations exist between the social and ecological elements of the system (Ostrom 2009) (Figure 1), with interplay between culture, land use, human decision making and ecosystem processes (Anderies et al. 2004). Knowledge and governance form the 'bridge' between the social and ecological components of the system (Berkes 2009). The ability of humans to respond appropriately to changes in the ecosystem is promoted or constrained by awareness, motivation and capacity to respond (Lambin 2005). Many human adaptations are maladaptive (Gunderson et al. 2006), e.g. to over-exploit natural capital for short term gain; or to use common property resources without restraint or rules.

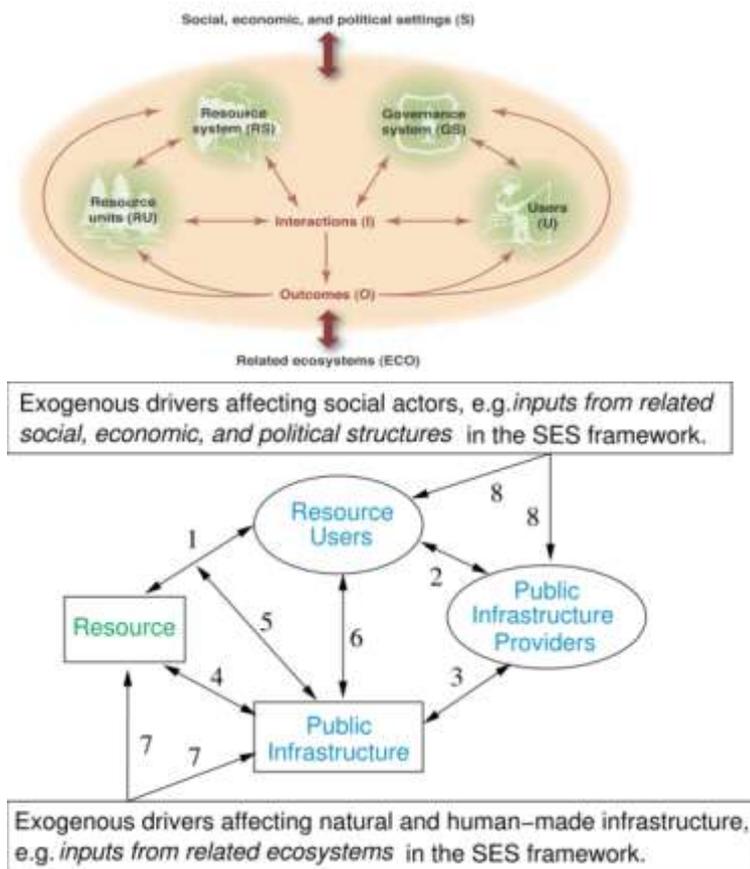


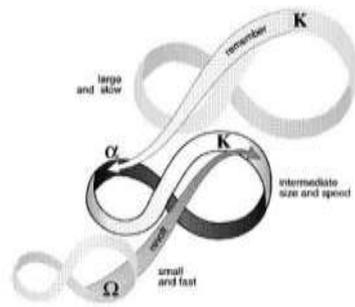
Figure 7. From Ostrom (2009). Science 235

## 2.2 The brittleness of arid agricultural systems in Africa

In most arid zones, slow variables drive the system, with many slow-growing species with long regeneration periods, and slow nutrient, carbon and nitrogen cycles (Lechmere-Oertel et al. 2008), as are decomposition rates (Mills and Cowling 2010). Seedlings are scarce (Sigwela et al. 2009), and indications are that some elements of the vegetation are adapted to long rest periods (true?). This is matched by co-evolved mega-herbivores and reptiles with slow life-cycles and the infrequent occurrence of fast abiotic processes such as fire and severe floods. When the vegetation is subject to vigorous disturbance its capacity to respond and adapt does not match the rate of change due to human impacts. Rapid defoliation, fuelwood collection and cultivation are examples of mismatches in temporal scale between rates of conversion and rates of self-organization.

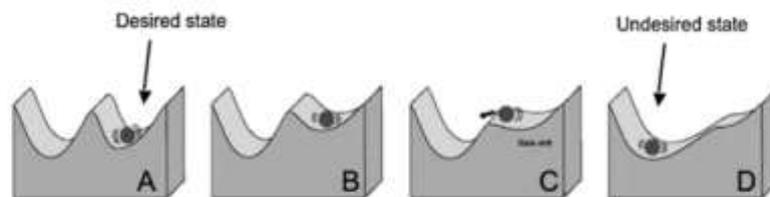
*Cross-scale feedbacks.* At regional scale, agricultural systems respond to changes in land use practices, which in turn respond to global demand for agricultural products and leisure (e.g. nature tourism, safaris and hunting), national policies and politics, and the regional capacity to provide public infrastructure and services (e.g. transport networks and access to markets, extension services, capacity for regulation). Global climate change, especially more frequent droughts, create shocks to the system from which it struggles to recover or re-organize. These factors in turn feed back, up the hierarchy, to agricultural practices, land prices and ultimately landscape-level disturbance. In communal areas, land entitlement, abandonment and cultivation are as much influenced by national

and provincial policies, the status and power of traditional institutions and agricultural extension practices, with reinforcing feedbacks on soil erosion ((Kakembo and Rowntree 2003).



**Figure 8.** From L. H. Gunderson and C. S. Holling, editors. *Panarchy: understanding transformations in human and natural systems*

*Thresholds and regime shifts.* Stocking rates and disturbance have upper thresholds which, when exceeded, lead to crossing of thresholds in vegetation cover and patchiness (Fabricius et al. 2003). When this happens, above-ground litter, soil Carbon (Mills and Cowling 2010), micorrhizal activity (Allsopp et al. 1996) and soil moisture (Van Lwijk et al. 2013) changes rapidly to a new ‘equilibrium’ associated with low productivity, less vigour and even higher fragility. From a social perspective, the availability of human capital such as skilled, healthy and able land managers, financial capital to enable proactive long term ecosystem management, and government’s capacity for extension services and / or law enforcement may reach thresholds which, when crossed, cascade to rapid and unexpected change. The system may move into a social-ecological ‘lock-in trap’ (Westley et al. 2011) with many self-reinforcing feedbacks (Gordon et al. 2010), a hostile environment with fewer ecosystem services and livelihood options for humans.



**Figure 9.** From Gordon, L. J., C. M. Finlayson, and M. Falkenmark. 2010. *Agricultural Water Management* 97:512-519

*Hysteresis (social-ecological memory).* The loss of natural capital and regenerative capacity lingers in the system long after impacts have occurred. The lag effect due to the ‘memory’ of past events means that the return pathways of re-organization or repair differ from that of the causal pathways. The amount of natural capital required to get the system back towards a desired state exceeds the original threshold value that was exceeded.

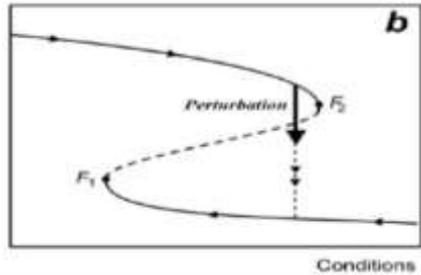


Figure 10. Scheffer et al. 2011. *Nature* 413: 591-596

### 2.3 Managing agricultural systems in Africa for resilience

Many cultivated landscapes in African ecosystems are currently in an undesirable yet trapped, resilient state from which it is difficult to 'escape'. The restoration approach should therefore be to promote social-ecological transformation, or transformability, rather than resilience, and once this has been achieved, to build resilience along the new trajectory.

*View the system through social-ecological lens* - the governance and institutional elements, the users, the ecosystem components as well as ecological elements are all part of the same integrated system. Research should thus focus on the interplay between these elements, and interventions should aim at addressing all of them.

*Understand feedbacks across scales* – monitoring systems should not only look at the focal scale of the landscape, the individual user or manager, and the capacity of ecological and human elements to adapt and change, but should also incorporate changes at a scale above that, i.e. changes in regional land use patterns, policy changes and changes in the adaptive capacity of authorities (Fabricius et al. 2002). At a scale below, changes in soil properties, regeneration, micro-scale disturbance and shifts in the awareness, cognitive processes and mental models of users and decision makers are important.

*Manage the slow-onset changes* – the regime shifts that occur in agricultural systems are the result of slow, almost undetectable changes in vegetation cover reaching thresholds, whereafter abrupt changes in soil properties take place. It is important to understand the boundaries of acceptable change, the safe operating space within which disturbance and vegetation cover can vary without lasting impacts, and manage the system to remain within those boundaries (Kinzig et al. 2006).

*Seek congruence between management and ecosystem processes.* The tempo of management interventions and resource use should match that of ecosystem processes (Bohensky and Lynam 2005). Quick-fix management interventions and vigorous disturbance events are incongruent with the slow ecological processes and rates of change that characterize arid African ecosystems and are likely to have unintended consequences.

*In restoration projects, be prepared to overcome the lingering memory (hysteresis effect) of degradation* - The social-ecological 'memory' in degraded systems lingers on, like a thermostat that fails to switch after the temperature has dropped (Scheffer 2009). The implication is that to move out of an undesirable basin of attraction with low energy and poor natural capital, current capacity

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will probably have to be restored at levels above where it was before the shift occurred. This could be a tedious and expensive process – there are no quick fixes. The key is to simultaneously adjust soil carbon and moisture-holding capacity and vegetation cover above threshold levels, without relying on seedling establishment. The same principle applies to when recovering the lost management and governance capacity, and knowledge. Crash-courses are unlikely to have the same impact as on-going and long term mentorship programmes in conjunction with recruitment drives for extension officers, ecosystem managers and information officers.

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## GLOSSARY OF TERMS

**Adaptive governance** – Governance approaches that are collaborative, flexible, and learning-based and rely on networks of people and organisations at multiple levels.

**Controlling (slow) variable** - Slow variables are system components that have a dominant influence on other system components (fast variables) including how they respond to variation in external drivers.

**Ecosystem services** - The benefits of ecosystem to people, categorized as provisioning, regulating and cultural services.

**Provisioning services** – Provisioning services are direct goods obtained from ecosystem such as food, fiber, fuel, and fresh water.

**Regulating services** – Regulating services are ecosystem processes that help to maintain ecosystem function and provide indirect benefits to people, for example, pollination, erosion control, carbon sequestration, water filtration, etc.

**Cultural services** - Cultural services support human well-being by providing a variety of values such as recreation opportunities, aesthetic and spiritual values, identity, etc.

**External Driver** - External drivers are forces of change that occur at scales outside of the focal system. They influence dynamics within the focal system yet there are no direct feedbacks to the external drivers. Examples of external drivers might include climate change, global markets, and ocean currents.

**Fast variable** - Fast variables are system components that are strongly shaped by changes in more slowly changing control variables. Fast variables are usually evident to ecosystem users e.g., pest species, fire, and often include ecosystem services, e.g., agricultural production, herd size, fish catch.

**Feedback (positive and negative)** - A signal within a system that loops back to control the system by either maintaining stability (negative feedback) or accelerating change within the system (positive feedback).

**Social-ecological system** – An integrated system that includes human societies and ecosystems and functions in an interdependent way with reciprocal feedbacks. The concept emphasizes the “humans-in-nature” perspective.

**Thresholds** - A threshold is a breakpoint between two alternate system states that occurs when levels of an underlying controlling variable pass a point at which the feedbacks to the rest of the system change.

### SUGGESTED FURTHER READING:

Resilience Thinking: Sustaining Ecosystems and People in a Changing World. By Brian Walker and David Salt. 2006. Island Press. 174pp.

Resilience Practice: Building Capacity to Absorb Disturbance and Maintain Function. By Brian Walker and David Salt. 2012. Island Press. 226pp.

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**Assessing Resilience in Social-Ecological Systems: Workbook for Practitioners 2.0.** 2010. Available online: [http://www.resalliance.org/index.php/resilience\\_assessment](http://www.resalliance.org/index.php/resilience_assessment)

Principles of Ecosystem Stewardship: Resilience-based Natural Resource Management in a Changing World. 2009. Editors: Chapin F.S. et al. Springer Publishers, 400pp.

**What is resilience? An introduction to social-ecological research.** Stockholm Resilience Centre. Publication can be downloaded [here](#).

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## **APPENDIX 6. EXAMPLE OF A VILLAGE RESOURCE MANAGEMENT PLAN (VRMP) FROM MACHUBENI, SOUTH AFRICA**

Key resource areas (KRAs) are landscapes of special importance within a village, at a fine scale, e.g. a specific valley or slope, or a spring or forest patch. A Village Resource Management Plan will contain a map identifying all KRAs. A mini-management plan is then developed for each KRA. Thus, a VRMP consists of an over-all description of all KRAs, and the management institutions and roles and responsibilities for managing them, as well as a collection of mini management plans, one for each KRA. An example of a mini management plan is copied below, from work done by the research team at Machubeni in South Africa's Eastern Cape. The focus should be on the seven steps.

### **1. DESCRIPTION AND IMPORTANCE**

- Situated below the village houses, and surrounded by Dongas.
- Very fertile soil, can be even more productive if it can be well managed.

### **2. PRODUCTION**

- Helpful during winter to feed livestock after harvest time when an agreement is reached with the Land management committee
- People can get enough food for their households by cropping vegetables
- This area can, however, be threatened if there is no land management to protect it

### **3. RIGHTS OF ACCESS**

- Anyone who owns a crop field in this KRA may use it
- However people who abandoned their fields and fail to abide by the land management rules may be asked to loan their lands to other people who will be keen to use them
- If most people fail therefore the Dept of Agriculture will be asked to assist in any possible way, and to educate crop farmers of those challenges and advise on how to overcome them.
- The Village Land Management Committee, Councilor, Headman, sub-headmen, PASC, and MTC have a big role to play in dealing with these situations.

### **4. RESPONSIBILITIES**

- All owners should plant crops, and maintain the fields at all times to avoid erosion and dongas
- Village people to see to it that Rules and Regulations are being followed
- Traditional leaders, sub-headman, Village Land Management Committee to put a stamp on the authority that these rules are followed
- Other relevant stakeholders should be involved like Municipalities, Dept of Agriculture, to assist in enforcement.
- Dept of Agriculture expected to play a major role in this field.

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## **5. RULES AND REGULATIONS**

### **2.1.1 General rules**

- Everyone needs to abide by these rules and failing to do so may lead to fines. Legal steps taken against them depending on the seriousness of the offence.
- The dignity of the crop fields needs to be reinstated.

### **2.1.2 Specific rules**

1. Stealing and vandalism will not be tolerated. Anyone caught will be prosecuted by law and other relevant local and legal structures
2. Only designated entrance and exit areas may be used as access points to and from the KRA
3. Livestock is allowed to graze for an agreed period on the advice of the Land Management Committee, however the owners must always keep an eye on them.
4. An agreement must be made with the Land Management Committee and property owners to graze on their land.
5. It is the duty of LMC to decide when the KRA is experiencing overgrazing . They can reduce the number of stock in the area according to their findings.
6. All crops must be planted on contours, across the slope and run of water
7. Dongas must be closed at an early stage (by owners), before they become a major problem
8. Make contours above the crop fields
9. Everyone must guard the fence from being removed, stolen, or vandalized
10. Livestock owners must take full responsibility for their stock to stay away from KRA during cropping seasons.
11. No one may start a fire without informing the LMC and people concerned
12. All entrances must be locked and sub-headmen and owners will keep keys. Entrances will only be opened when necessary.

## **6. MANAGEMENT RECOMMENDATIONS**

- The area must be fenced off
- Village support (everyone to keep an eye on activities inside this KRA)
- To utilize it at all times
- Keep up to date by seeking technical advice for monitoring and support
- Keep everyone ( stakeholders, villagers) up to date about any progress made in this KRA at all times
- Form Village Land Management Committees for this and other KRAs
- Hold monthly meetings
- Revisit the rules annually
- Selected community representative structures must play a major role to protect these KRAs.

## **7. REVISION**

- The rules may be reviewed after a period of 12 months.