

# RVCC PERMACULTURE PROJECT CLOSEOUT REPORT

Project period: 27 December 2019 - 30 September 2021

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PERMACULTURE

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## ACRONYMS

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|       |                                                                                            |
|-------|--------------------------------------------------------------------------------------------|
| BBCDC | Bethel Business and Community Development Centre                                           |
| BoQ   | Bill of Quantities                                                                         |
| CA    | Conservation Agriculture                                                                   |
| CAD   | Computer-Aided Design                                                                      |
| CTA   | Chief Technical Advisor                                                                    |
| DPIC  | District Project Implementing Committee                                                    |
| FFS   | Farmer Field Schools                                                                       |
| GEF   | Global Environmental Fund                                                                  |
| GoL   | Government of Lesotho                                                                      |
| LCDF  | Least Developed Country Fund                                                               |
| MAFS  | Ministry of Agriculture and Food Security                                                  |
| MFRSC | Ministry of Forestry, Range and Soil Conservation                                          |
| NSDP  | National Strategic Development Plan                                                        |
| PC    | Project Coordinator                                                                        |
| PFF   | Project Field Facilitator                                                                  |
| PIC   | Permaculture International Consultant                                                      |
| PSC   | Project Steering Committee                                                                 |
| RVCC  | Reducing vulnerability from climate change in the Foothills, Lowlands, and the Lower Senqu |
| TAC   | Technical Advisory Committee                                                               |
| ToR   | Terms of Reference                                                                         |
| UNDP  | United Nations Development Programme                                                       |

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SOURCE: RORY CLARK (2020)

## PROJECT TEAM

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The following is a list of all the project team members involved in the RVCC permaculture project and the time frames in which they were involved (Table 1).

*TABLE 1: PROJECT TEAM MEMBERS*

| Table 1: Project Team Members |                                   |                     |
|-------------------------------|-----------------------------------|---------------------|
| Name                          | Designation                       | Time Frame          |
| Kevan Zunckal                 | RVCC-Chief Technical Advisor      | Duration of project |
| Lebone Molahlehi              | RVCC-Project Coordinator          | Duration of project |
| Mpine Mabataung               | RVCC-Project Field Facilitator    | Duration of project |
| Motlatsi Phasumane            | RVCC-Project Field Facilitator    | Duration of project |
| Mamorakane Makhetha           | RVCC-Procurement                  | Duration of project |
| Rethabile Thipe               | RVCC-Procurement                  | Duration of project |
| Rory Clark                    | Permaculture Specialist           | Duration of project |
| Neo Mosito                    | RVCC-Project Field Facilitator    | Duration of project |
| Nkuebe                        | RVCC-Driver                       | Duration of project |
| Seliane                       | RVCC-Driver                       | Duration of project |
| Sbongiseni Mabea              | Permaculture Specialist Assistant | Duration of project |

## Acknowledgments

The permaculture international consultant, hereafter referred to as the PIC, would like to acknowledge and thank all those who assisted and contributed to the project: the members of the team listed in Table 1 above; and senior UNDP management: Betty Wabunoha (Resident Representative), Nessie Golaka (Deputy Resident Representative), and Limomane Peshoane (Sustainability Expert); and the various members of the Ministry of Forestry, Range, and Soil Conservation (MoFRSC), Ministry of Agriculture and Food Security (MoAF) members of the project steering committee (PSC); and the RVCC project vehicle drivers. The PIC would also like to thank the funder for the project – Global Environmental Facility (GEF).

# 1. EXECUTIVE SUMMARY

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Permaculture, which consists of two components, “permanent” and “agriculture,” can be defined as a whole-system food production system that mimics natural land behaviours to produce food, fibre, and energy and accommodates local needs. As such, permaculture is a regenerative farming system based on design principles that organize plants and animals to function together while providing abundant and diverse yields on a sustainable basis.

The RVCC permaculture project has proved unequivocally that permaculture is a practice of excellence, well suited to address and reverse the land degradation issues faced by Lesotho and to lessen the vulnerability of its people to the negative effects of climate change.

The suite of permaculture principles implemented were contrasted to traditional agricultural practices and were captured in a baseline assessment prior to the start of the project. Baseline practices observed prior to project start were essentially characterised by extensive extractive cultivation and practices that precipitate land degradation while making limited room for resilient and nutritionally rich food production.

The pilot project demonstrated how Permaculture is well suited to small-scale farmers' circumstances as they combine a range of quick wins – necessary to convince farmers of the worth of their investment in such projects - combined with long-term development/food gains. The adoption and upscaling of permaculture as an agricultural production system can play a quintessential role in containing and even reversing soil erosion and bringing back sustainable agro-biodiversity compared to unsustainable traditional farming practices.

Recommendations on sustaining each of the permaculture interventions, as well as on scaling them up, have been clearly unpacked in the report. Avenues for expanding permaculture into other tribal council areas have already been identified with the relevant stakeholders, and the MAFS and the MFRSC have pledged they will incorporate permaculture into their extension services and programmes, and will where possible, replicate the concept of demonstration gardens and hold permaculture open days for the new communities being reached.

The report outlines several operational issues (mostly of a financial nature) that were encountered and hampered the optimal implementation of the project. Although the permaculture project was implemented over a relatively short time period of 19 months – providing time to only lay the foundational work – these foundations have been laid solidly, and the project is equipped to sustain itself in the future, provided that additional time and resources are dedicated to mentoring the farmer-beneficiaries, and adequate monitoring is maintained by the project partners. A project of this scope that includes agroforestry interventions should ideally run for five years so that farmers and their farms can go through several stages of development and receive the mentorship prescribed for each phase.

During September 2021, while compiling the closeout report, the PIC had the opportunity to visit some of the beneficiary sites. In total, 20 permaculture gardens have been created across the Mohale’s Hoek district area, directly contributing to the lives of the farmers and their families that work these gardens – approximately 178 (homestead garden beneficiaries, plus members of each community garden) have benefited directly from this aspect of the RVCC project. These farmers are now better equipped to face the challenges of climate change and land degradation. Their farms have been equipped with rainwater harvesting tanks and runoff harvesting earthworks, with raised vegetable beds with many types of open-pollinated crops, conservation agriculture plots with cover crops, drip irrigation, holistic animal structures, traditional breeds of chickens, beehives, fodder, and forage crops, fruit and nut trees, different types of berries, fences with vine crops growing on, herbs and medicinal plants; kitchens for seedbanks and the

preservation of food products. These gardens will serve as model examples for their neighbours and communities at large to follow.

On-site observations made as part of the close-out visits, despite having been conducted very early in the growing season, revealed that the newly set up gardens were establishing well, and the infrastructure installed is functioning well after having been tested by some harsh weather events. It was also apparent that farmer-beneficiaries have understood the need to work with slope planning: contour making (using an A-frame); planting trees on steeper slopes; using walled terraces if needed in order to mitigate soil erosion and rehabilitate land degradation. Most have already adopted many of the permaculture practices: such as mulching, companion planting, free-range chickens; improving animal well-being and health through holistic animal husbandry; planting a diversity of crops; run-off rainwater harvesting; water conservation through drip irrigation; and integrating animals, crops, and trees. Some indicated that the installation of infrastructure has started playing a part in resolving conflict among community members (especially around the use of water resources), whilst others had expressed some inclination to shift from subsistence to commercial production.

At the time of submitting this report, there were still a few remaining actions that needed to take place for the project to be fully completed. Clear tasks have been outlined at UNDP, and ministerial implementation partners will be taking this forward.



*SOURCE: RORY CLARK (2020)*

## 2. INTRODUCTION

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This document is prepared for the United Nations Development Programme (UNDP) Lesotho as part of the Reducing vulnerability from climate change in the Foothills, Lowlands, and the Lower Senqu (RVCC) permaculture project closure reporting requirements.

The report presents the summary of all the project's planned deliverables, including its management structure, implementation plan, the current status of select pilots, and provides recommendations for designing and implementing programs that would seek to replicate the adopted approach to upscale permaculture in Lesotho. This report should be read in conjunction with the policy brief<sup>1</sup> developed on the basis of this pilot programme and the permaculture training material<sup>2</sup> developed for the permaculture project.

### 2.1 Background

The kingdom of Lesotho is already experiencing the negative effects of climate change, which include *inter alia* high variations in temperatures from year to year, increases in the average annual temperatures since 1970, and water sources such as springs, dams, and rivers having either run dry or are greatly diminished. Recurring drought has also caused yearly crop yields to drop significantly. It is noted, though, that many of the climate change impacts that are emerging are exacerbated by unsustainable land-use practices that have a long history of land degradation in the country.

Agriculture is the main source of income for the Basotho and is mostly rain-fed. Only 11% of the total land in Lesotho is arable. Lesotho ecosystems are fragile, and due to widespread land degradation – essentially attributable to agriculture - agricultural activity is increasingly practiced in marginal areas.

Lesotho's topography and location influence its temperate, alpine-like climate. This terrain is likely to compound the country's vulnerability to climate variability and long-term climate change (Ministry of Energy, Meteorology and Water Affairs 2013). The projected impacts of climate change on Lesotho, as assessed by the IPCC's Fifth Assessment Report (AR5), are briefly captured in box one below.

#### **BOX 1: FUTURE IMPACTS OF CLIMATE CHANGE ON LESOTHO**

The northern areas are projected to see annual temperatures increase between 0.4-4.7°C, while the southern regions will experience temperature increases between 0.2-3.8° C by 2100.

The number of 'frost' days is projected to decrease by mid-century (2046-2065) and late-century (2081-2100) under all emissions scenarios. The largest projected change in the number of 'frost' days is over north-eastern Lesotho in the Mountain livelihood zone. The number of 'warm' days and nights is projected to increase by the mid and late 21st century under low, medium, and high emissions scenarios. North-western Lesotho is projected to see the largest increase.

Projections suggest a late onset of summer rains and a change in rainfall patterns that will become more erratic. Mean annual precipitation is projected to increase slightly by the middle (2046-2065) and late 21st century (2081-2100) under all emissions scenarios. Southern Lesotho is projected to see average to below-average precipitation in summer.

Projections indicate an increase in the intensity and frequency of floods and droughts.

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<sup>1</sup> Clark, R. 2021. Contributing to climate change adaptation in Lesotho through policy interventions focused on scaling up permaculture principles and practice and linking with the Ecological Organic Agriculture Initiative (EOA-I): Policy Brief.

<sup>2</sup> Clark, R. 2020. The RVCC Permaculture Gardening Handbook.

The Senqu River valley lowlands are the most vulnerable to climate change, with a population of mostly peasant subsistence farmers, livestock farmers, and destitute households with very limited livelihood options (MNR, 2007)

### 2.1.1 The “Reducing vulnerability from climate change in the Foothills, Lowlands and the Lower Senqu River Basin” (RVCC) project

The “Reducing vulnerability from climate change in the Foothills, Lowlands and the Lower Senqu River Basin” project, henceforth called RVCC, has implemented multiple strategies to increase resilience and to mitigate the effects of climate change in Lesotho. From building capacity and informing policy change at the Government level to grassroots initiatives that directly strengthen the lives and livelihoods of the

Basotho against predicted climate shocks through climate-smart ecosystem management and rehabilitation.

The RVCC project took place in the Moleleke’s Hoek district in three community councils: Khoelenya, Lithipeng, and Thaba-Mokhele, which comprise fifty of the most “climate change vulnerable” villages in the area. At least 7,000 households are benefiting from this Least Developed Country Fund (LCDF) funded project.

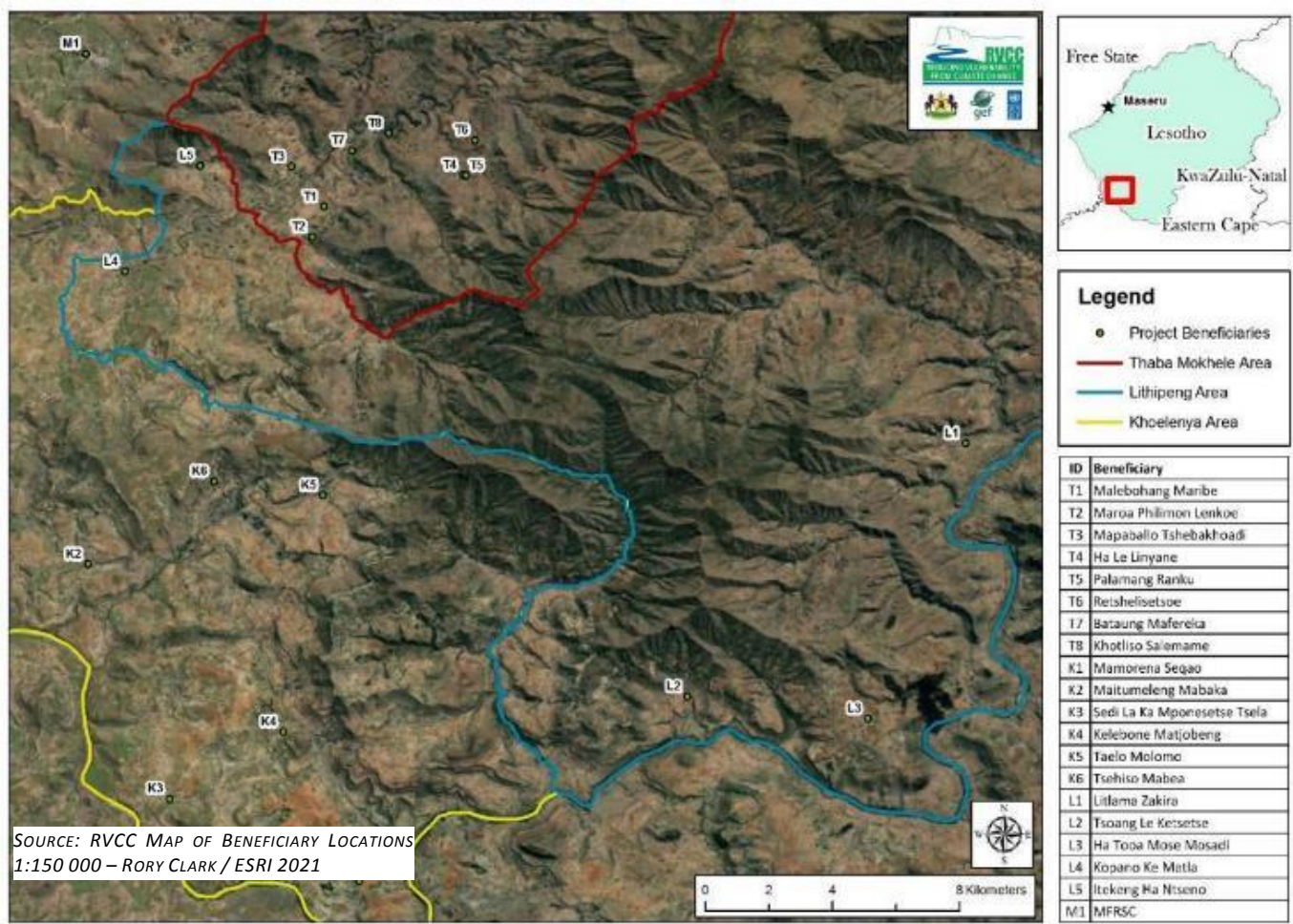


FIGURE 1: MAP OF THE PROJECT AREA

Land management practices are currently unsustainable or inadequate. Natural resources in these areas are under the most threat from climate change, and agriculture is being carried out in the absence of conservation agriculture or permaculture principles, aggravating land degradation, poverty, and vulnerability.

### 2.1.2 The RVCC Permaculture Project

On the occasion of a visit to the project intervention sites in June 2019, the Chief Technical Advisor (CTA) noticed that all the food production initiatives, both intensive and extensive, lacked any evidence of permaculture principles and practice. Recognising that this was a serious gap and one that, if filled, could add substantial value to the project, he motivated for the procurement of a permaculture specialist who could provide the necessary inputs into the food production interventions of the project. With the project focusing on climate change resilience, he felt that a strong permaculture influence needed to be incorporated into any food production/security initiatives in order to be sustainable and regenerative and therefore contribute to climate change resilience. He also felt strongly that the model of small scale regenerative agriculture projects at the community and household-scale was an essential alternative to the unsustainable way in which food is currently produced in the country, i.e., that the livestock and crop production methods, as well as intensive food gardens all seriously lacked sustainable methods of production. Such a project, if successful, will enhance community resilience to climate change throughout the country. The RVCC Permaculture Project thus came about as an additional intervention to those already planned by the RVCC project.

## 2.2 Project Goals, Objectives, and Outcomes

### 2.2.1 Overarching RVCC Project Goal, Objective, and Outcomes:

The RVCC Project Goal (of which the RVCC permaculture project is a part) is to ensure that by 2020 Lesotho adopts environmental management practices that promote a low-carbon, climate-resilient economy and society, sustainably manages natural resources, and reduces vulnerability to disasters

The project objective is to mainstream climate risk considerations into the Land Rehabilitation Programme of Lesotho for improved ecosystem resilience and reduced vulnerability of livelihoods to climate shocks. (UNDP RVCC ToR 2015).

**The project design makes provision for five project Outcomes, which are intended to achieve the project Objective, as follows:**

1. The Ministry of Forestry, Range and Soil Conservation and relevant Departments have increased technical capacity to apply up-to-date climate science
2. Communities are empowered with skills, knowledge, partnerships, and institutions for managing natural resources to reduce vulnerability to climate change and increase the resilience of natural and social capital (over 1,000 households with potential for upscaling to cover 20,000 households).

3. Over 50,000 hectares of land across the Foothills, Lowlands, and the Lower Senqu River Basin were rehabilitated through the operationalization of the climate-smart Land rehabilitation program.
4. National strategies for rangeland and wetland management are strengthened by the integration of climate change/variability and ecosystem management.
5. The Lesotho National Strategic Development Plan (NSDP) is mainstreamed into local development strategies to support the constituency-wide adoption of the climate-smart land rehabilitation program.

This report specifically focuses on the permaculture project and does not discuss the main RVCC project.

### 2.2.2 RVCC Permaculture Project Outcomes (as per the ToRs):

The RVCC permaculture project was conceived to supplement the scope of the RVCC main project. It was implemented between February 2020 and October 2021, a period of twenty months, and specifically focused on empowering the target communities (over 7,000 households with potential for upscaling to cover over 20,000) with skills, knowledge, partnerships, and institutions for managing natural resources to reduce vulnerability to climate change and increase the resilience of natural and social capital. In alignment with these afore-mentioned objectives and to further expand and enrich the scope of the overall RVCC project, the RVCC Permaculture Project sought to contribute to the following outcome:

1. Increased technical capacity of the Ministry of Forestry, Range and Soil Conservation and relevant departments to apply up-to-date climate science for the management of evolving risks and uncertainty linked to climate change; and
2. Communities empowered with skills, knowledge, partnerships, and institutions for managing natural resources to reduce vulnerability to climate change and increase the resilience of natural and social capital (over 7,000 households with potential for upscaling to cover over 20,000) households.
3. Technical guidelines for climate change adaptation interventions developed and implemented.
4. Policy recommendations for the integration of climate risk considerations in the Lithipeng, Khoelenya, and Thaba-Mokhele Community Councils' development plans, as well as the Mohale's Hoek District development plan implemented.

**Notes from the PIC on what is framed as intended outcomes and proposed revisions to the framing of deliverables (also refer to section 5, which discusses project outputs):**

In these ToRs, it is worth noting that items 3 and 4 are formulated as outputs as opposed to outcomes. The PIC wishes to suggest a reframing of these outputs so that these are better aligned to the effective scope of work carried out as part of the RVCC permaculture project, whilst reflecting recent discussions with project advisors:

- For deliverable number 3, the crafting of guidelines “for climate change adaptation interventions” have specifically focused on permaculture interventions as an intrinsic contribution to climate change adaptation strategies. Hence the revised header for this deliverable reads as follows “*Guidelines for*

*Permaculture in Lesotho: a pathway for sustainable agriculture in Lesotho whilst contributing to climate change adaptation.”*

- For deliverable number 4, similarly, the policy section seeks a narrower scope than formulating “recommendations for the integration of climate risk considerations” in the said areas and is rather focused on recommendations related to further upscaling permaculture practices in Lesotho. It also attempts to provide much broader policy guidance for consideration at the national level, with due consideration given to aligning the learning gained from the RVCC permaculture project with a possible nation-wide organic and regenerative agriculture plan that would see Lesotho join the rank of countries actively working towards supporting Ecological Organic Agriculture (EOA), as advocated by the African Union (AU) Heads of States. The policy brief has thus been retitled *“Contributing to climate change adaptation in Lesotho through policy interventions focused on scaling up permaculture principles and practice and linking with the Ecological Organic Agriculture Initiative (EOA-I).”*

## 2.3 Situation analysis

Global challenges such as climate change are already impacting the lives of countless Basotho but particularly those who are most vulnerable - those who rely on the land for all their needs, food, and income. Approximately 80% of the Kingdom of Lesotho’s population depends on the agricultural sector, but less than 5% of households in Lesotho produce enough food to feed their families. Rising food prices, the rising cost of seeds and fertilizer, dependency on food imports (70 percent of food consumed is imported); drought in recent years, declining agricultural production - caused by severe land degradation (30 percent of the country's needs are met through cereal production compared to 80 percent in 1980 (International Fund for Agricultural Development (IFAD))<sup>3</sup>. The Senqu River valley lowlands are the most vulnerable to climate change, with a population of mostly peasant subsistence farmers, livestock farmers, and destitute households with limited livelihood options (MNR, 2007)<sup>4</sup>.

Although the growing of food is happening at many of the sites within the project area, this is largely happening in the absence of any permaculture principles and practice. Land management practices are currently unsustainable or inadequate, natural resources in these areas are under the most threat from climate change, and agriculture is being carried out in the absence of conservation agriculture or permaculture principles, creating land degradation, poverty, and vulnerability; while also contributing to climate change through the release of carbon from soil stores and the loss of carbon sequestration capacity.

In terms of the agricultural support provided to farmers in Lesotho, the baseline situation was that permaculture principles and practice were not integrated into any of the training provided by the RVCC project to either technical staff of the relevant Ministries and/or the participating community members.

Detailed baseline information collected before project implementation indicates the following trends:

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<sup>3</sup> International Fund for Agricultural Development (IFAD )(2021). Climate adaptation and mitigation measures for nutrition co-benefits in IFAD investments in Lesotho. Available from: <https://www.ifad.org/en/web/knowledge/>

<sup>4</sup> Ministry of Natural Resources (MNR). (2007). Lesotho IWRM Strategy- Available from: <https://www.academia.edu/>

- The target beneficiaries grew a range of vegetables but a limited range of staple crops (grains and beans), fruit, nuts (no nut trees), and some fodder/forage crops, with very limited production in winter.
- Most of the beneficiaries had some perennial crops growing, such as a few fruit trees and lucerne at the start of the project. However, they were few in number (and low in diversity) and did not cover a significant portion of the farmer's production area, nor were they integrated with farm animal production.
- Only a few beneficiaries were using cover crops, such as vetch and lucerne, and even fewer had some perennial crops growing, such as a few fruit trees and lucerne at the start of the project. These crops only represented a limited portion of the farmer's production area and were not integrated with animal production.
- Only a few beneficiaries had been maintaining a seed bank.
- Only a few beneficiaries were using organic pest control methods. The overall ecological health of each beneficiaries' farm was in poor condition in terms of natural habitat, for predator birds and wasps, vegetative cover, plant, and animal diversity.
- Only a few farmers were practicing plant propagation, and even then, practices were very basic; farmers would, for instance, grow some vegetable seedlings in broken small plastic tubs and using and using local non-enriched soil; that would preclude any commercial prospects and also compromise the quality of stock for planting.
- Only a few beneficiaries had an Alien Invasive Plant (AIP') removal programme in place.
- Some of the beneficiaries were practicing conservation agriculture.
- Applying kraal manure to vegetable beds and staple crop plots is widely practiced. However, very few beneficiaries were applying dry mulch, and no beneficiaries were making compost teas. Even this traditional practice of applying dry manure is a sub-optimal approach to soil management and calls for an intervention (i.e., adequate composting).
- Although some attempts to work appropriately with contours and sloped land were evident, no beneficiaries were making use of precision equipment such as A-frames or other equipment to plan their farm layout to minimise soil erosion. On several sites, the cultivation of crops such as maize was taking place on steep slopes and was causing degradation.
- The condition in which the animals are kept and housed at many of the beneficiary sites was cause for concern. Many had very limited space to move, little and inadequate shelter from rain, sun, or snow, and not enough food or opportunity to fulfill social needs and behaviour. One of the farmers kept battery (caged) chickens in such a manner that the animals had no free movement and were very overcrowded. The RVCC permaculture project has sought to address some of these pressing issues through capacity building, support, and mentorship in "climate-smart agricultural best practices,"<sup>5</sup> as exemplified in permaculture principles, to the region.

This has been achieved specifically through the objectives of the training of ministerial technical staff, teachers, and farmers, and the creation of demonstration gardens in three strategic locations across three different communities (as well as 17 subset gardens), thereby increasing Climate Change adaption and livelihood resilience of the farmers, and their families.

## 2.4 Institutional Arrangement /Reporting framework

The Consultant reported directly to the Project Coordinator, who was supported by the Chief Technical Advisor (CTA). The Consultant worked in close collaboration with the Project Management Unit staff members, the staff of the Ministry of Forestry, Range and Soil Conservation (MFRSC), the Farmer Field Schools (FFS), Community Councils, selected farmers, and NGO representatives.

## 3. PROJECT PHASES & DELIVERABLES (OUTPUTS)

### 3.1 Project Phases and Timeline

The following chart illustrates the flow of the activities and various deliverables according to their date of implementation.

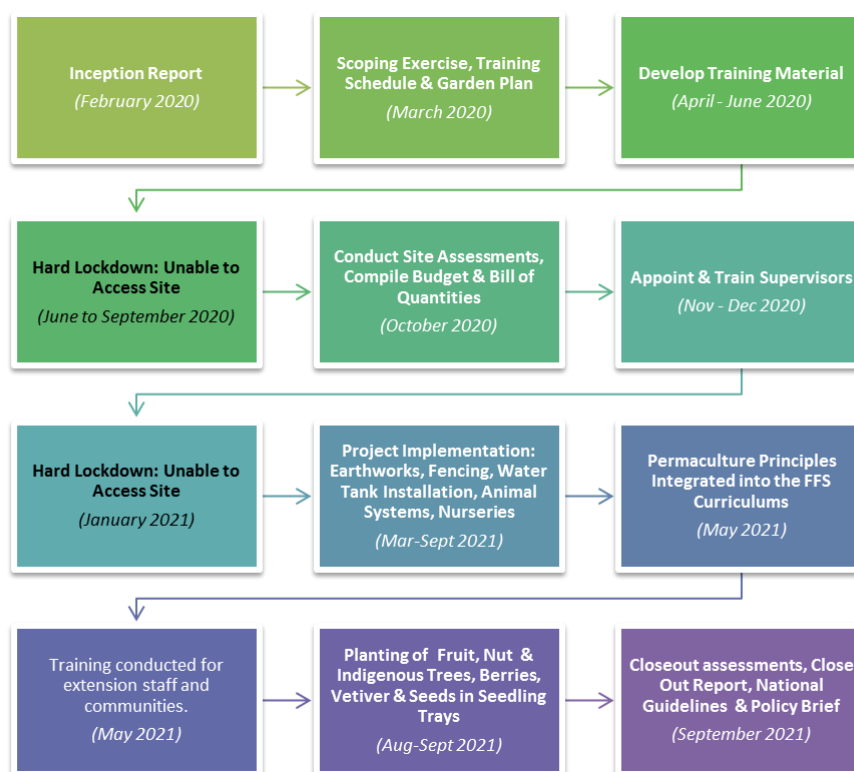


FIGURE 2: PROJECT PHASES AND TIMELINE

## 3.2 Overview of Project Deliverables and processes followed

The following is a list of the project deliverables and their status taken from the Permaculture Independent Consultant's (PIC) contract:

TABLE 2: STATUS OF PROJECT DELIVERABLES

| Table 2: Status of project deliverables                                                                                                                                                           |                        |                         |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------|-------------------------|
| Description                                                                                                                                                                                       | Status                 | Reviewed & confirmed by |
| Inception Report                                                                                                                                                                                  | Completed & signed off | Project Coordinator     |
| Compile a training schedule and plan for the development of demonstration food gardens                                                                                                            | Completed & signed off | Project Coordinator     |
| Develop training material                                                                                                                                                                         | Completed & signed off | Project Coordinator     |
| Conduct site assessments & farmer interviews, compile a budget with detailed specifications & BoQ for the three demo gardens.                                                                     | Completed & signed off | Project Coordinator     |
| Report on developed TORs for engagement of permaculture supervisors                                                                                                                               | Completed & signed off | Project Coordinator     |
| Progress report on installation of water systems (tanks, tank stands, and gutters) and Soil sampling and amendments; and completed earthworks (digging of swales, tractor tillage, and TLB works) | Completed & signed off | Project Coordinator     |
| Report on training conducted for extension staff and communities and Permaculture principles integrated into the FFS curriculums.                                                                 | Completed & signed off | Project Coordinator     |
| Progress report on the delivery of equipment and materials to the sites and installation of animal systems and infrastructure (Perimeter fencing, chicken run fencing.)                           | Completed & signed off | Project Coordinator     |
| Report on delivery and planting of plant materials (fruits and nuts and, berries and nuts)                                                                                                        | Completed & signed off | Project Coordinator     |
| Project close-out report, national guidelines, and policy brief.                                                                                                                                  | Pending                |                         |

The following is a description of the PIC's Scope of work as it is presented in the ToR.

1. Undertake a fact-finding mission to the project area to meet with relevant technical staff, Farmer Field School Chairs and community representatives, participants, and farmers to assess the situation as far as school, household, and community-based food production initiatives are concerned and together with

the technical staff, farmers, NGO representatives, Farmer Field Schools, and Field Facilitators; compile a training schedule and plan for the development of demonstration food gardens.

2. Develop training material aimed at addressing the specific circumstances found within the project area. Particular attention must be paid to the selection of food plants that are relevant to building resilience to climate change projections and local growing conditions, as well as food processing and preparation requirements.
3. Deliver training as per the agreed schedule and to at least 30 technical staff /NGO staff and 50 - 75 lead farmers / and teachers representing the 27 schools. Note that training may be best delivered to small groups within each of the Community Council Areas depending on what is agreed to during the fact-finding mission.
4. Design, establish and support the development and maintenance of three demonstration food gardens (one per Community Council area) in which the principles and practices of permaculture are clearly demonstrated. As with the training, particular attention must be paid to the selection of food plants that are relevant to building resilience to climate change projections and local growing conditions, as well as food processing and preparation requirements. Seasonal variations must be covered in this process to ensure that food can be produced throughout the year.
5. Work with the Farmer Field Schools to ensure that the permaculture training is fully integrated into their curriculums, that the trainers have the capacity to replicate the training to more farmers, that they can support the replication of permaculture food gardens and the integration of permaculture practice into existing food gardens. Provide mentorship to the trainers monitoring the replication of the training and practical demonstration.
6. Provide a report which documents the processes that were followed in the implementation of this work, detailing all the outputs and providing data on methods applied, seeds selected, food produced, farmer perceptions, and the uptake of the permaculture principles and practice; and recommendations for policy integration/policy brief.

The RVCC permaculture projects sought to address adverse land management practices by piloting the introduction of permaculture principles. In doing so, the project structured its activities along three main axes:

- 1) A training component: this entailed the development of training materials and a training programme, which were developed concurrently with the setting up of pilot training sites. The training was then delivered, reaching 23 Ministerial staff (technical staff) and 34 lead farmers.
- 2) A demonstration site component: the project designed, established, and supported the development and maintenance of twenty trial sites. These included three demonstration gardens - one in each Community Council area that included the whole “suite” of permaculture recommended principles - and 17 subset gardens that included a portion of these in order to test and unearth the most cost-efficient and easy way to replicate permaculture interventions into existing RVCC food production intervention sites. Of these twenty gardens that were developed, 12 were at homesteads, 7 were community gardens, and one was at the MFRCS district office in Mohale’s Hoek.
- 3) A networking/institutional linkages component: the project worked closely with Farmer Field Schools (FFS) to ensure that the permaculture training is fully integrated into their curriculums, that the trainers have the capacity to replicate the training to more farmers, that they can support the replication of permaculture food gardens and the integration of permaculture practice into existing food gardens.

On the basis of what the baseline assessment revealed and what was required to establish the demonstration gardens, the Permaculture Project sought to contribute to the RVCC project in the following areas:

- Improve rainwater harvesting & infiltration
- Increase water storage and rainwater harvesting off roofs
- Provide homestead/farm connections to natural water sources (such as springs)
- Provide solutions to halt and rehabilitate soil erosion
- Increase crop diversity
- Increase perennial plant production (farmers mostly rely on “one season” annual crops for food needs)
- Providing year-round food production solutions
- Reduce input costs such as seeds and fertilizers
- Increase crop yields and outputs
- Provide organic pest control methods and solutions
- Increase technical capacity through permaculture training
- Provide holistic/ethical animal husbandry solutions (free-range chicken runs, pig pens, sheep pens)
- Improve livestock nutrition and fodder availability
- Increase and diversify livelihood enterprises

Each of the intended deliverables and how these have been carried out is detailed hereafter.

### 3.3 Inception phase

#### 3.3.1 Inception report

The contract was sent to the PIC on 4<sup>th</sup> February 2020 and was signed and returned on the same day. The PIC had his first inception meeting with the CTA on 7 February 2020 and a meeting with the Project Coordinator on 12 February 2020. The PIC worked on the inception report between 15 and 28 February 2020<sup>6</sup>.

**The objectives of this inception report were to:**

- Confirm the project objectives, the scope of work, and deliverables;
- Report on inception activities;
- Detail the project approach and methodology;
- Confirm and elaborate on the project plan;
- Outline the preliminary findings of the desktop review
- Discuss progress in data collection;
- Outline the limitations of the evaluation;
- Provide recommendations

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<sup>6</sup> Clark, R. 2020. Inception report.

### 3.3.2 Training schedule and garden development plan

#### 3.3.2.1 [Scoping exercise](#)

The PIC made his first trip to the RVCC project area in the Maseru's Hoek District of Lesotho from 1<sup>st</sup> March to 6<sup>th</sup> March 2020. In that time, he met with the RVCC team, paid a courtesy visit to the Principal Secretary, Ms. Maseithati Mabeleng, at the MFRSC offices, and gave several presentations on the inception report, including to the RVCC team, Development Partners Implementing Committee (DPIC), and the Technical Advisory Committee (TAC). He also made a short visit to the three council areas and met with Councillors, lead farmers, community gardeners, and project school gardeners in the Districts. The PIC then presented his findings from this mission and held a training schedule workshop with the DPIC team. The trip ended with a final Project Inception Report, which was presented to the TAC and then again to the UNDP Sustainable Development Specialist, Mr. Limomane Peshoane, at the UNDP office in Maseru.

The PIC gathered data such as GPS coordinates, lead farmer information (through short interviews), crop varieties, challenges and strengths, needs, photographs, and drone imagery, farmer field School information, and interviews with DPIC team individuals. The PIC established a rapport with the RVCC team and discussed the many initiatives of the project.

The PIC made the following preliminary observations during the mission:

- There is a wealth of knowledge and resources amongst many lead farmers.
- Many farmers rely almost exclusively on their farming for food and income.
- The challenge singled out most frequently by farmers was the availability of water and water storage issues. The experience of drought is still ripe in people's minds.
- There is a lot of dignity and pride of achievement with these lead farmers, who prove to be very self-reliant.
- Many farmers have some diversity of income and practice value-adding such as making bee products or preserving fruit into jams.
- The lead farmers whom the PIC met with have utilized the RVCC resources they have received very well: such as solar driers and shade tunnels.
- Some constraints were observed with the tunnels provided to schools, such as irrigation not being installed yet.
- The infrastructure: shade tunnels, plastic tunnels, irrigation, and tanks. were found to be of good quality and well installed.
- The extension services provided by the DPIC team in the community appeared to be well received and effective, albeit excluding reference to permaculture principles and practice.
- There was tangible, visual evidence of the good work done by the Ministry, such as the many Keyhole gardens that could be seen throughout the community councils.
- Some very proactive community farmer's groups have volunteered their time to participate in a variety of project initiatives, among which: Alien Invasive Plant (AIP) clearing, soil erosion control.

- Soil degradation in many sites within the project area is of great concern, and there is a very low amount of vegetation cover in certain areas.
- Agricultural diversity is low, even amongst the Lead farmers. Most farmers are relying very heavily on one single crop: maize.

This scoping exercise proved useful to determine the reality of the context during which some ground-truthing of key assumptions was conducted. These assumptions were as follows: i) there is a low diversity of crop varieties grown, ii) there is a heavy reliance on a single crop for food requirements i.e. maize; iii) very little rainwater harvesting is happening; iv) there is a great need for securing water availability for irrigation; v) there is a great need to improve livelihood opportunities.



FIGURE 3: A MAIZE PLANTATION, WITH OFF CONTOUR PLOUGHING SHOWING EROSION

### 3.3.2.2 [Development of a training schedule](#)

The purpose of the training schedule was to document all the details relating to the training, which was to take place in May 2020 (note the training was eventually rescheduled to May 2021 due to COVID-related delays). It formed the plan for the RVCC team and the PIC to ensure the training was executed timeously, smoothly and met the training program objectives.

**The objective of the training schedule was to:**

- Define and outline training goals:
  - Train technical staff
  - Train lead farmers
  - Train the trainers
- Training methodology to be used for the course
- Recommendations on training venues & locations
- Schedule and provisional dates of the various trainings
- Course lessons to be covered in the permaculture training. Please see section 3.4.3.

- Materials & resources needed as well as a preliminary budget
- Logistic requirements for transporting course participants
  - Tentative dates
  - Type of vehicles required
- Roles & responsibilities in the training for:
  - RVCC project team; PFF's; drivers
  - Permaculture International Consultant (PIC)

### 3.3.2.3 [Garden development plan](#)

**The objectives of the Garden Plan were to define:**

- Purpose & Objectives of Demo garden:
  - Firstly, to provide all year round nutritious food to those who cultivate and maintain it - the custodians
  - Secondly, to show case Permaculture and local/traditional best practices and be a thriving example of climate smart agriculture and resilience to climate change for the broader community
  - Thirdly, to provide resources to the greater community particularly in the form of plant material and seed that can be propagated and taken to use elsewhere
  - Fourthly, as a research station to test out farming methods, particular alternative species of plants and/or animals and refine farming practices
- Components of a demonstration permaculture garden
  - Vegetable garden
  - Food Forest
  - Staple Food garden
  - Water systems: Storage; irrigation; rainwater runoff harvesting
  - Animal systems: Chicken coop and run; bee hives; pig pens
  - Mini-nursery for seedling production
  - Seed bank
- Potential locations based on an initial fact-finding mission
- Description of materials and resources needed
- Description of design considerations
- Description of site assessment template used
- Description of Permaculture garden plans
- A draft implementation schedule that was finalized closer to the time of implementation.<sup>7</sup>

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<sup>7</sup> Clark, R.2020. Training schedule and garden development plan for the RVCC permaculture project, compiled for the UNDP Country Office, Maseru, Lesotho. March 2020.

### 3.3.3 Development of training materials

By the end of March 2020, countries globally started to introduce COVID 19 travel and other restrictions due to the emerging global pandemic. In April, May, and June 2020, the PIC spent the hard lockdown period developing the permaculture training material, known as “*The RVCC Permaculture Gardening Handbook*” (2020). The purpose of this handbook was to present permaculture principles, concepts, and methods to help and guide farmers on their permaculture journey. It contains the fundamentals of permaculture design and garden/farm layout so that one can create more energy-efficient systems. It also contains lessons on pest control, soil building, and other helpful techniques which can immediately be applied to improve fertility and production in the garden. The handbook contains tutorials on seed saving and plant propagation that will assist in reducing input costs and helpful ideas on generating income from surplus. The document is 111 pages long and includes many photographs, tables, sowing and calendars. Refer to Figure 4.

One hundred copies of the manual were printed and given to beneficiaries and technical staff. It was recommended by the PIC to translate the manual into Sotho, but due to budget constraints, the translation never took place.

Over and above the deliverable for developing training materials (manual<sup>8</sup>), the PIC also created several farmer resource posters – detailed sowing calendar, sowing instructions, harvest calendar that were translated into Sotho, printed, laminated, and distributed to all the farmer-beneficiaries.

### 3.3.4 Conduct a scoping exercise and team introduction



<sup>8</sup> Clark, R.2020. The RVCC Permaculture Gardening Handbook ,for the RVCC permaculture project, compiled for the UNDP Country Office, Maseru, Lesotho. April 2020.

At the beginning of October 2020, the PIC was able to travel and enter the Kingdom of Lesotho as South African COVID restrictions were eased.

Courtesy meetings were held at the Ministry of Forestry, Range and Soil Conservation and also a planning meeting with the Project Coordinator and further meetings in Mphahle's Hoek with UNDP Procurement and Project Field Facilitators.

The PIC then went into the field to identify the main three Permaculture Demonstration Garden sites. Once these main sites were identified, the team further identified and assessed the 17 Permaculture Subset Demonstration Gardens in each of the three Community Councils and one at the MFRSC district offices. A Total of 20 sites were visited and selected. Please refer to Table 3 for the list of beneficiaries sites

Each site assessment included the following:

- Detailed farmer interview
- Pictures of the site & farmers
- Drone images & video (videos were uploaded to YouTube & can be accessed via Google Earth under the individual farmer folders)
- GPS Locations
- Site evaluation findings & measurements

TABLE 3: BENEFICIARY SITES

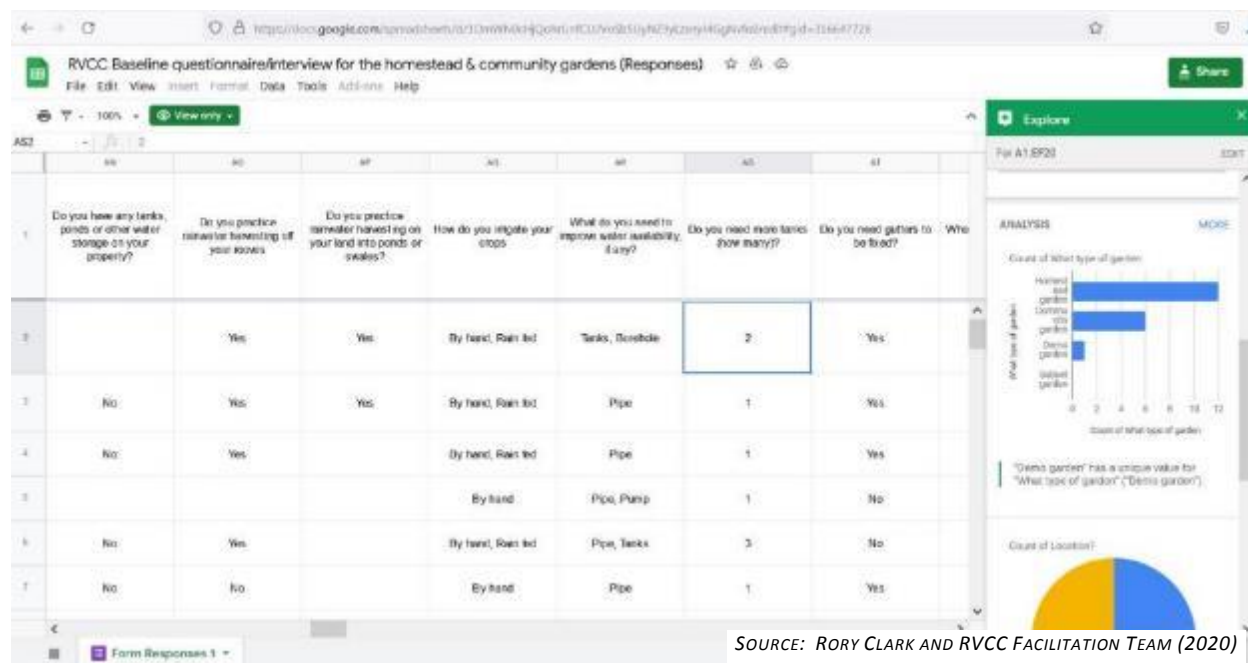
| Famer-Beneficiaries |      |                                  |                       |
|---------------------|------|----------------------------------|-----------------------|
| Qty                 | Code | Area & Name of farmer            | Area & Name of farmer |
| Thaba Mokhele       |      |                                  |                       |
| 1                   | T1   | > Malebohang Maribe              | Demo Garden           |
| 2                   | T2   | > Maroa Philimon Lenkoe          | Homestead garden      |
| 3                   | T3   | > Mapaballo Tshebakhoadi         | Homestead garden      |
| 4                   | T4   | > Ha le linyane community garden | Community Garden      |
| 5                   | T5   | > Palamang Ranku                 | Homestead garden      |
| 6                   | T6   | > Retshelisetswe                 | Homestead garden      |
| 7                   | T7   | > Bataung Mafereka               | Homestead garden      |
| 8                   | T8   | > Khotliso Salemane              | Homestead garden      |
| Khoelenya           |      |                                  |                       |
| 9                   | K1   | > Mamorena Seqao                 | Demo Garden           |
| 10                  | K2   | > Maitumeleng Mabaka             | Homestead garden      |
| 11                  | K3   | > Sedi la ka Mponsetse tsela     | Community Garden      |
| 12                  | K4   | > Kelebone Matjobeng             | Homestead garden      |
| 13                  | K5   | > Taelo Molomo                   | Homestead garden      |
| 14                  | K6   | > Tsehisso Mabea                 | Homestead garden      |
| Lithipeng           |      |                                  |                       |
| 15                  | L1   | > Zakaria Litlama                | Demo Garden           |
| 16                  | L2   | > Tsoang le ketsetse             | Community Garden      |
| 17                  | L3   | > Ha tooa mose mosadi            | Community Garden      |
| 18                  | L4   | > Kopano ke matla                | Community Garden      |
| 19                  | L5   | > ltekeng ha Ntseno              | Community Garden      |
| MoF                 |      |                                  |                       |
| 20                  | M1   | > MoF Mphahle's Hoek             | Research Garden       |

### 3.3.5 Farmer interviews and needs analysis

During the scoping exercise, semi-structured interviews were conducted with the farmers to select the garden sites and elicit information from the farmers. With the help of the Project Field Facilitators (PFF), data such as names, telephone numbers, the number of people in the household; income sources; sources of livelihood, and enterprise interests was collected. This also allowed the assessment of the primary needs of the farmers and their sites, as determined by the farmers themselves. Figure 5 shows a screenshot of the Beneficiary Baseline Interview. The exercise was very beneficial and helped the project prioritize resources when developing the budget and also fine-tuning the implementation plan. Data such as the average age,

how many people are in the household, level of food security, average income, main income sources can be easily extracted with a few clicks of a mouse.

Farmer/farmer group, interviews, and needs assessments can be viewed following. <https://docs.google.com/spreadsheets/d/1OmWN0cHiQohrUnfCLUVoSb5UyNZ9yLzsnYJ4GgNvfo0/edit?usp=sharing>



SOURCE: RORY CLARK AND RVCC FACILITATION TEAM (2020)

FIGURE 5: BENEFICIARY BASELINE INTERVIEW (ONLINE GOOGLE DOCUMENT)

### 3.3.6 Conceptual drawings & capturing data onto Google earth:

From the data and images collected, the PIC was then able to produce conceptual drawings on Computer-Aided Design software (CAD) for working out all the measurements and materials needed for the Bill of Quantities (BoQ).

The PIC then uploaded all the data - CAD drawings, interviews, drone photos, video links, and still photos - onto one platform, **Google Earth**. This was and is for viewing on a user-friendly platform that can be easily shared with all who require the information: such as the RVCC team, technical team, and installers, to produce location maps and to also monitor changes in the gardens in forthcoming seasons. Drone images from each season can be taken and overlaid on each other in Google Earth. Using the GE tools, one can then toggle (switch on and off) between different layers.

Please download the following KMZ file to view. <https://drive.google.com/file/d/1dcGXVdPjnmYGwT3cdSuDc79d4FrGHViP/view?usp=sharing>

Please also see figure 6 of the “screenshot” sample.

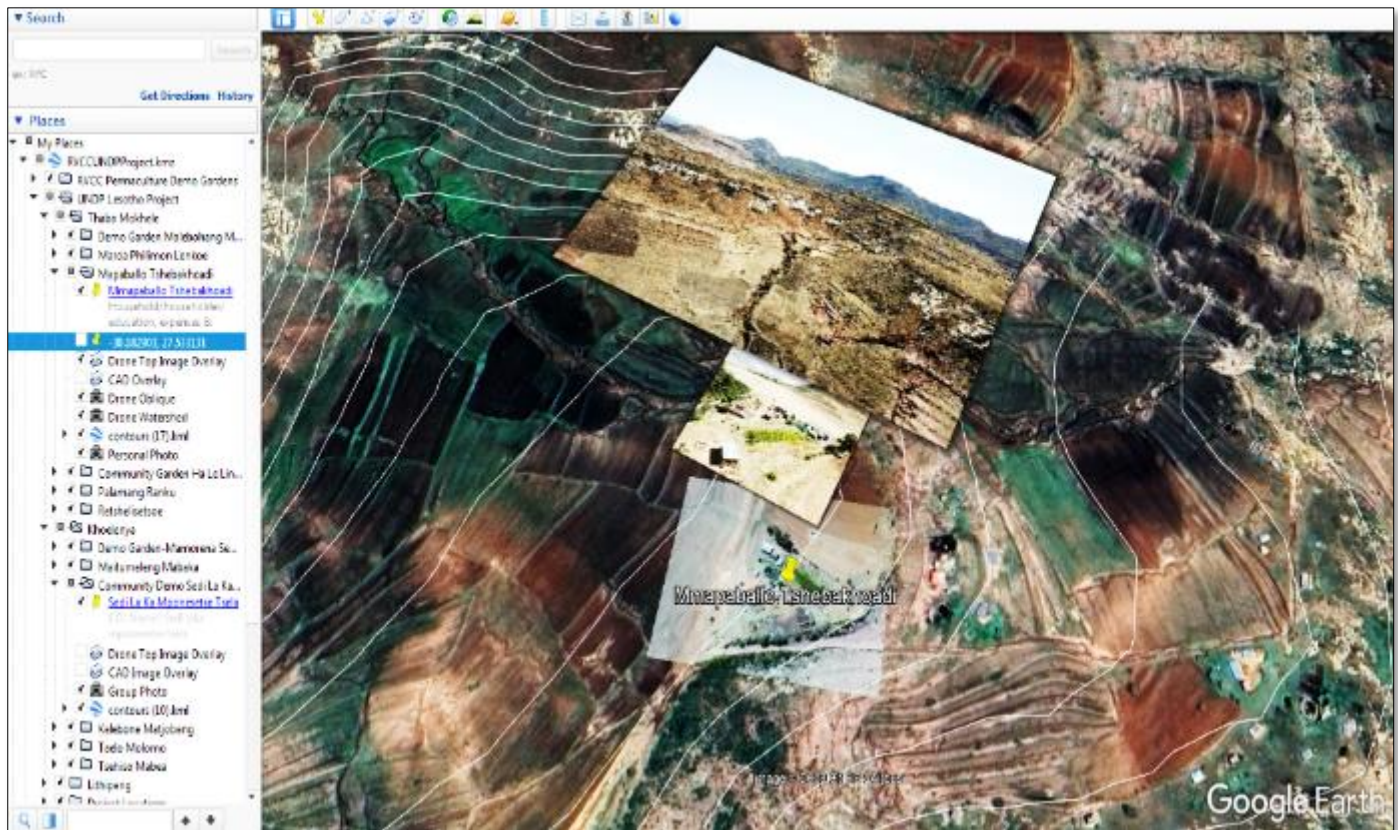


FIGURE 6: GOOGLE EARTH GIS BENEFICIARY DATABASE

The concept drawings were then presented to the CTA and then again to the PFFs. A workshop was held to incorporate their suggestions and feedback. The concept drawings were ultimately used to assist supplier/installers with their implementation on the ground and to compile a budget and BoQ for the twenty permaculture gardens.

After the review exercise and receiving recommendations from the RVCC project team, the PIC was able to develop the **RVCC permaculture project budget** (the final version of the budget). The process included contacting local installers and nurseries for quotes and compiling all the measurements and quantities for each farmer onto one spreadsheet so that a BoQ could be exported for the whole project or individual farmers. Several other sheets were produced, such as a month-to-month cash flow schedule, an implementation schedule, and a supplier list. A preferred supplier motivation letter was also drafted. Drawings for chicken coops and pig shelters were also done to assist bidders in quoting.

By the end of October 2020, the final budget was presented to the RVCC team: PC, PFF, and CTA and then again to the UNDP Procurement office. Several meetings were held with UNDP procurement to “unpack” the budget and ensure it was presented with all the right information and contained all the specifications needed. The RVCC permaculture project budget can be viewed with all the additional sheets (in one file) by following [this link, https://docs.google.com/spreadsheets/d/1HWtdGkWT\\_MepEI9YgNWs0mkTEQEjPiwqJX6PQ8hc6mA/edit?usp=sharing](https://docs.google.com/spreadsheets/d/1HWtdGkWT_MepEI9YgNWs0mkTEQEjPiwqJX6PQ8hc6mA/edit?usp=sharing)

The RVCC permaculture project budget can also be found in Annexure B attached with this report.

## 3.4 Implementation phase

### 3.4.1 Engagement of permaculture supervisors

#### 3.4.1.1 Developed ToRs and permaculture workshop

At the beginning of November 2020, a ToR was written in conjunction with the RVCC team for the employment of six permaculture supervisors. This initiative was the product of a collaborative effort between the RVCC project and the MFRSC through the office of the Principal Secretary (PS) and that of the District Office. The permaculture supervisors who were employed were all youth and graduates from various agricultural disciplines.

Their role in the project was to assist the PIC with “supervising” the on-the-ground activities for the duration of the project. This entailed inter alia:

- Developing the permaculture demo and subset gardens - creating swales and raised beds
- Supervising labour
- Receiving goods from suppliers and compiling a stock inventory
- Assisting in overseeing the installation of fencing, micro-nurseries, grape trellises and chicken coops
- Supervising the earthworks provided by the TLB
- Planting out plant material - trees, berries, herbs, seedlings, and seeds

Their orientation to the project began with a short introduction to the theory of permaculture at Mount Mahluti Hotel in Mohale’s Hoek, which took place on 2 November 2020 and it included the following:

- Introduction to permaculture
- Permaculture ethics
- Principles of permaculture

#### 3.4.1.2 Embedding of the permaculture supervisors into the communities

The Supervisors (listed under the project area name below) were then deployed and embedded in each of the three community project areas (tribal councils):

##### **Khoelenya:**

- Amelia Phangoa
- Tsepo Ntoanyane

##### **Thaba Mokhele:**

- Khosi Matsoso,
- Pitso Bonezwa

##### **Lithipeng:**

- Ntsane Mabote
- Mohase Nkhetla

The process of allocating and “embedding” the supervisors to a specific community was a strategic move by the project to enhance working relationships between the beneficiaries and the project team and to capitalise on the resulting synergies.

The PIC provided ongoing training to the graduates throughout the project. They learned many new skills in land surveying, plant propagation, runoff rainwater harvesting, irrigation, seed banks and holistic animal husbandry.

### 3.4.2 Development of the permaculture gardens

The Permaculture team - PIC and his assistants, six permaculture supervisors - started with marking out contours for earthworks at the beneficiary sites in December 2020. The permaculture supervisors were trained on how to use a dumpy level and A-frame (land surveying equipment) to dig and shape swales (swales are ditches that run on contour and are used for rainwater harvesting) and on how to create raised vegetable beds.

Just before the holiday season in South Africa, the country went into another COVID19 related lockdown, and travel across the border was prohibited. The PIC and his assistant could only return to Lesotho in the second week of February.

After entering the country, a supplier/installer briefing meeting was held in Mphahle's Hoek to introduce all the supplier/installers to the project, which included site visits to each community. The suppliers had the opportunity to ask questions and go through their deliverables.



SOURCE: RORY CLARK (2020)

FIGURE 7: SURVEYING THE PROJECT AREA

#### 3.4.2.2 Land surveying and earthworks

Sechache Nkunyane Construction, the TLB Company, started on 24 March 2020 with the earthworks at the demo gardens and subset gardens. Where necessary, new driveways were cut, fencing lines cleared, large invasive plants removed, areas for animal shelters levelled (see figures 7 and 8). The TLB earthworks continued on and off until mid-June and included challenging work at Sedi la ka Mponesetse tsela, Morobong, Khoelenya.

The following quotes were made by beneficiaries of the Thaba Mokhele community and are taken from the closeout interview. See section 3.5.2.

*"It has made a good pathway which was not there. It has created a bigger space for planting trees and plot construction. It has removed invasive plants which I never even thought of removing"~ Marou Lenkoe*

*"I didn't have a place for vegetable production, but the TLB made that space for me." ~ Khutliso Salemane*



SOURCE: RORY CLARK (2020)

FIGURE 8: TLB WORKS

### 3.4.2.3 [Building raised vegetable gardens, fruit tree basins, and raised beds for berries](#)

The manual earthworks for the raised vegetable beds, tree basins, and staple crop plots were done between December 2020 and July 2021.

**Double-reach-raised-vegetable-beds** were constructed in each of the beneficiary gardens. These are vegetable growing beds with designated pathways and growing areas (see figure 9) to minimize compaction by not walking on top of, thereby reducing the need for tillage. These vegetable plots were positioned close to the house to demonstrate the permaculture principle – zone planning (designing for energy efficiency).

**Raised tree basins and berry beds** (formed in-between tree basins) were constructed in the permaculture fruit orchard areas of each of the gardens. They were laid out in an agroforestry fashion with strips of tree plantings with a gap for plots of staple crops in between (see figure 10). The tree basins that were placed on a slight slope were designed in a horseshoe pattern to catch rainwater runoff at the base. If the trees were on level ground, they were designed in a doughnut shape so that the farmers could pour water into the basins when needed (to supplement water or if the drip irrigation is not functioning). The Agroforestry system was laid out on



FIGURE 9: DOUBLE REACH, RAISED VEGETABLE BEDS



FIGURE 10: RAISED TREE BASIN

contours, and the raised berry beds would catch any rainwater runoff and hold it in place to minimize erosion and maximize infiltration and irrigate the trees and berries.

**Staple crop plots** were laid out in between the strips of trees; vetiver a grass with long leaves that grows in clumps and is used for soil erosion control and mulch, was used (where possible) to demarcate crop rotation plots. If space allowed, three or four such plots were demarcated to allow for up to a four-year crop rotation plan.

**Fence beds** were constructed along the fence lines so that various crops such as black berries, kiwifruit; grape vines; runner beans; and cherry tomatoes could be trellised up the fence (see figure 11).

#### 3.4.2.4 [Installation of water systems](#)

The installation of the water systems started in April 2020 with tank stand installations at the beneficiary sites. The beneficiaries cited the lack of water availability for irrigation and farming activities as their number one need. The permaculture project, therefore, prioritized and sought to resolve as many of these challenges for the farmers as possible.



FIGURE 11: FENCE BED FOR CROPS

Two companies were responsible for the installation of the water systems of the project:

- The Tank installation company - Particles Civil Works & Construction
- Water supply, tap stands, and irrigation - Super Power Pty Ltd.

The supplier and installer, Super Power, conducted his site inspections in April 2020 to verify the measurements and materials needed. Both companies then ordered some of the harder-to-source materials from South Africa.

Several water supply issues needed to be resolved within the project to connect the gardens with water. In some cases, discussions took place with the communities and chiefs to get approval for tapping into existing

community water lines or permission to connect to springs. In one case, at the community garden in Waterfall, the project installed a tank for the school in exchange for sharing the waterline with them.

At the farmers' sites, a water supply pipeline was connected to 5,000lt storage tanks installed on top of a brick and mortar tank stand, with ball valves fitted to control the water feeding in. The installation also included a pipe that ran from the tanks to taps, good quality metal taps on raised stands at strategic points in the garden (close to the animal shelters; nursery and vegetable beds, to facilitate ease of watering), and another pipe running from the tanks and connected to drip irrigation lines that run along the raised tree basins and berry beds (see figure 12). In some of the gardens, drip irrigation was installed on the raised vegetable beds.

The installations at the time of this report were ongoing, essentially because the supplier - Particles Civil Works & Construction, were running out of funds to complete the work on time.



SOURCE: RORY CLARK (2020)

FIGURE 12: DRIP IRRIGATION LINES

Please consult Table 4 for a description of what was supplied and installed for the water systems

TABLE 4: WATER SYSTEMS PROVIDED TO BENEFICIARIES

| Water Systems                          |       |
|----------------------------------------|-------|
| Tank 5000lt-Plastic                    | 26    |
| Tank stand-Brick & Mortar              | 26    |
| Taps & tap stand                       | 40    |
| Pipe-25mm LDPE (to connect tap stands) | 2400m |
| Drip irrigation 16mm                   | 8380m |

|                                                             |       |
|-------------------------------------------------------------|-------|
| Pipe-40mm (Irrigation feedline)                             | 1695m |
| Pipe- 40mm HDPE (for connecting the site to a water source) | 3750m |

The following quote was made by a lead farmer of the Kholenya community and is taken from the closeout interview. See section 3.5.2.

*“Tanks store water for irrigation and animal drinking. Taps have made things easy within the household, and we get water right at the doorsteps.”~ Kelibone Matjobeng*

### 3.4.2.5 Perimeter Fencing and Gates

The installation of the perimeter fencing and gates was done by Tsoelopele Consultants and Contractors. They started work in March 2021 and completed work by August 2021.

Apart from water issues listed in the previous section, the next most critical need cited by the farmers was adequate fencing. To protect crops from grazing animals, even where cattle and sheep are shepherded, donkeys are often not and can destroy crops when there is no supervision.

The fencing also served another purpose: as a trellis for various crops, as already alluded to.

Of the twenty gardens that were developed, fifty percent needed fencing to protect the investment of fruit trees and other inputs. In total, 2,318 meters of fencing were installed, with driveway and pedestrian gates for each site. Please see Figure 13 and Table 5 for



SOURCE: RORY CLARK (2021)

| Table 5: Perimeter fencing & gates |               |      |      |      |      |           |      |      |      |      |
|------------------------------------|---------------|------|------|------|------|-----------|------|------|------|------|
|                                    | Thaba Mokhele |      |      |      |      | Khoelenya |      |      |      | Li   |
| Description                        | T1            | T2   | T4   | T7   | T8   | K2        | K3   | K4   | K6   | L1   |
| Fencing                            | 140m          | 166m | 140m | 300m | 306m | 275m      | 305m | 251m | 165m | 270m |
| Driveway gates                     | 1             | 1    | 1    | 1    | 1    | 1         | 1    | 1    | 1    | 1    |
| Pedestrian gates                   | 1             | 1    | 1    | 1    | 1    | 1         | 1    | 1    | 1    | 1    |
| Total meters done                  | 2318m         |      |      |      |      |           |      |      |      |      |

installation details and which gardens received fencing.

TABLE 5: PERIMETER FENCING & GATES

The following quote was made by a lead farmer of the Lithipeng demo-garden site and is taken from the closeout interview. See section 3.5.2.

*“Thanks to the new fencing, I sleep peacefully knowing that my animals are safe within the yard and neighbours’ animals no longer eat my vegetables.” ~ Zachariah Litlama*

#### 3.4.2.6 [Supply and Installation of animal systems, mini nursery, and grape trellis](#)

The installation of animal systems: chicken coops, pig pens; mini-seedling nurseries; and grape trellises were done by J.J Construction. They started work in May 2021 and were completed by August 2021. Refer to Figures 15, 18, and 20 for samples of the work. Many of the structures that were at the farmers’ sites (if not all) were less than fit to keep animals. In particular, pigs were kept in very tiny enclosures with little to no shelter from the weather.

**Chicken coop and run-** Prior to the start of the permaculture project, it was found that chickens were being raised in overcrowded battery cages at one of the gardens. See figure 14.



FIGURE 14: CROWDED BATTERY CAGES

The project constructed new 48m<sup>2</sup> chicken coops with runs at each of the three demo gardens. This was designed to allow for enough space for chickens to comfortably move around. The coops were made out of treated timber and roof sheeting with a durable steel door and had one course of bricks around the base. Nesting boxes made with treated plywood were raised off the floor, built into, and ran along the sides of the coop. See figure 15. The fence for the run was made out of galvanized weldmesh and treated timber poles.

Three hundred and forty traditional breed chickens - Boschveld, chosen for their adaptive qualities to the environment and mixed uses (meat and egg production), have been supplied by the project to the homestead gardens: fifty to each of the demo gardens and ten each to the subset gardens. All thirteen gardens received chickens. The community gardens weren’t supplied due to issues with stock theft. The new chicken systems will contribute to household food and livelihood security.



SOURCE: RORY CLARK (2020)

FIGURE 15: NEWLY CONSTRUCTED CHICKEN COOPS

**A-frame Chicken tractors** were constructed for all the thirteen homestead permaculture gardens. An A-frame chicken tractor is a small mobile (roving) chicken coop where animals can forage wherever you place it. See figure 16. The system is being used in conjunction with the chicken coops and run: the chicken tractors rove on top of the raised vegetable beds and clear up crop residues, forage on insect pests and enrich the soil with their droppings; and where a rooster can be placed with hens and produce fertilized eggs (away from the main coop).



FIGURE 16: A-FRAME CHICKEN TRACTOR



FIGURE 17: ONE OF THE BEEHIVES

**Pig and sheep pens** were installed at the three demo gardens. They consist of a run or fenced area and a durable shelter structure made of gum poles and roof sheeting. See figure 18.

They replaced many of the former dilapidated structures (See figure 19) that offered little in the way of protection or movement to the animals. These new animal systems will demonstrate holistic animal husbandry, particularly during the FFS open days or permaculture open days.

**Solar pig and chicken (poultry) electric fencing** was supplied to the three demo gardens. They are movable and are to be used in the staple food plots in between the tree rows to allow for animals to contribute their services to the agroforestry system: pigs to dig up and eat crop residues and till the soil before planting; chickens to cut pest cycles by eating larvae and to spread dung and manure.

**Beehives:** 62 beehives, with protective clothing; tools; and nine honey extractors were supplied to all the beneficiaries. See figure 17.



SOURCE: RORY CLARK (2021)

FIGURE 18: NEWLY CONSTRUCTED PIG PEN



SOURCE: RORY CLARK (2021)

FIGURE 19: DILAPIDATED SHELTER WHICH WAS REPLACED

TABLE 6: SUPPLIED ANIMAL MATERIALS &amp; EQUIPMENT

| Animal Materials & Equipment                 |         |              |     |     |     |     |     |     |     |           |     |     |     |     |     |           |     |     |     |     |          |                |  |
|----------------------------------------------|---------|--------------|-----|-----|-----|-----|-----|-----|-----|-----------|-----|-----|-----|-----|-----|-----------|-----|-----|-----|-----|----------|----------------|--|
|                                              |         | Thabo Mokele |     |     |     |     |     |     |     | Khoelenya |     |     |     |     |     | Lithipeng |     |     |     |     | MF<br>RS |                |  |
|                                              |         | T1           | T2  | T3  | T4  | T5  | T6  | T7  | T8  | K1        | K2  | K3  | K4  | K5  | K6  | L1        | L2  | L3  | L4  | L5  |          |                |  |
| Description                                  | Unit    | Qty          | Qty | Qty | Qty | Qty | Qty | Qty | Qty | Qty       | Qty | Qty | Qty | Qty | Qty | Qty       | Qty | Qty | Qty | Qty | Qty      | Grand quantity |  |
| Animals                                      |         |              |     |     |     |     |     |     |     |           |     |     |     |     |     |           |     |     |     |     |          |                |  |
| Chicken (Hen-Brum 4weeks)                    | Unit    | 53           | 10  | 10  |     | 10  | 10  | 10  | 10  | 53        | 11  |     | 10  | 10  | 10  | 53        |     |     |     |     |          | 260            |  |
| Chicken (Rooster-Brum 4weeks)                | Unit    | 4            | 1   | 1   |     | 1   | 1   | 1   | 1   | 4         | 1   |     | 1   | 1   | 1   | 2         |     |     |     |     |          | 20             |  |
| Bee Equipment                                |         |              |     |     |     |     |     |     |     |           |     |     |     |     |     |           |     |     |     |     |          |                |  |
| Bee Hives                                    | Boxes   | 2            | 2   | 2   | 6   | 2   | 2   | 2   | 2   | 2         | 2   | 6   | 2   | 2   | 2   | 2         | 6   | 6   | 6   | 6   |          | 62             |  |
| Bee suites-veil & overall                    | 1 Piece |              |     |     | 3   | 1   | 1   | 1   | 1   | 1         | 1   | 3   | 1   | 1   | 1   | 1         | 3   | 3   | 3   | 3   |          | 28             |  |
| Hive tool                                    | Each    |              |     |     | 3   | 1   | 1   | 1   | 1   |           | 1   | 3   | 1   | 1   | 1   | 1         | 3   | 3   | 3   | 3   |          | 27             |  |
| Smoker                                       | Each    |              |     |     | 2   | 1   | 1   | 1   | 1   |           | 1   | 2   | 1   | 1   | 1   | 1         | 2   | 2   | 2   | 2   |          | 21             |  |
| Gloves                                       | Each    | 1            | 1   | 1   | 3   | 1   | 1   | 1   | 1   | 1         | 1   | 3   | 1   | 1   | 1   | 1         | 3   | 3   | 3   | 3   |          | 31             |  |
| Bee brush                                    | Each    | 1            | 1   | 1   | 3   | 1   | 1   | 1   | 1   | 1         | 1   | 3   | 1   | 1   | 1   | 1         | 3   | 3   | 3   | 3   |          | 31             |  |
| Queen Excluder                               | Each    | 2            | 2   | 2   | 6   | 2   | 2   | 2   | 2   | 2         | 2   | 6   | 2   | 2   | 2   | 2         | 6   | 6   | 6   | 6   |          | 62             |  |
| 4 frames extractor                           | Each    | 1            |     |     | 1   |     |     |     |     | 1         |     | 1   |     |     |     | 1         | 1   | 1   | 1   | 1   |          | 9              |  |
| Animal Feed                                  |         |              |     |     |     |     |     |     |     |           |     |     |     |     |     |           |     |     |     |     |          |                |  |
| Chicken grow mash epol econo pellets         | Bag     | 53           | 26  | 10  |     | 10  | 10  | 35  | 10  | 70        | 11  |     | 10  | 10  | 10  | 70        |     |     |     |     |          | 335            |  |
| Feeders & Containers                         |         |              |     |     |     |     |     |     |     |           |     |     |     |     |     |           |     |     |     |     |          |                |  |
| Feed Container 200lt                         | Each    | 2            |     |     |     |     |     |     |     | 2         |     |     |     |     |     | 2         |     |     |     |     |          | 6              |  |
| 10lt Poultry drinking Fountain               | Each    | 5            | 2   | 2   |     | 2   | 2   | 2   | 2   | 5         | 2   |     | 2   | 2   | 2   | 5         | 2   |     | 2   |     |          | 39             |  |
| Chicken Feeder 6kg                           | Each    | 4            | 2   | 2   |     | 2   | 2   | 2   | 2   | 4         | 2   |     | 2   | 2   | 2   | 4         | 2   |     | 2   |     |          | 36             |  |
| Veneted Egg tray collector plastic           | Each    | 2            | 1   | 1   |     | 1   | 1   | 1   | 1   | 2         | 1   |     | 1   | 1   | 1   | 2         | 1   |     | 1   |     |          | 18             |  |
| Solar Pig & Chicken Fencing                  |         |              |     |     |     |     |     |     |     |           |     |     |     |     |     |           |     |     |     |     |          |                |  |
| Solar pig fencing                            | Each    | 1            |     |     |     |     |     |     |     | 1         |     |     |     |     |     | 1         |     |     |     |     |          | 3              |  |
| Solar chicken fencing                        | Each    | 1            |     |     |     |     |     |     |     | 1         |     |     |     |     |     | 1         |     |     |     |     |          | 3              |  |
| Animal Tractors                              |         |              |     |     |     |     |     |     |     |           |     |     |     |     |     |           |     |     |     |     |          |                |  |
| Chicken Mobile Barn 1.22m x 2.44m floor area | Each    | 1            |     |     |     |     |     |     |     | 1         |     |     |     |     |     | 1         |     |     |     |     |          | 3              |  |
| Pig Mobile Tractor 1.22m x 2.44m floor area  | Each    | 1            |     |     |     |     |     |     |     | 1         |     |     |     |     |     | 1         |     |     |     |     |          | 3              |  |
| A-frame chicken tractor 1.7m x 1.8m x 1.2m   | Each    | 2            | 1   | 1   |     | 1   | 1   | 1   | 1   | 2         | 1   |     | 1   | 1   | 1   | 2         |     |     |     |     |          | 16             |  |
| Animal Structures                            |         |              |     |     |     |     |     |     |     |           |     |     |     |     |     |           |     |     |     |     |          |                |  |
| Chicken Coop & run with nesting boxes        | Each    | 1            |     |     |     |     |     |     |     | 1         |     |     |     |     |     | 1         |     |     |     |     |          | 3              |  |
| Pig pen & run                                | Each    |              |     |     |     |     |     |     |     | 1         | 1   |     |     |     |     | 1         |     |     |     |     |          | 3              |  |
| Sheep pen & run                              | Each    | 1            |     |     |     |     |     |     |     | 1         |     |     |     |     |     | 1         |     |     |     |     |          | 3              |  |

**Mini nurseries** were installed at all of the 20 garden sites. The mini nursery is a standalone structure constructed out of treated timber, shade cloth, and wire mesh as a table that fits 7 x 200 cavity seedling trays or 1400 seedlings. See figure 20. The concept is to assist the farmers in reducing input costs by producing seedlings, as well as being a potential income-generating activity. The mini nursery is also a place to grow cuttings and bagged plants (under the nursery table). These plants, such as strawberries and berries, can then be planted back into the farmers' gardens for increasing production. The high-value plants can also be sold. All the necessary nursery materials and equipment were supplied by the project to cater to the needs of the nursery.



FIGURE 20: NURSERY UNDER SHADECLOTH

#### [3.4.2.7 Supply and planting of fruit and nut trees, berries and vines, vetiver and herbs](#)

When selecting plant species for the project, special consideration was given to their climate suitability, coverage of the lower yield periods of the year – the main growing seasons is 7.5 months (224 days), from around September 21 to around May 3; and including species that are good sources of plant-based protein such as nuts and beans; including perennial plants for fodder/forage; planting a diversity of crops for better resilience against crop failure and diversifying livelihood opportunities; including high-value crops.

**Trees:** A large assortment of temperate climate fruit, nut, and indigenous trees were supplied by the project to all the twenty sites. See table 8. Four suppliers supplied the project plant material. The first deliveries started on 27 June 2021, with the final deliveries taking place on 17 September 2021.

The trees were planted in all the prepared planting holes with a mixture of compost and local soil and secured to a “tree stake” to assist them in growing straight. Nuts such as walnut, almond, hazelnut, and pecans were also planted.

Indigenous trees were supplied to provide ecological goods and services to the gardens and gardeners: some for firewood, nectar, and pollen for bees, forage for livestock, and nitrogen-fixing.

TABLE 7: MINI SEEDLING NURSERY &amp; MATERIALS

| Mini Seedling Nursery & Materials          |      |              |     |     |     |     |     |     |     |           |     |     |     |     |     |           |     |     |     |     |       |                |
|--------------------------------------------|------|--------------|-----|-----|-----|-----|-----|-----|-----|-----------|-----|-----|-----|-----|-----|-----------|-----|-----|-----|-----|-------|----------------|
|                                            |      | Thabo Mokele |     |     |     |     |     |     |     | Khoelenya |     |     |     |     |     | Lithipeng |     |     |     |     | MFRSC |                |
|                                            |      | T1           | T2  | T3  | T4  | T5  | T6  | T7  | T8  | K1        | K2  | K3  | K4  | K5  | K6  | L1        | L2  | L3  | L4  | L5  | M1    |                |
| Description                                | Unit | Qty          | Qty | Qty | Qty | Qty | Qty | Qty | Qty | Qty       | Qty | Qty | Qty | Qty | Qty | Qty       | Qty | Qty | Qty | Qty | Qty   | Grand quantity |
| Mini Seedling Nursery                      | Each | 1            | 1   | 1   | 1   | 1   | 1   | 1   | 1   | 1         | 1   | 1   | 1   | 1   | 1   | 1         | 1   | 1   | 1   | 1   | 1     | 20             |
| Nursery Materials                          |      |              |     |     |     |     |     |     |     |           |     |     |     |     |     |           |     |     |     |     |       |                |
| 200 cavity Trays                           | Each | 10           | 10  | 10  | 10  | 10  | 10  | 10  | 10  | 10        | 10  | 10  | 10  | 10  | 10  | 10        | 10  | 10  | 10  | 10  | 10    | 200            |
| Seedling Tray Poly 98 Cav x 24 DV          | Each | 2            | 1   | 1   | 1   | 1   | 1   | 1   | 1   | 1         | 1   | 1   | 1   | 1   | 1   | 2         | 1   | 1   | 1   | 1   | 1     | 22             |
| Open Seedling Tray 27 x 30 x 11cm          | Each | 1            | 1   | 1   | 1   | 1   | 1   | 1   | 1   | 1         | 1   | 1   | 1   | 1   | 1   | 1         | 1   | 1   | 1   | 1   | 1     | 20             |
| Open Seedling Tray 350x480x80mm            | Each | 1            | 1   | 1   | 1   | 1   | 1   | 0   | 0   | 1         | 1   | 1   | 1   | 1   | 1   | 1         | 2   | 2   | 2   | 2   | 2     | 23             |
| Plant Bag Virgin 2.5L x 100um (N4)(Pkt 25) | Each | 2            | 1   | 1   | 1   | 1   | 1   | 1   | 1   | 2         | 1   | 1   | 1   | 1   | 1   | 2         | 1   | 1   | 1   | 1   | 1     | 23             |
| Plant Bag Blk 1.25L (TQ3)                  | Each | 1            | 1   | 1   | 1   | 1   | 1   | 1   | 1   | 1         | 1   | 1   | 1   | 1   | 1   | 3         | 1   | 1   | 1   | 1   | 1     | 22             |
| Dynaroot No.2 600g (rooting hormone)       | Each | 2            | 1   | 1   | 1   | 1   | 1   | 1   | 1   | 2         | 1   | 1   | 1   | 1   | 1   | 2         | 1   | 1   | 1   | 1   | 1     | 23             |
| Label T Maker 17.5cm - white               | Each | 15           | 15  | 15  | 15  | 14  | 14  | 14  | 14  | 15        | 15  | 15  | 15  | 14  | 14  | 15        | 15  | 15  | 15  | 15  | 15    | 294            |
| Permanent Marker                           | Each | 1            | 1   | 1   | 1   | 1   | 1   | 1   | 1   | 1         | 1   | 1   | 1   | 1   | 1   | 1         | 1   | 1   | 1   | 1   | 1     | 20             |
| Grape trellis                              | Each | 2            | 1   | 1   | 1   | 1   | 1   | 1   | 1   | 2         | 1   | 1   | 1   | 1   | 1   | 2         | 1   | 1   | 1   | 1   | 2     | 24             |

TABLE 8: FRUIT &amp; NUT TREES

| Fruit & Nut Trees                       |                        |                       |
|-----------------------------------------|------------------------|-----------------------|
| Almond-NonPereil                        | Fig-White Genoa        | Pecan Ukalinga        |
| Almond-Neplusultra                      | Hazelnut               | Persimmons-Izu        |
| Apple-Granny smith                      | Nectarine              | Plum-Santa Rosa       |
| Apple-Top Red                           | Olive, edible-Mission  | Plum-Red Gold         |
| Apple-Golden Delicious                  | Olive, edible-Frantoio | Plum-Wickson          |
| Apricot-Bulida                          | Peach-Cling            | Pomegranate-Wonderful |
| Apricot-Royal                           | Peach-Red cheek        | Pomegranate-Corbon    |
| Cherry-Tree Sweet                       | Pear-Bon creation      | Prune-                |
| Cherry-Lapins                           | Pear-Packham           | Quince                |
| Fig-Adams                               | Pecan Barton           | Walnut-Black          |
| Varieties = 30      Total Planted = 745 |                        |                       |

TABLE 9: INDIGENOUS TREES

| Indigenous Trees                               |                                        |
|------------------------------------------------|----------------------------------------|
| <i>Buddleja salviifolia</i>                    | <i>Searsia lucida</i> , (Rhus)         |
| <i>Calpurnia sericea</i>                       | <i>Searsia pendulina</i> , White Karee |
| <i>Halleria lucida</i> (tree fuchsia, lebetsa) | <i>Senegalia caffra</i> , (Acacia)     |
| <i>Dovyalis caffra</i> , Kei Apple             | <i>Olea Africanus</i> , Wild Olive     |
| <i>Searsia lancea</i> , Karee                  | <i>Vachellia karroo</i> , sweet thorn  |
| Varieties = 10    Total Planted = 161          |                                        |



SOURCE: RORY CLARK (2021)

FIGURE 21: PLANTING OF TREES IN PREPARED PLANTING HOLES

**Berries and vine fruits** Berries such as blueberries, goji berries; blackberries; strawberries, and vine fruits (three types of grapes and kiwifruit) were supplied by the project to all 20 sites. There were no berries identified by the PIC (bar one single gooseberry plant in Thabo Mokhele) at any of the sites the PIC visited or worked with at the beginning of the project.

Blueberries and goji berries were planted in-between the trees on raised beds to take advantage of driplines and the available area between the trees. The trees were also given a slightly larger spacing to allow for the berry plants. Strawberry plants were planted on each side of the larger berry bushes (blue and goji berries). Blackberries needed to be trellised and were planted on specially constructed raised planting beds that ran along fence lines, as were the kiwifruits. The grapes were planted adjacent to the grape trellises (some extra were planted along the fencelines).

Berries are delicious and nutritious, and wildly appreciated for their health benefits. There has been an increase in their demand in recent years, and they go for a premium price in retail outlets. The PIC bought a small punnet of blueberries at the local shop in Mohale’s Hoek for R19 and paid R11 for a single Kiwifruit. See figure 22. Organically produced berries and vine crops could be a great new economic opportunity for small-scale farmers in the region.



FIGURE 22: BLUEBERRIES IN LOCAL SUPERMARKET

TABLE 10: BERRIES AND VINES

| Berries & Vines                    |
|------------------------------------|
| Grape-Haanepoort                   |
| Grape-Red Globe                    |
| Grape-Crimson seedless             |
| KiwiFruit                          |
| Blackberry                         |
| Blueberry                          |
| Goji berry                         |
| Strawberry                         |
| Varieties = 8 Total Planted = 1232 |

**Vetiver** was planted at all twenty sites. Vetiver was chosen for its excellent benefits of soil erosion control due to its deep and adventitious rooting system, leaf material to be used for mulch and fodder (especially in times of drought), and pest control properties. It was planted around the tree basins to be cut twice a year for mulch and to hold the tree basins in place. It was also planted in and around the staple crop plots to designate crop rotation areas and for rehabilitation of the severely degraded community garden site: “Sedi la ka Mponesetse tsela” in Morobong Khoelenya. For example (See figure 23).

**Herbs.** Several types of herbs were supplied and planted by the project for i) culinary purposes: mint, rosemary, lavender; ii) medicinal purposes: yarrow, nitrogen-fixing: pigeon pea, ii), as well as rich fertilizer leaves comfrey. They were planted in and around tree basins to additionally provide ecological support to the trees.

TABLE 11: EXOTIC HERBS

| Exotic Herbs                              |
|-------------------------------------------|
| Basil perrenial                           |
| Comfrey                                   |
| Lavender                                  |
| Lemon Verbina                             |
| Mint                                      |
| Pigeon Pea                                |
| Rosemary                                  |
| Rue                                       |
| Yarrow                                    |
| <b>Varieties = 10 Total Planted = 553</b> |
| <b>Vetiver (qty 13000)</b>                |

FIGURE 23: PLANTING OF VETIVER GRASS



**Seed hampers and seed saving materials** were provided to all the beneficiaries that contained 40 varieties of vegetable seed, two varieties of fruit seed, and nine varieties of cover crops and forage/fodder crops; zip lock bags, and plastic Tupperware (provided only to the demo gardens). Special attention was given to including species that can help to extend the traditional growing season, such as peas, broad beans, kale, turnips, winter wheat. Thus increasing food security and also improving climate change adaption.

A variety of cover crops and forage/fodder seeds, specially selected for the Lesotho region, were also supplied by the project to all the farmers. The cover crop seed can be used in crop rotation and or for Conservation Agriculture (CA) planting regimes. Forage and fodder crops are to be planted in and around



FIGURE 24: SEED SAVING HAMPER

the production plots, especially near the animal structures, to provide “cut and carry” feed for the kraaled animals.

The extra seed was supplied at open days to the broader community members, thus increasing the reach of the project.

TABLE 12: SEED BANK COMPONENTS

| Seed bank                      |
|--------------------------------|
| 6lt Plastic Container Addis    |
| 1lt Plastic Container          |
| 250ml Plastic Container        |
| Large Ziplock packets (1 each) |
| Sieve (to clean seed)          |

TABLE 13: VEGETABLE SEEDS

| Seeds-Vegetables                                                                              |                              |                                 |
|-----------------------------------------------------------------------------------------------|------------------------------|---------------------------------|
| Amaranth, Foxtail Red                                                                         | Carrot                       | Pigeon Pea                      |
| Baby Marrow                                                                                   | Kale, Chou Molluer           | Potato                          |
| Beetroot-Detroit                                                                              | Leek                         | Pumpkin Wit boer                |
| Beans, Sugar dried                                                                            | Lettuce cos                  | Radish                          |
| Beans, Lazy housewife runner                                                                  | Lettuce crisp head, Ice berg | Sorghum                         |
| Beans runner, White shooter                                                                   | Lettuce loos leaf            | Sunflower, Titan 50sds          |
| Beans, "Jugo" ground                                                                          | Mountain Papaya              | Sweet pepper, california wonder |
| Beans, Lima                                                                                   | Millet Traditonal OP         | Swisschard(spinach)             |
| Brinjal, Black Beauty                                                                         | Mustard, Mutshaina           | Tomato, Cherry red              |
| Broad beans                                                                                   | Mustard, "Sprouting"         | Tomato, Jam-Roma                |
| Buckwheat                                                                                     | Newzealand Spinach           | Turnip                          |
| Butternut squash, waltham                                                                     | Onion, Texs Grano            | Tree lucerne                    |
| Bush Beans, contender                                                                         | Peas, English                | Vetch                           |
| Cabbage, drumhead                                                                             | Peas, Oregon sugarpod        | Wheat, winter hard              |
| <b>Varieties = 42    Total Supplied = 20 Hampers (plus surplus for Handouts to community)</b> |                              |                                 |

TABLE 14: COVER CROPS SEEDS

| Seeds-Cover Crops                                                                            |                     |                    |
|----------------------------------------------------------------------------------------------|---------------------|--------------------|
| Pearl Millet                                                                                 | Fodder Turnip       | Panicum Maximum    |
| Cowpeas                                                                                      | Smudts Finger Grass | Lotus corniculatus |
| Grazing Vetch                                                                                | Rhodes grass        | Lezpedeza          |
| <b>Varieties = 9    Total Supplied = 20 Hampers (plus surplus for Handouts to community)</b> |                     |                    |

### 3.4.2.8 [Supply of materials, tools, and equipment](#)

The project supplied a variety of materials, useful tools, and equipment needed for the development and maintenance of the permaculture garden and to help farmers to perform necessary tasks. For a detailed list of what each farmer received, please see Annexure F.

**Tools and small-scale farming implements.** A selection of tools and small-scale “low-tech” farming equipment were supplied to the beneficiaries. See table 15.

The small scale farming equipment such as the Haraka rolling punch planter (no-till push seeder) below (see figure 26) to assist farmers with no-till farming practices and speed up operations. A short video on how it works can be viewed following this link.

<https://photos.app.goo.gl/R7HQ82y1EqHicXac7>

Other equipment like the spear punch planter (see Figure 25), a seedling planter, and a no-till ox pulled planter were supplied by the project to the beneficiaries.



SOURCE: RORY CLARK (2021)

FIGURE 25: SPEAR PUNCH PLANTER



SOURCE: RORY CLARK (2021)

FIGURE 26: NO-TILL SEED PLANTER

TABLE 15: TOOLS AND SMALL-SCALE FARM IMPLEMENTS

|                                       |      | Thabo Mokele |     |     |     |     |     |     |     | Khoelenya |     |     |     |     |     | Lithipeng |     |     |     |     | MFRSC |
|---------------------------------------|------|--------------|-----|-----|-----|-----|-----|-----|-----|-----------|-----|-----|-----|-----|-----|-----------|-----|-----|-----|-----|-------|
|                                       |      | T1           | T2  | T3  | T4  | T5  | T6  | T7  | T8  | K1        | K2  | K3  | K4  | K5  | K6  | L1        | L2  | L3  | L4  | L5  | M1    |
| Description                           | Unit | Qty          | Qty | Qty | Qty | Qty | Qty | Qty | Qty | Qty       | Qty | Qty | Qty | Qty | Qty | Qty       | Qty | Qty | Qty | Qty | Qty   |
| <b>Tools</b>                          |      |              |     |     |     |     |     |     |     |           |     |     |     |     |     |           |     |     |     |     |       |
| Wheel barrow Lasher                   | Tool | 1            | 1   | 1   | 3   | 1   | 1   | 1   | 1   | 1         | 1   | 3   | 1   | 1   | 1   | 1         | 3   | 3   | 3   | 3   | 31    |
| Spade Flat Lasher                     | Tool | 1            | 1   | 1   | 5   | 1   | 1   | 1   | 1   | 1         | 1   | 5   | 1   | 1   | 1   | 1         | 5   | 5   | 5   | 5   | 43    |
| Forks 4 prong Lasher                  | Tool | 1            | 1   | 1   | 5   | 1   | 1   | 1   | 1   | 1         | 1   | 5   | 1   | 1   | 1   | 1         | 5   | 5   | 5   | 5   | 43    |
| Pick                                  | Tool | 1            | 1   | 1   | 5   | 1   | 1   | 1   | 1   | 1         | 1   | 5   | 1   | 1   | 1   | 1         | 5   | 5   | 5   | 5   | 43    |
| Hoe                                   | Tool | 1            | 1   | 1   | 5   | 1   | 1   | 1   | 1   | 1         | 1   | 5   | 1   | 1   | 1   | 1         | 5   | 5   | 5   | 5   | 43    |
| Garden Hose Pipe 20mm x30m            | Tool | 1            | 1   | 1   | 1   | 1   | 1   | 1   | 1   | 1         | 1   | 1   | 1   | 1   | 1   | 1         | 1   | 1   | 1   | 1   | 19    |
| Watering can galvanized 10lt          | Tool | 2            | 2   | 2   | 5   | 2   | 2   | 2   | 2   | 2         | 2   | 5   | 2   | 2   | 2   | 2         | 5   | 5   | 5   | 5   | 56    |
| Fencing Pliers 250mm                  | Tool | 2            | 1   | 1   | 1   | 1   | 1   | 1   | 1   | 1         | 1   | 1   | 1   | 1   | 1   | 1         | 1   | 1   | 1   | 1   | 20    |
| Crowbar 1.8m x 32mm                   | Tool | 1            | 1   | 1   | 1   | 1   | 1   | 1   | 1   | 1         | 1   | 1   | 1   | 1   | 1   | 1         | 1   | 1   | 1   | 1   | 19    |
| Bow saw Lasher H/D 750mm              | Tool | 1            | 1   | 1   | 1   | 1   | 1   | 1   | 1   | 1         | 1   | 1   | 1   | 1   | 1   | 1         | 1   | 1   | 1   | 1   | 19    |
| Hammer claw 500g all steel            | Tool | 1            | 1   | 1   | 1   | 1   | 1   | 1   | 1   | 1         | 1   | 1   | 1   | 1   | 1   | 1         | 1   | 1   | 1   | 1   | 19    |
| Dibber                                | Tool | 1            | 1   | 1   | 1   | 1   | 1   | 1   | 1   | 1         | 1   | 1   | 1   | 1   | 1   | 1         | 1   | 1   | 1   | 1   | 19    |
| Hand shovel                           | Tool | 1            | 1   | 1   | 5   | 1   | 1   | 1   | 1   | 1         | 1   | 5   | 1   | 1   | 1   | 1         | 5   | 5   | 5   | 5   | 43    |
| Tool box                              | Tool | 1            | 1   | 1   | 1   | 1   | 1   | 1   | 1   | 1         | 1   | 1   | 1   | 1   | 1   | 1         | 1   | 1   | 1   | 1   | 19    |
| Sprayer Bottle 20lt                   | Tool | 1            |     |     | 1   |     |     |     |     | 1         |     | 1   |     |     |     | 1         | 1   | 1   | 1   | 1   | 9     |
| Sprayer Bottle 2lt                    | Tool | 2            | 2   | 2   | 2   | 2   | 2   | 2   | 2   | 2         | 2   | 2   | 2   | 2   | 2   | 2         | 2   | 2   | 2   | 2   | 38    |
| Large Chisel for digging holes        | Tool | 1            |     |     | 1   |     |     |     |     | 1         | 1   | 1   | 1   | 1   | 1   | 1         | 1   | 1   | 1   | 1   | 13    |
| <b>Small Scale Farming Impliments</b> |      |              |     |     |     |     |     |     |     |           |     |     |     |     |     |           |     |     |     |     |       |
| Haraka Rolling Punch Planter          | Tool | 1            |     |     | 1   |     |     |     |     | 1         |     |     |     | 1   |     | 1         |     | 1   |     |     | 6     |
| Haraka Fine Seed Planter              | Tool | 1            |     |     | 1   |     |     |     |     | 1         |     |     |     | 1   |     | 1         |     | 1   |     |     | 6     |
| Ox Drawn No-Till Maize Planter        | Tool |              | 1   |     |     |     |     |     |     |           |     |     |     |     |     |           |     |     |     |     | 1     |
| Spear Punch Planter                   | Tool | 1            |     |     | 1   |     |     |     |     | 1         |     |     |     | 1   |     | 1         |     | 1   |     |     | 6     |
| Seedling Transplanter                 | Tool | 1            |     |     | 1   |     |     |     |     | 1         |     |     |     | 1   |     | 1         |     | 1   |     |     | 6     |

**Compost.** Table 16 lists the materials that were supplied to assist the farmers in developing their permaculture gardens.

**Organic Pest control and fertilizers.** Table 16 lists the materials that were supplied to assist the farmers in maintaining their permaculture gardens.



FIGURE 71: THE AGRICULTURAL STORAGE FACILITY

TABLE 16: ORGANIC FERTILIZER, PEST CONTROL AND COMPOST

| Organic Fertilizer, Pest Control & Compost |        |              |     |     |     |     |     |     |     |           |     |     |     |     |     |           |     |     |     |     |     |       |
|--------------------------------------------|--------|--------------|-----|-----|-----|-----|-----|-----|-----|-----------|-----|-----|-----|-----|-----|-----------|-----|-----|-----|-----|-----|-------|
|                                            |        | Thabo Mokele |     |     |     |     |     |     |     | Khoelenya |     |     |     |     |     | Lithipeng |     |     |     |     |     | MFRSC |
|                                            |        | T1           | T2  | T3  | T4  | T5  | T6  | T7  | T8  | K1        | K2  | K3  | K4  | K5  | K6  | L1        | L2  | L3  | L4  | L5  | M1  |       |
| Description                                | Unit   | Qty          | Qty | Qty | Qty | Qty | Qty | Qty | Qty | Qty       | Qty | Qty | Qty | Qty | Qty | Qty       | Qty | Qty | Qty | Qty | Qty |       |
| Organic Fertilizer Pest Control            |        |              |     |     |     |     |     |     |     |           |     |     |     |     |     |           |     |     |     |     |     |       |
| Organic Seedling fertilizer                | 1Kg    | 3            | 2   | 2   | 2   | 2   | 2   | 2   | 2   |           |     |     |     |     |     |           |     |     |     |     | 4   | 21    |
| Organic Fert - Vita Grow                   | 25kg   | 2            | 1   | 1   | 2   |     | 1   | 1   | 1   | 3         | 3   | 4   | 4   | 4   | 4   | 3         | 3   | 3   | 2   | 2   |     | 44    |
| Organic Fert - Vita Veg                    | 25kg   | 1            |     |     |     |     |     |     |     | 2         | 1   | 2   | 1   | 1   | 1   | 2         | 1   | 2   | 1   | 2   |     | 17    |
| Organic Fert - Vita Fruit & Flower         | 25kg   |              |     |     |     |     |     |     |     | 1         |     |     |     |     |     | 1         |     |     |     |     |     | 2     |
| Organic Worm Compost-Fertilis              | 0Dm Ba | 1            | 1   | 1   | 1   | 1   | 1   | 1   | 1   | 1         | 1   | 1   | 1   | 1   | 1   | 1         | 1   | 1   | 1   | 1   | 1   | 20    |
| Organic pest control-Bioneem               | 500ml  | 1            | 1   | 1   | 1   | 1   | 1   | 1   | 1   | 1         | 1   | 1   | 1   | 1   | 1   | 1         | 1   | 1   | 1   | 1   | 1   | 20    |
| Organic pest control- Pyrol                | 500ml  | 1            | 1   | 1   | 1   | 1   | 1   | 1   | 1   | 1         | 1   | 1   | 1   | 1   | 1   | 1         | 1   | 1   | 1   | 1   | 1   | 20    |
| Organic pest control-Finalson              | 500ml  | 1            | 1   | 1   | 1   | 1   | 1   | 1   | 1   | 1         | 1   | 1   | 1   | 1   | 1   | 1         | 1   | 1   | 1   | 1   | 1   | 20    |
| Compost, Peat & Hay bales                  |        |              |     |     |     |     |     |     |     |           |     |     |     |     |     |           |     |     |     |     |     |       |
| Compost                                    | 50Kg   | 180          | 60  | 40  | 100 | 70  | 70  | 50  | 50  | 220       | 80  | 540 | 180 | 180 | 180 | 220       | 240 | 160 | 180 | 130 | 80  | 3010  |
| Potting Soil                               | 10Kg   | 18           | 10  | 6   | 10  | 6   | 6   | 6   | 6   | 18        | 10  | 30  | 10  | 10  | 10  | 18        | 12  | 10  | 5   | 5   | 0   | 206   |
| Seedling Compost                           | 10Kg   | 5            | 5   | 2   | 5   | 2   | 2   | 2   | 2   | 5         | 2   | 5   | 4   | 4   | 4   | 5         | 5   | 5   | 4   | 4   | 0   | 72    |
| Coco/peat                                  | Bales  | 2            | 1   | 1   | 1   | 1   | 1   | 1   | 1   | 2         | 1   | 3   | 1   | 1   | 1   | 2         | 1   | 2   | 1   | 1   |     | 25    |
| Hay Bales                                  | Bales  | 10           | 3   | 3   | 5   | 3   | 3   | 3   | 3   | 10        | 3   | 16  | 5   | 5   | 5   | 10        | 5   | 4   | 4   | 4   | 5   | 109   |

**Bookkeeping.** Farmer bookkeeping materials have been provided to assist the farmers in documenting and running their enterprises from products grown or made from their permaculture gardens: Kitchen scale to weigh produce; monthly yield record sheets; cash book sheet to record daily expenses and income; income statement sheet, to show profit and or losses of a period; see Figure 28.



FIGURE 28: BOOKKEEPING AND MONITORING PRODUCE

### 3.4.3 Training conducted for extension staff and communities

Planning for the 3 x 5 Day Permaculture courses started in early April 2021. A document entitled: *Concept Note for Training of Technical Officers and Lead Farmers on Permaculture Principles and Establishment of Demonstration Gardens* was written (see in Annexure A) and distributed for comment. A meeting with members of the project implementing partners (PIP) was held on 30 April 2021, and the training plan, with dates, budget, and logistics arrangement, was finalized.

Training materials were purchased (see Appendix C) as part of the training budget, such as seeds, seedlings; fruit trees; nursery items, and delivered to the BBCDC

The Bethel Business and Community Development Centre (BBCDC) in Bethel, 1,5 hours' drive away from Mohale's Hoek, was selected as the venue for its all-inclusive package and its off-the-grid, self-sufficient, and sustainable living practices.

The training dates were as follow:

- 1st Course. Technical Officers: 3rd May – 7th May 2021
- 2nd Course. Lead farmers: 17th May – 21st May 2021
- 3rd course. Lead farmers: 24th May – 29th May 2021

Course participants arrived on a Sunday, a day before the course started. They were driven to the venue from Mohale's Hoek in vehicles hired for the purpose.

The course started on a Monday and finished on a Friday.

Motlatsi Phasumane, Project Field Facilitator (PFF), was responsible for planning and all the course logistics and coordination, and he managed this well and efficiently.



FIGURE 29: COURSE CERTIFICATE

## Basic course outline:

The course comprised of the following learning methods:

- Theory: 35%
- Discussion/questions/feedback: 13%
- Practical's: 35%
- Demonstrations: 13%
- Multimedia: 4%

The following is a basic course outline. Refer to Appendix D for the Course Schedule.

**Day 1:** Introduction to Permaculture, & Building Resilience to Climate Change: The course started with the foundations, principles, and ethics of Permaculture; a comprehensive tour of the BBCDC campus followed showcasing the many climate mitigation technologies: such as solar ovens, bio-gas, solar geysers, and solar panels. This was followed by lessons on preserving food through solar drying and a lesson on solar cooking.

**Day 2:** Principles of Permaculture Design: A morning lesson on Permaculture Design themes: site assessment, zone planning, sector planning, and slope planning (refer to Figure 31).

Practical's:

- building an A-Frame,
- marking and digging a swale,
- and the design game— participants apply the morning theory to a small model farm and present back to the class, building double reach raised beds.

**Day 3:** Developing Agro-ecosystems & Building Healthy Soils: A lesson on building and maintaining healthy soil the organic way: What is soil? How is it created? Importance of micro-organisms in the soil? How to make and apply compost?

Lesson on three themes in ecosystems:

- succession,
- habitat,
- and diversity

Practical's:

- applying compost and mulch to the raised beds;
- a tour of BBCDC compost heap;
- demo on making compost tea (see Figure 30).
- Four types of companion planting in the raised beds.



SOURCE: RORY CLARK (2020)

FIGURE 30: PRACTICAL DEMONSTRATIONS ON SOIL

Demonstrations:

- making natural pest control sprays.

**Day 4: Agroforestry:** Introduction to agroforestry and the various types of agroforestry; value and importance of perennial agriculture systems; What is a Food Forest? Steps to creating a Food Forest; animals in permaculture and agroforestry systems; crops in agroforestry systems; conservation agriculture.

Practical's:

- planting a Food Forest guild,
- learning how to use small-scale farming Conservation Agriculture equipment.

Demonstrations:

- A-frame chicken tractors,
- solar electric fencing for pigs,
- solar poultry fencing.

**Day 5: Plant propagation & Improving Livelihoods:** Lesson on plant propagation and the various methods of propagation relevant to a small-scale farmer: cuttings, root division, seedling trays, creating your growing mediums. Lesson on improving livelihoods; Farming enterprise ideas.

Practical's:

- taking cuttings and using root hormone;
- planting seedling trays.

### Comments from course attendees:

*"The training was fruitful and important to me because everything we were taught is doable because most of the things are available on my farm." ~ Taelo Molomo*

*"The training was an eye-opener for me, I have dual-purpose chicken, but I was not aware that I can use them to prepare and fertilize my land, and for this information, I'm thankful." ~ Palamang Ranku*

*I also learned that animals, more especially small stock such as chickens and pigs, could not only be reared for slaughtering (meat) and manure, but they can also play a very important role in land preparation (preparing the land) through mobile pans. Also, I found compost making and preparation of liquid manure very helpful because it is climate-smart and saves money, so that is an advantage on the side of farmers to achieve more production but lower expenses incurred." ~ Malepeke Lethaha (Senior District Forestry Officer)*

*"The entire permaculture course was very detailed and useful and of course beneficial to every one of us. I have started to practice permaculture. I want to live permaculture because I have gained a lot from your lecture that I am also going to give back to my farmers and everyone around me." ~ Pauline (District Nutrition officer) Ministry of Agriculture and food security.*



*Practical-A-frame construction & marking a contour*



*Practical-digging a swale (runoff harvesting)*



*Practical- Permaculture Design Game*

SOURCE: RORY CLARK (2020)

FIGURE 31: PRACTICAL EXERCISES ON DAY 2 OF THE TRAINING (PERMACULTURE DESIGN)

### 3.4.4 Permaculture principles integrated into the Farmer Field School (FFS) curriculum

Subsequent to the permaculture training in May 2021, the PIC integrated Permaculture principles and practices into the FFS curriculum.<sup>9</sup>

For each topic in the curriculum, a permaculture component has been added with references to support the relevant subject matter in the Permaculture manual, a section on learning outcomes, and a suggested lesson plan.

The topics that contain Permaculture principles in the curriculum are as follows:

- Climate change adaptation
- Ecosystems and agricultural livelihoods
- Agro Eco System Analysis Concept
- Integrated Production and Pest Management

## 3.5 Outcome assessment and close-out phase

The following activities took place during the closeout phase of the project, where the PIC's main focus was to ensure the sustainability of the interventions; assess the project outcomes amongst beneficiaries, and consolidate all the data into the closeout report.

### 3.5.1 Open days

Permaculture open days were devised by the PIC to invite community members living around the developed permaculture gardens to “open” the doors to them to come to see what has been done at the sites, undertake an informative tour, and participate in an introductory workshop on permaculture. It was also an opportunity for the technical staff of the MFRSC and MAFS to facilitate permaculture training on their own with backup support provided by the PIC and to expand the reach of the project.



SOURCE: RORY CLARK (2020)

FIGURE 32: OPEN DAY WORKSHOPS

At the end of each open day, seeds were gifted to all the participants. In total, 130 local community members participated in 5 open days over a five-day period (see figure 32).

<sup>9</sup> Clark, R. 2021. Permaculture Integrated FFS Manual CCA Lesotho. Compiled for the UNDP Country Office, Maseru, Lesotho. May 2021.

TABLE 17: PERMACULTURE OPEN DAYS: TRAINING SCHEDULE

| Permaculture garden Open Days-Training Schedule |                                                        |                                                                                                          |                                                                                                         |
|-------------------------------------------------|--------------------------------------------------------|----------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------|
| Time                                            | Lesson/Activity                                        | Themes                                                                                                   | Resources required                                                                                      |
| 8.00-8.30                                       | Course registration & orientation.                     | o Introductions                                                                                          | Attendance register                                                                                     |
|                                                 |                                                        | o Workshop orientation                                                                                   |                                                                                                         |
| 8.30-9.00                                       | Introduction to permaculture & the project             | o What is Permaculture                                                                                   | Whit board, white board markers                                                                         |
|                                                 |                                                        | o Relevance of permaculture to Lesotho (climate change & resilience too; land degradation;)              | Whit board, white board markers                                                                         |
|                                                 |                                                        | o Permaculture principles                                                                                | Whit board, white board markers                                                                         |
| 9.00-10.00                                      | Comprehensive tour of the site                         | o Design/layout according permaculture principles                                                        | Garden hats, water bottles, walking shoes                                                               |
|                                                 |                                                        | o Water systems: Rain water harvesting off roof, land; Irrigation                                        |                                                                                                         |
|                                                 |                                                        | o Earth works: Swales, tree basins, raised vegetable beds                                                |                                                                                                         |
|                                                 |                                                        | o Animal systems: Free range chickens, A-frame chicken tractors; pig, sheep, goat - pens;                |                                                                                                         |
| 10.00-12.00                                     | How to work with slope of the land - slope planning    | o Slope planning: importance of; what can be cultivated on what slope %; strategies for different slopes | Work clothes                                                                                            |
|                                                 |                                                        | o Water systems: Rain water harvesting off roof, land; Irrigation                                        |                                                                                                         |
|                                                 |                                                        | o Finding the contour: making an A-frame                                                                 | A frame materials (poles, soft wire, pliers, marker, hammer, stakes), enough for 10 groups of 5         |
|                                                 |                                                        | o Digging a swale and or making raised vegetable beds                                                    | 10 Spades, 10 pics, 10 forks, 10 rakes; compost, haybales, watering cans, measuring tape, building line |
| 12.00-13.00                                     | Creating a healthy farm ecosystem & Planting practical | o Introduction to natural pest control: Building a healthy farm ecosystem, pest control measures         |                                                                                                         |
|                                                 |                                                        | o Planting seedling trays                                                                                |                                                                                                         |
|                                                 |                                                        | o Planting seeds in beds                                                                                 |                                                                                                         |
| 13.00-13.15                                     | Closure                                                | o How to apply permaculture to you your home and fields                                                  | Written comments from the participants                                                                  |
|                                                 |                                                        | o Support the Ministries can provide                                                                     |                                                                                                         |
|                                                 |                                                        | o Dispensing seed hampers                                                                                |                                                                                                         |

TABLE 18: TECHNICAL STAFF WHO FACILITATED OPEN DAYS

| Technical staff that facilitated the Open Days |                                             |                                                  |              |
|------------------------------------------------|---------------------------------------------|--------------------------------------------------|--------------|
| Names                                          | Designations                                | Ministry                                         | Departments  |
| Malepeke Lethaha                               | Senior District Forestry Officer (SDFO)     | Ministry of Forestry Range and Soil Conservation | Forestry     |
| Tsepang Makhetha                               | Range Technical Officer (RTO)               | Ministry of Forestry Range and Soil Conservation | Range        |
| Motlatsi Pheko                                 | Senior District Conservation Officer (SDCO) | Ministry of Forestry Range and Soil Conservation | Conservation |
| Mampeli Tsiloane                               | Assistant Conservation Officer (ACO)        | Ministry of Forestry Range and Soil Conservation | Conservation |
| Lekote Kotsoane                                | Forester (F)                                | Ministry of Forestry Range and Soil Conservation | Forestry     |
| Molefi Ramontsoe                               | Senior District Irrigation Officer (SDIO)   | Ministry of Agriculture and Food Security        | Irrigation   |

### 3.5.2 Closeout interviews

The PIC conducted closeout interviews with the beneficiaries – one of the permaculture supervisors was hired by the PIC to conduct the interviews telephonically on his behalf. The process sought to assess the beneficiaries' uptake of permaculture principles, capture their impressions and reflections on the project, and document any unresolved issues.

In terms of the uptake of permaculture principles, the exercise was overall premature as the demo gardens have just been completed, and many of the assessment questions were not relevant for this point in the development phase and would be more applicable if conducted a year from now and again after six years, as fruit trees can take up to five years to bear. However, it was successful in capturing the beneficiaries' impressions of the project and documenting their comments at this early stage. Their feedback also has given the project a sense of their motivation and interest in applying permaculture going forward. The closeout interviews also sought to get a preliminary sense of how the project has impacted the beneficiaries in terms of food and domestic livelihood security.

The feedback was very helpful in compiling the closeout report, national guidelines, and policy brief.

The beneficiary closeout interviews can be found at the following link.  
<https://docs.google.com/spreadsheets/d/1hAYIBL5kVZJH6GfiyA3cFSN-UfQEY-pJhc6AqWxDQfQ/edit?usp=sharing>

### 3.5.3 Meetings with the Ministries and arranging final close-out tasks

The PIC met with Nkuebe Lerotholi, District Coordinator for MFRSC, and Malerato Lekhooa, District Agriculture officer for MAFS, to discuss approaches to sustain the interventions, including; extension needs of the current beneficiaries of the project, closeout tasks that still need to be completed, monitoring of the project intervention, and upscaling possibilities of permaculture principles and practices to the other councils in the Mphahle's Hoek district.

### 3.5.4 Project report, national guidelines, and policy brief.

The close-out report (this report) was compiled by the PIC during September and October 2021 and documents the processes that were followed in the project, the project's outputs, and the uptake of the permaculture principles and practices.

A separate document compiled by the PIC, and which accompanies this report, is a policy brief, which was also compiled in September-October 2021 and forms a part of the final closeout deliverable.

The Policy brief, *Contributing to climate change adaptation in Lesotho through policy interventions focused on scaling out permaculture principles and practice and linking with the Ecological Organic Agriculture Initiative (EOA-I)* (2021): includes recommendations for a sustainable upscaling of permaculture in Lesotho, which was elaborated based on the pilot project experience and the lessons learnt from overcoming implementation challenges and reflecting on how best to capitalise on possible opportunities and synergies. The brief also makes a case for tying this upscaling of permaculture practices with an explicit policy effort to support the emergence of the organic sector in Lesotho, in alignment with the EOA-I, an approach that is strategic to turn around Lesotho's' agricultural orientations and to put Lesotho on the funding map of this continental initiative.



## 4 PROJECT OUTCOMES

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### 4.1 Summary overview of key outcomes

The PIC is confident that the project has achieved the desired outcomes based on the expected deliverables and, where possible, has gone beyond the project brief and expanded the reach of the project.

- ✓ **Time frame:** Although the project required a four-month extension due to delays caused by COVID19, it was still completed within the new contract extension period and kept roughly to the schedule throughout the project.
- ✓ **Quality:** The project sought to achieve a good standard of quality in all its interventions, equipment supplied, and installations of infrastructure.
- ✓ **Cost:** The budget was managed by UNDP procurement, and there were no major project overruns. No cost-benefit analysis has been done for the permaculture project.
- ✓ **Stakeholder and beneficiary satisfaction:** The project worked closely with the MAFS and MFRSC, and according to the feedback given, the stakeholders are satisfied with the project intervention.
- ✓ **Relevance of the project:** According to the feedback from the farmer-beneficiaries, the project and its interventions have been relevant to them and met their needs. It has also shown how the application of permaculture principles and practice to food production throughout the country will contribute significantly to developing resilience to climate change and land degradation.

The following is an analysis of the project scope of works versus actual outputs:

- Create three demonstration gardens that showcase permaculture principles and best practices
  - ✓ The project has developed twenty permaculture gardens: three demo and 17 subset gardens that showcase a suite of permaculture principles relevant to temperate climate permaculture in Lesotho.
- Develop training material aimed at addressing the specific circumstances found within the project area
  - ✓ The project has developed a 111-page manual covering the permaculture principles and practices relevant to the Lesotho context. The project integrated permaculture principles into the FFS curriculum and provided a sowing calendar poster with detailed instruction for planting and harvesting.
- Train 80 technical staff and farmers
  - ✓ The project trained 23 technical staff and 34 lead farmers at the five-day permaculture courses in May 2021 and a further 130 at the open days in September 2021.
- Develop the capacity of technical staff so that they can replicate the training to more farmers and replicate the development of permaculture food gardens.
  - ✓ The project has “trained the trainers” - technical staff from the MFRSC and MAFS-extension officers; horticulture; range; irrigation; conservation; soil, and provided them with the experience of co-facilitating the permaculture 5-day course and also the permaculture 1-day workshops

- Provide a selection of food plants that are relevant to building resilience to climate change projections and local growing conditions and ensure food can be produced throughout the year
  - ✓ The project has supplied up to forty-five different species of perennial food plants: fruit and nut trees; berries and vines; and thirty-two species of vegetable seed that cover food production in all the seasons, as well as improved the husbandry of various livestock species.

## 4.2 Challenges encountered in programme implementation

The following were some of the noteworthy challenges experienced during implementation:

### 4.2.1 Challenges due to the COVID19:

The COVID 19 global pandemic that started at the end of March 2020 and continues at the time of writing, over a year and seven months later, has had far-reaching impacts on the RVCC project's ability to implement. The RVCC project was awarded an extension till the end of 2021 based on the negative impact COVID 19 had on its performance during this period.

The pandemic has also greatly affected the RVCC permaculture project, resulting in the project falling at least four months behind in delivery.

The impact COVID 19 has had on the project are as follows:

- Borders being closed during high-level lockdowns (PIC could not cross over the border)
- Delays to procurement processes
- Delayed start for supplier/installers
- Impediments to suppliers sourcing materials from South Africa
- Delays in delivery of specific materials.

These impediments and delays resulted in the RVCC/UNDP awarding the PIC a “no-cost extension” to his contract from the period 1 June 2021 to 31 October 2021.

### 4.2.2 Support on the ground by Project Field Facilitators:

The PIC's ToR indicates the PFF's would be available to assist in implementation. However, they were heavily burdened with other project responsibilities, leaving a gap in the management of the RVCC permaculture project implementation. This resulted in some challenges, especially when it came to resolving water issues, dealing with labour support, assisting with supplier/installer challenges, coordinating activities with the Ministry, resolving issues in good time.

### 4.2.3 Logistics issues:

Due to the very large geographical area covered by the project, the distance between farmers, and the demands on the project delivery vehicle for other RVCC project activities (not related to permaculture interventions), this posed several challenges to the implementation of the RVCC permaculture project. Often plans were made for the week only to find out on the day that no project vehicle was available due to the vehicle being used for other RVCC project activities. The PIC used his vehicle extensively in the project, but the Lesotho terrain is extremely rugged, and the PIC's vehicle sustained many damages.

### 4.2.4 Payment delays:

Delayed payments were a consistent and challenging element in the project. For example, it appears on average that suppliers received payment three or more months from the time of invoicing when the agreement was only for the duration of a month. This resulted in strained working relationships between the PIC and the said suppliers and in the additional administrative burden of following up on supplier payments.

The delayed payments for the six permaculture supervisors, where they consistently didn't receive their salaries on time and mostly two months late, caused a great dip in morale and challenges for them on the ground in terms of paying their living expenses. The PIC had to loan money to them on several occasions.

The PIC himself experienced several delayed payments and contractual issues that resulted in very challenging financial circumstances, particularly towards the end of the project, when the PIC's contract expired, but he had to continue working to remain on schedule.

At the time of writing this closeout report, the labour support had still not been paid. Towards the end of the project, when the PIC and his assistant entered the community for closeout activities, they were cornered by the disgruntled labourers who demanded their money that was several weeks overdue. The situation was tense at times and made for very uncomfortable working conditions. It also tarnished the reputation of the project.

### 4.2.5 Communication challenges between procurement and consultant:

Due to the complex, specialized and detailed list of procurements, the PIC had to play a more active role in reviewing purchase orders before being sent out to suppliers and reviewing quotes before approval. Due to time constraints and possibly UNDP policy issues, the PIC could not be involved resulting in some challenges with items being incorrectly quoted on. Fortunately, suppliers and procurement were patient, and issues were resolved in the end.

### 4.2.6 Supplier and installer issues:

Some of the suppliers and installers appeared to run out of money or struggled financially to sustain their operations at various stages in the implementation. This is in part most likely due to UNDP's procurement

order policy (where services or goods are to be supplied before payment). This caused a lot of undue delays and was a burden to the project.

Tenders were awarded to two suppliers when ideally, they could have been given to one. For example, there were separate tank and irrigation suppliers - the tank supplier delayed his installation, thereby impeding the progress of the irrigation supplier, causing the latter delays, much frustration, and extra costs. It may have been preferable to award the whole tender to one reliable supplier.

Awarding tenders to suppliers that are not experienced in the field of those products: One of the two tree suppliers supplied inferior quality seedlings. The trees were small and weak, and some plants were not even rooted in the bags (just sticks), and some of the plants delivered were dead. When inquiries were made, the supplier pleaded she was not familiar with trees and other plants and therefore was unaware of the poor quality being supplied to her.

#### 4.2.7 The project timeframes were too short

It was said many times by members of the ministry and other stakeholders involved in the project that it would have been ideal if the permaculture project had started at the beginning of the RVCC project in 2015. Although the permaculture project spanned 19 months (15 when taking into account the time lost for the lockdown period), it was only enough to lay the foundational work. There has been very little time spent on mentorship for the farmers. Ideally, a project of this scope that includes agroforestry interventions would run for five years so that farmers and their farms can go through several stages of development and receive the mentorship prescribed for each phase.

Due to the project finishing just before the growing season, many planting tasks remained incomplete at the time of submitting this report. The PIC is back in South Africa and is now forced to follow up telephonically with the parties responsible for concluding some of the uncompleted tasks: suppliers who hadn't completed their work at the time of exiting the country, and with the Ministry who have agreed to assist with final deliveries and planting of crops. In addition to this, the PFF allocated to support this project is no longer available due to his contract expiring as well.

#### 4.2.8 The PIC did not receive the labour support needed in time

The permaculture supervisors were not engaged for the duration of the project and missed two months on the project when their contracts expired and had to wait to be reinstated.

For several months the permaculture project never received the labour support needed for the consultant to complete the development of



FIGURE 33: HEAVY RAINS AT MAITUMELENG MABAKA

the food gardens. This resulted in a bottleneck of activities towards the end of the project when labour was eventually provided.

### 4.3 Closeout assessment

During September 2021, while compiling the closeout report, the PIC had the opportunity to visit some of the beneficiary sites.

Although this was very early in the growing season, the gardens with newly planted trees and other plants were starting to show their new leaves for spring and looked healthy. At one of the sites in Maitumeleng Mabaka (K2), there had been a very heavy rainfall event at the time of the visit, and the PIC had the opportunity to assess some of the rainwater harvesting systems. (Please see Figure 33). The PIC is pleased to report they are working well.

The farmers are getting ready to plant their seeds in the vegetable beds, and many have planted up seedling trays in their new nurseries. At the time of writing, some beneficiaries were almost ready to plant these seedlings out. See figure 34.

The farmer-beneficiaries visited were very pleased with their new permaculture gardens, which included: agroforestry systems, water systems, animal systems, mini nurseries, tools, and equipment, and they appeared happy with the outcomes of the project and proud of their contributions and accomplishments in developing their gardens.

There are still a few remaining actions that need to take place that will finish off the project completely. Please see section 4.9.

A closeout interview with the beneficiaries formed part of the closeout assessment of the project.<sup>10</sup>



SOURCE: RORY CLARK (2020)

FIGURE 34: SEEDLINGS IN NURSERY

<sup>10</sup> Clark, R. 2021. RVCC Permaculture Project - Closeout Interviews.



FIGURE 35: RESTORATION AT KHOELENYA, MOROBONG

## 4.4 Garden examples

### Sedi la ka Mponsetse tsela (K3) Community Garden

A special mention should be made of the restoration work done at the community garden from Morobong, Khoelenya. A very commendable effort was put in by the community group “Sedi la ka Mponsetse tsela.” The members were aged but showed up every day to do very hard menial labour for weeks on end. The site is severely degraded, and the involvement of the group was of particular interest to the Project Coordinator (PC) and the RVCC team. As mentioned in a previous section, vetiver was planted out extensively to assist in mitigating soil erosion and for rehabilitation of the site. Lines of vetiver have been placed around fields, on the banks to stabilize dams, and on the steeper slopes where erosion is particularly bad. Every vetiver plant will produce another one hundred “tillers” or root suckers (baby plants). In one year, the eight thousand plants supplied will produce eight hundred thousand plants, and if those are all planted out, they can collectively produce eight million plants in two years.

The site is large, and only 40 percent of the area was worked on during the permaculture project. A second phase could look at restoring the other areas on the property. The area Morobong, where the community is situated, is severely degraded in general, and it is hoped that this community garden can serve as an example, particularly on how to use vetiver in land rehabilitation work as well as be able to supply vetiver plants to future projects and providing an income to the community group. See picture 35 of the community group planting vetiver.

The interventions provided for this garden are as follows:

- ✓ 8000 vetiver plants
- ✓ 70 fruit and nut trees,
- ✓ 50 indigenous trees (including indigenous fruit trees),
- ✓ 70 fruit (including persimmon, cherry; and plum.) and nut trees (hazelnut; almond; walnut; pecan), berries (blue, black; goji),
- ✓ 30 types of OPV/heirloom seed,
- ✓ eight types of cover crops,
- ✓ micro-nursery with seedling trays and organic seedling fertilizer,
- ✓ provided a water connection to a local spring,
- ✓ installed tanks, drip irrigation,
- ✓ fenced the entire garden,
- ✓ four beehives, tools, and bee suites;
- ✓ four days’ work with a TLB;
- ✓ new driveway; digging tree hole;
- ✓ raised vegetable beds made out of stone on hard rock;
- ✓ 5-day permaculture course; tools;
- ✓ 500 bags of compost; organic fertilizer;
- ✓ a kitchen scale and our farmer bookkeeping sheets.



SOURCE: RORY CLARK (2021)

FIGURE 36: AERIAL VIEW OF REHABILITATION

### Malebohang Maribe (T1) Demonstration garden

Malebohang Maribe farm, situated in Thabo Mokhele, approximately forty-five minutes' drive from Mohale's Hoek, was chosen as one of the three permaculture demonstrations sites in the three tribal council areas. The site was chosen for a demo garden as it satisfied certain criteria.

- The beneficiary is an active farmer
- Farming is both substance and commercial
- The farm has access to water for irrigation
- The farmer was willing to allow her site to be open to the public as a demonstration garden
- The farmer was interested in our permaculture proposal for her sites
- The farmer was practicing mixed farming with crops, animals, and trees and was interested in incorporating all three into an agroforestry system
- The site was ideally located to allow for access from the public

The interventions implemented at this garden were as follows:

- ✓ A new driveway and a platform for a chicken coop was cut;
- ✓ 140 m of fencing, a driveway gate, and a pedestrian gate was installed;
- ✓ Swales dug to catch surplus rainwater runoff and passively irrigate the trees planted downslope;
- ✓ New raised vegetable bed garden and, raised beds along the fence line developed;
- ✓ Mini nursery installed; grape trellis installed;
- ✓ Chicken coop (with nesting boxes) and run installed - for up to 50 chickens;
- ✓ New sheep run and shelter installed;
- ✓ Water supply from the local spring connected to the garden via 40 mm pipe;
- ✓ 2 x 5000 lt tanks on tanks stand installed; drip irrigation for vegetable,
- ✓ Trees and berries installed;
- ✓ CA plots developed; 39 fruit and nut trees planted;
- ✓ 10 indigenous trees planted; 155 berries planted;
- ✓ 52 useful herbs planted;
- ✓ 300 vetiver planted;
- ✓ 12 grapes and two kiwi fruit planted;
- ✓ Seed-bank materials
- ✓ a kitchen scale and our farmer bookkeeping sheets.



FIGURE 37: NEWLY CONSTRUCTED SHEEP RUN

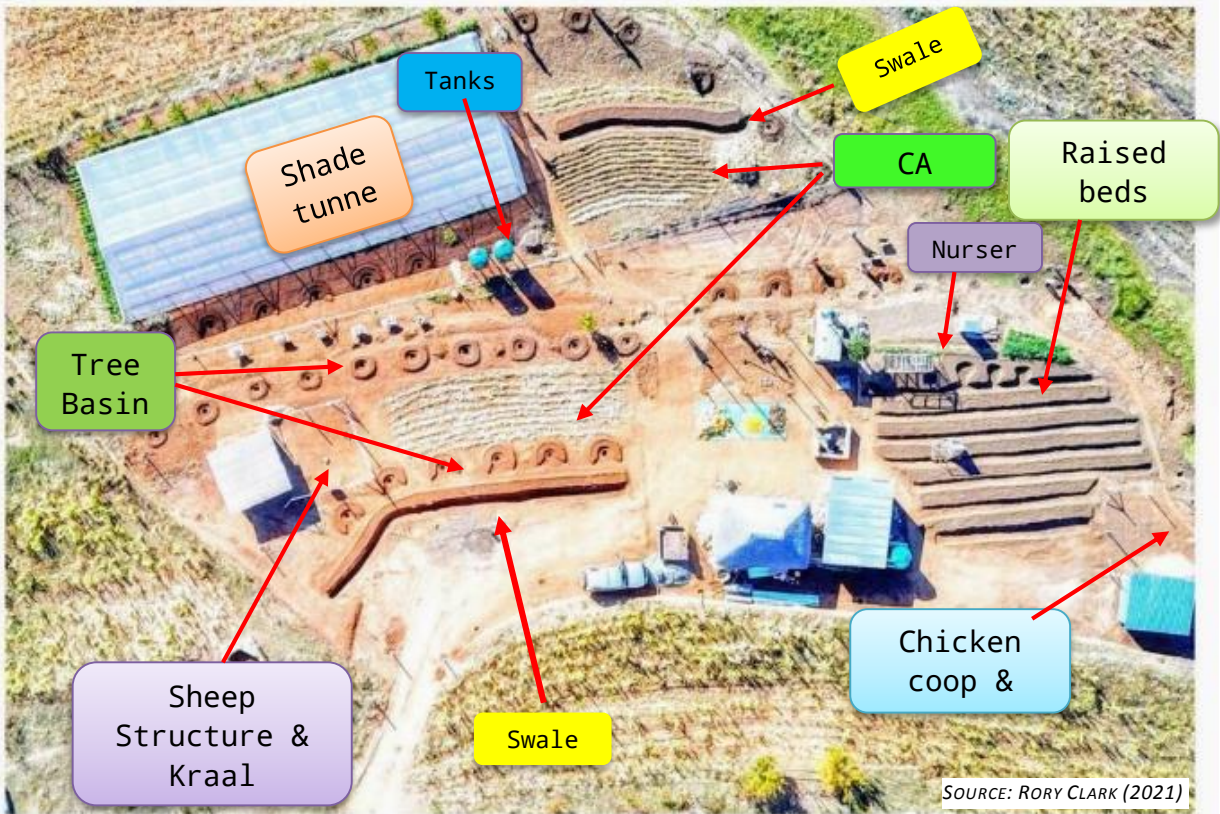


FIGURE 38: DETAILED AERIAL VIEW OF MALEBOHANG MARIBE (T1) DEMONSTRATION GARDEN

The project has just been completed (30 September 2021), and the newly planted gardens haven't been through one season yet, so it is still early to determine any medium to long-term project outcomes. The planted fruit trees may take up to five years to reach any meaningful production. However, the following short-term outcomes or benefits for the project farmer-beneficiaries have been identified from the closeout interviews conducted by the PIC and are a good indicator of the relevance of the project, the uptake of permaculture principles by them, and the immediate impact it has made to their lives. Quotes from these interviews have been captured and featured in Appendix B.

Based on the close-out assessment of the sites: how the various systems in place are performing, and also by the feedback through the closeout interviews, the following general summary can be drawn.

The beneficiaries:

- Have expressed deep appreciation of permaculture as a sustainable agroecological design and production practice.
- Have understood the value of the farm as an agroecosystem and are able to see the importance of the interrelationships between all the elements that make up the ecosystem
- Have found the permaculture approach to using biological resources: cover crops, animal tractors, kraal manure, and compost tea to be low cost, most relevant, and sustainable.
- Understood the need to work with slope planning: contour making (using an A-frame); planting trees on steeper slopes; using walled terraces if needed in order to mitigate soil erosion and rehabilitate land degradation.
- Have already adopted many of the permaculture practices: such as mulching, companion planting, free-range chickens; improving animal well-being and health through holistic animal husbandry; planting a diversity of crops; rainwater run-off harvesting; water conservation through drip irrigation; and integrating animals, crops, and trees.
- Indicated that the roll-out of infrastructure has started playing a part in resolving conflict among community members (especially around the use of water resources)
- Slowly getting comfortable with book-keeping practices and playing a part in the emergence of a business culture among beneficiaries
- (for some) are expressing some inclination to shift from subsistence to commercial production.
- Need further education and mentorship on some of the plants and seeds they received

In addition:

- The earthworks and rainwater run-off harvesting have been effective and already tested by heavy weather events.
- Beehives have already started attracting bees to take up residence

## 4.6 Lessons learned

The following lessons were learned and can inform the project design of future permaculture interventions:

- Cater fully for logistics by providing the necessary vehicles: bakkies, and truck for materials, especially when more than one council is being worked in.
- Cater fully for community facilitation processes.
- Conduct background checks on suppliers and their products and assess their financial capacity to complete work; or that their products are of the quality required.
- As far as possible, do not split items (of the same nature) between suppliers or installers.
- Ensure quotes supplied are pre-approved by the consultant/permaculture practitioner before accepting them.
- Plan for a longer project of between four and five years to include phases of garden development and a longer mentorship period.

## 4.7 Close-out assessment of uptake, sustainability, and scalability of permaculture principles and recommendations on the way forward

### 4.7.1 Planting a diversity of crops and making use of polycultures (plants that benefit from each other when grown together):

**Relevance:** Planting a diversity of crops increases resilience against climate change shocks that may result in crop failure, as some plant species are still able to perform under climate variations-drought or above-average rainfall. Having a variety of crops in the ground reduces pest pressures and also increases the success of the growing season. It also equates to a diversity of livelihood opportunities, as some crops might be of commercial interest. Finally, planting a diversity of crops that also cover other seasons helps to increase year-round food availability, thereby increasing both food security and livelihood opportunities while providing for nutritional diversity and related health benefits.

**Baseline assessment and interview:** The beneficiaries grow a limited range of vegetables, staple crops (grains and beans), fruit, nuts (no nut trees), forage, and fodder crops, with particularly limited production in winter.

**Project intervention:** The project provided a variety of seeds: vegetables, forage crops, cover crops, as well as a variety of fruit, nut, firewood, forage/fodder trees. See table 8 in section 3.4.2.7; many high-value berries, fruit, and nut trees were supplied, such as blueberry.

**Sustainability:** For this intervention to be sustainable, the beneficiaries would need to be educated on the threats that climate change poses to them and their farming practices; climate change projections forecasted for their area; and crops best suited to meet these changes. Ideally, extension officers would work with the farmers, testing out suitable crops and varieties and incorporate ongoing test trials that can be organized through the Farmer Field Schools. The MFRSC will be monitoring the performance of the different fruit and nut trees. They also have a Climate forecasting, climate information, and dissemination component in one of their other projects, of which elements could be brought into this project.

**Scalability:** The value of planting a diversity of crops and making use of polycultures can be advocated and taught through the FFS and permaculture open day workshops and replicated into other districts of the country.

**Reflection:** It is not possible at this early stage to assess the impact of this intervention, as the project is closing out before the first growing season, and some plants will take several years to produce, such as fruit and nut trees. The true impact can only be measured in four to six years.

It is expected that not all the seeds or crops provided will be adopted, but it is essential to provide alternative “broader options” for farmers to test for suitability for both sustenance and market opportunities and what may assist in weather pattern changes due to climate change.

#### **Recommendations:**

MAFS and MFRSC are to jointly:

- Organise that extension officers work closely with the farmers to i) provide awareness on how the climate change risk can be mitigated and ii) monitor the performance of crops and varieties introduced (through the Farmer Field Schools) to determine what are the most suitable fruit and nut trees for each agro-ecological zone. This monitoring should be performed at least on a bi-annual basis for the next five years.
- Integrate the Climate forecasting, climate information, and dissemination from the sister project to the ongoing monitoring and scaling up of this project.

The monitoring effort should also include a component focusing on the commercial potential of the species/varieties introduced. For instance, blueberries are sold in the local supermarket in Molele's Hoek and indicate that high-value crops such as berries could potentially be a growing market, particularly with tourism being one of Lesotho's main industries and the selective demand that this brings.

*“Greater adoption of a wider array of perennial vegetables could help to address some of the central, interlocking issues of the 21st century: climate change, biodiversity, and nutrition,”<sup>11</sup> Eric Toensmeier*

#### **4.7.2 Planting perennial plants & using perennial agriculture systems:**

**Relevance:** Farming methods based on perennial agricultural systems such as agroforestry and the planting of crops that last several seasons for food (vegetables, fruit & nuts), firewood, medicine, fibre, soil erosion control, and nectar flow, animal fodder/forage all contribute to building farmer resilience against climate change, mitigating climate change (through carbon sequestration), mitigating land degradation (through their stabilizing root systems, increasing vegetative cover); enhance livelihood security (a diverse range of

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<sup>11</sup> Toensmeier, E. July 10, 2020. Perennial vegetables: A neglected resource for biodiversity, carbon sequestration, and nutrition.

products and high value produce such as blueberries and blackberries), and strengthen food security and nutrition.

**Baseline assessment and interview:** Most of the beneficiaries had some perennial crops growing, such as a few fruit trees and lucerne, at the start of the project. However, they were few in number (and low in diversity), and these generally covered a limited portion of the farmer's production area and were generally not integrated with farm animal production.

**Project intervention:** One of the main project interventions was to introduce (where it hadn't been done yet) or enhance agroforestry systems on the farms of the beneficiaries. Beneficiaries were trained at the permaculture course in agroforestry and permaculture food forest systems. The project also assisted the beneficiaries with designing and creating agroforestry plots with rows of fruit, nut, and berry plants with staple crop production plots in between; A-frame chicken tractors and solar electric fencing were provided to integrate livestock into the system, and unused areas around the homestead and production areas were planted to perennial forage and fodder crops.

**Sustainability:** Fruit trees can take several years to produce fruit. Agroforestry systems, therefore, go through several stages of development. This necessitates monitoring and extension support at each stage. The MFRSC has pledged its support to provide mentorship to each of the gardens for this critical establishment period over the next several seasons.

Future projects or interventions could include micro tree nurseries in the three community councils, where champion farmers with an aptitude for plant propagation could be engaged to produce good quality grafted fruit, nut, and fodder/forage trees; as well as berries (blueberry, goji berry, strawberry and blackberry) and vine crops (grapes, kiwifruit, and runner beans). These trees could be purchased by the department of agriculture and or sold to local farmers and or by other agroforestry projects. There are already micro-community tree nurseries started by the project.

**Scalability:** The MFRSC's department of Forestry advocates and includes agroforestry in its programmes. The MFRSC has expressed significant interest and attention in the permaculture methods of planting and establishing food forests (permaculture fruit orchards). They have indicated that there are opportunities to include permaculture agroforestry systems in their other projects in other areas (outside of the three RVCC project areas).

**Reflections and recommendations:** As indicated, tree systems take several years to develop and establish. The permaculture project was only implemented over 18 months. Ideally, the project should have been initiated at the same time as the RVCC project in 2015 or a year later in 2016 to allow for proper development of the gardens and to also include a much longer mentorship and monitoring phase.

#### **Recommendations:**

The MFRSC shall:

- Provide mentorship to each of the gardens for this critical establishment period over the next five growing seasons.

- Act on its stated intention to include permaculture agroforestry systems in their other projects in other areas

The MAFS shall:

- Ensure that the procurement of trees in forthcoming projects investigates suppliers that have not supplied the project before or question them (or allow the consultant to do so) on the products they quoted on supplying before approval.<sup>12</sup>
- Consider micro tree nurseries in the three community councils, where champion farmers with an aptitude for plant propagation could be engaged to produce trees for agroforestry upscaling.

*“Permaculture is one of the best interventions to include in our programmes because it addresses food security issues, climate change in terms of the utilization of resources, e.g., we don’t just dispose of the animal manure, we can recycle them (sic) into vegetable and fruit trees, involvement of bees in pollination, it mimics ecology.” ~ Nkuebe Lerotholi, District Coordinator for MFRSC<sup>13</sup>*

#### 4.7.3 Practicing crop rotations and making use of cover crops:

**Relevance:** Crop rotations are used for cutting pest cycles by changing crops that otherwise would build up in a plot of land where the same crop is grown year after year. Crop rotation assists in not over-depleting the soil of specific nutrients. Cover crops are used for soil building, adding specific nutrients using nitrogen-fixing crops, building organic matter in the soil, sustaining and creating diverse and healthy soil life, providing living mulch for weed suppression. They provide better soil protection from wind erosion and heavy rainfall events during fallow periods. In combination, cover cropping and crop rotation are very effective and constitute appropriate strategies for small-scale farmers to reduce inputs and time in the field while improving yields.

**Baseline assessment and interview:** At the start of the project, only a few beneficiaries were using cover crops, such as vetch and lucerne, and some of the beneficiaries had some perennial crops growing, such as a few fruit trees and lucerne. Diversity was limited, and the said cover crops covered a limited portion of the farmer's production area, and the practice was not integrated with animal production.

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<sup>12</sup> As indicated in section 4.2.6 one of the plant supplier’s BG Greenlife supplied inferior quality trees.

<sup>13</sup> Personal communication held on 24 September 2021

**Project intervention:** The PIC consulted experts in the industry with regards to cover crop species selection, and the seed was sourced (via a Lesotho company – Lebesse farm supplies) from Barenbrug, an international company of high repute. Cover crop seed to be used in rotational cropping regimes, in conservation agriculture, and for perennial fodder and forage; was supplied to the farmers with extra seed, which was distributed by the MFRSC at the permaculture open days.

Crop rotations were a subject covered in the permaculture training course given to the farmers.

**Sustainability:** Although using crop rotations and cover crops is relatively simple, it requires that the farmers receive a few seasons of extension support. Fortunately, the MFRSC already has a programme in place providing support to the farmers under Range Management. The District Coordinator, Mr. Nkuebe Lerotholi, has pledged his department's support in ensuring that the beneficiaries of the permaculture gardens will receive further mentorship support on cover crops and crop rotations and that they will be further monitored.



FIGURE 39: COVER CROPS WITH CROP RESIDUE IN-BETWEEN (MULCH)

**Scalability:** Cover crops and crop rotation can be addressed and promoted through the FFS's and the permaculture open days. Seed can be distributed on these occasions and also during the seed sharing events to be organised by the newly created Participatory Guarantee System (PGS) of Lesotho, which has started to roll out in Lesotho with the certification of a few farmers. Organic producers have to use organic seeds, so they will also be a good relay to keep the seed banks alive. Farmers can be taught how to save seed as it is all Open Pollinated Varieties (OPV), which adds to the sustainability of the intervention.

**Reflections:** Cover crops and crop rotating can be powerful tools in the tool kit of farmers in Lesotho. The Basotho are already familiar with such practices and some of the plant species used. However, the PIC observed very little of these practices during the project period in the target communities; therefore, much still remains to be done in this regard, such as increasing the diversity of species available to farmers and the distribution of seeds; as well as further training on cultivation practices and cropping regimes.

#### **Recommendations:**

The MAFS shall:

- Facilitate the inclusion of teaching about/promotion of cover crops and crop rotation through the FFS's and the permaculture open days
- Provide more training on cultivation practices and cropping regimes

- Facilitate and pursue the dialogue and work with the Lesotho PGS and support this initiative further through availing organic seed to farmers but also through making local organic trading spaces available.

The MFRSC shall:

- uphold its undertaking to provide mentoring support to the beneficiaries of the permaculture gardens as well as monitoring.

#### 4.7.4 Making use of Open Pollinated Variety Seeds and maintaining a seed bank

**Relevance:** The cost of fertilizer and seeds is cited as one of the biggest impediments to farmers in Lesotho in recent years. OPVs are natural seeds that are non-hybrid and non-GMO, and therefore plants can be grown out for their seeds - “seed to seed,” season after season, thus reducing one of the most expensive inputs to these farmers. OPVs are grown out year after year in the same locality and develop genetic strength for the area and its climate. Maintaining a community seed bank of a variety of OPVs could thus contribute to farmers and their communities in building resilience against climate change, improving food security, and domestic livelihood security.

**Baseline assessment and interview:** Only a few beneficiaries have been maintaining a seed bank and only a limited amount of varieties, mainly maize, sorghum, dried sugar beans, a sunflower. Beneficiaries rely heavily on bought seed and or handouts of seed from the Government and other organizations.

**Project intervention:** Seedbanks at three demonstration gardens have been created using various sizes of high-quality plastic containers. The other beneficiaries received large Ziplock bags to keep seed and saved seed. Containers and training on how to maintain them were provided. OPV seed hampers were given to all twenty beneficiaries.

**Sustainability:** To maintain a diverse seed bank, a farmer needs basic training in seed saving. Project time was insufficient to include this in the permaculture training in May 2021. There is scope to not only set up these seed banks but also to set up small-scale seed multiplier businesses, which would present the merit not only of consolidating and providing backup to these seed banks but also create employment opportunities.

**Scalability:** The intervention can be scaled up to reach many other farmers in the community areas through the permaculture open days and FFSS.

**Reflections:** Seed banks and seed saving can be a critical climate change adaption tool for small-scale farmers and is one of the determinants of success and sustainability. It should therefore be an important component when considering interventions for food security and climate change projects.

#### Recommendations:

The MAFS shall:

- Organise (and co-teach) several training sessions on seed saving. This subject can be addressed through the Farmer Field Schools' and/or permaculture open days (workshops). If funding can be sourced, the PIC would be available to conduct these workshops if needs be. Farmers would learn about the different pollination strategies, how to clean and treat seed and how to label and maintain a seed bank.
- Support the emergence of these seed banks and set up small-scale OPV seed multiplier businesses.

#### 4.7.5 Reducing pest pressures through improving the health of agroecosystems and applying organic methods for pest control

**Relevance:** Pest pressures that result in unhealthy crops and crop losses are often cited by farmers as a big concern. Conventional chemicals can be harmful to both the environment, animals and to the health of those who use them (especially if used incorrectly or without the right protective clothing) in the long run. In permaculture, we take the long-term approach and aim to improve ecological function and services within our farm ecosystems so that our permaculture continuously evolves to become healthier and self-regulating, thereby reducing pest problems. We treat the system in a holistic manner (and therefore the root cause), not the symptom per se. However, in alignment with the permaculture principle, "obtain a yield," it is also conceded that "if we don't get a harvest, we may not be able to eat." Therefore there are various organic pest control methods that can and should be employed by the farmer, when and if needed.

**Baseline assessment and interview:** Only a few beneficiaries were using organic pest control methods. In general, beneficiaries' farms were characterized by unhealthy ecological systems, especially in terms of natural habitat for predators such as birds and wasps, vegetative cover, and plant and animal diversity.

**Project intervention:** One of the main project interventions was to assist farmers with developing ecologically healthier farms, such as moving away from an approach whereby production areas would be partitioned by bare ground. The 5-day permaculture training was conducted in May 2021 with a focus on creating a balanced agroecosystem and where the making of organic pest sprays and adopting companion planting was also dealt with. A variety of indigenous trees and shrubs were supplied to provide supportive elements to the agroecosystem that will, amongst other things, help to reduce pest pressures. The project also supplied commercial organic pest control sprays; 2lt and 15lt sprayer bottles; steel buckets (for making and mixing pest spray solutions); indigenous herbs like wild garlic and pelargonium that are known for their pest repelling properties and which can be planted around the gardens as well as made into pest sprays.

**Sustainability:** Healthy agroecosystems can take several years to fully stabilize and for farmers to start reaping the benefits thereof. The project supplied some plant material to assist farmers. However, the success of this intervention will be determined by the success of propagating (multiplying) the said plants and filling out the space around the production areas of the gardens. Additional indigenous and relevant exotic plants could be sourced to further improve farms health.

**Scalability:** Once each farmer is propagating their plants and has satisfied their own needs, he/she can start sharing or selling to other farmers or projects. Working examples of these demonstration gardens can be used as venues for the FFS' or permaculture open days, thus showcasing what can be achieved and visually impressing this permaculture principle. We may find that (as is the case with the permaculture principles) that the spread of these practices and ideas will happen organically as well.

**Reflections:** It is too early to fully measure the impact and success of this intervention. Only after several seasons can we truly gauge its effectiveness; however, this is one of the defining cornerstones of permaculture systems and can not be overlooked or lost sight of in future projects. Assessing what tree, shrub, and other plant materials work; what insect and animal species contribute to a healthy agro-ecosystem in the Lower Senqu valley environment is all a part of an ongoing assessment and monitoring of the project.

The shorter-term strategies, such as homemade pest sprays and commercial organic pest sprays, can be measured later on in the 2021/2 growing season.

#### **Recommendations:**

The MAFS shall ensure that:

- Extension officers are sent out to closely monitor the effectiveness of the agroecosystem designed companion planting, and organic pest management methods through the ongoing keeping of logs for each demonstration site and beneficiary interviews
- Organise open days in the demonstration gardens (to serve as venues for the FFS' or permaculture open days), thus showcasing what can be achieved and visually impressing this permaculture principle upon the farmers and also using the opportunity to teach the making of organic pest control remedies.

#### **4.7.6 Plant propagation for small to medium scale farmers**

**Relevance:** Plant propagation for small scale farmers such as producing vegetable seedlings; taking stem or root cuttings; layering (such as strawberry runners); or by division (dividing plants that have “pups” or baby plants emerging from their roots) can be easily done with low inputs and basic tools, and helps farmers to drastically reduce input costs and even provide additional income opportunities through the sale of seedlings or bagged plants. Many farmers do not have easy access to seedlings or plant material or aren't able to get seedlings at the time when they need them. Plant propagation at the homestead or on the farm ensures the quality, quantity, and timing of plant material.

**Baseline assessment and interview:** Very few farmers were practicing plant propagation, but practices were very basic such as vegetable seedlings in a broken small plastic tub that wouldn't allow for resale or good quality stock for planting.

**Project intervention:** The project supplied training at the permaculture 5-day course in May 2021 in the basics of plant propagation to technical staff and farmer-beneficiaries; supplied a mini-nursery that can house ten vegetable seedling trays; t-markers for labelling trays; organic seedling fertilizer, special seedling compost; seed hampers with a selection of seed; open top propagation trays for plant cuttings, such as herbs; black plant bags of various sizes for propagating strawberries, blueberries, and herbs; potting soil – special compost for plant bags; and rooting hormone to stimulate root growth on cuttings.

**Sustainability:** Plant propagation is a simple activity that many small-scale farmers engage in. Like any farming operation, it requires some minimal inputs. The project provided some surplus compost that can be mixed

with soil and kraal manure (especially cow manure) to produce vegetable seedlings (and potting soil) when supplies start to run low in two or three seasons. Farmers can use the proceeds from the sales of the seedlings and bagged plants to purchase seedling fertilizer and compost if needs be. Ongoing assessment of the intervention needs to follow the project closeout. Follow-up support will need to be provided by the relevant Ministries on various aspects of plant propagation, especially stem cuttings. Some growers might also be interested in purchasing organically produced seedlings for their production, and support to such potential business ventures should also be considered by the MAFS.

**Scalability:** When providing the onsite training in using the newly purchased materials, it was very easy for even the most uneducated of farmers to follow and a much-welcomed intervention to the beneficiaries as a whole. To upscale this intervention through the open days and other Ministry projects would be relatively easy as the materials are readily available.

**Reflections** At the time of writing this report, the intervention appeared to work. However, it would be good for the Ministry to follow up on the beneficiaries. Only in several months will we be able to assess the other propagation techniques taught and employed by the farmers.

## Recommendations

The MAFS shall:

- Monitor the beneficiaries' gardens from mid-October to November 2021, i.e., 6 to 8 weeks after the planting of the seedlings, to assess its successes and challenges.
- Support the emergence of seedling nurseries and small businesses of seedling suppliers linked to these
- Explore avenues to purchase the afore-mentioned inputs in bulk for further distribution.

### 4.7.7 Removing Alien Invasive Plants (AIPs) from your farm, land, or homestead.

**Relevance:** Alien invasive plants (AIPs) can reduce the health of the agro-ecosystem and should be cleared. AIPs are often very aggressive invaders and pioneer species that take over disturbed lands and out-compete native plants due to the lack of biological and other inhibiting controls that are naturally found in the invader's land of origin. They have also been introduced into the country historically for specific purposes such as gully erosion control, without the knowledge of how they would affect the environment. They take up valuable space in farmer's lands and should be cleared to make way for more valuable non-invasive species that perform better functions without compromising the environment.

**Baseline assessment and interview:** Only a few beneficiaries had AIPs on their land.

**Project intervention:** The project identified and removed AIPs from farmer's lands.

**Sustainability:** For this intervention to remain sustainable, farmers need to appreciate and be educated in the harm invaders are causing to their farms, communal and grazing lands, and on how to identify them; safely and effectively remove them, and what native or non-invasive plants can replace them.

**Scalability:** AIP education can take place at FFS and open days and be included in other land rehabilitation projects or future permaculture projects implemented by the Ministries.

**Reflections:** The removal of AIP's from the beneficiary lands creates an immediate benefit to the farmers. The project has planted several Kei apples (*Dovyalis caffra*), a southern African indigenous fruit tree that is commonly used as a fedges<sup>14</sup> in food gardens, and replaces the invader species such as the American agave -*Agave americana* L.

**Recommendations:**

The ministries shall:

- Include awareness on AIP as part of the FFS and open days and in the context of future permaculture projects to be implemented.
- Explore and trial the use of pioneering native or non-invasive plants used for creating fedges (or food hedges) in replacement of these AIPs.

#### 4.7.8 Use no-till and minimum-till agriculture practices

**Relevance:** Mechanical disturbances to the soil, such as ploughing, are one of the leading causes of land degradation in Lesotho. No-till and minimum-till agriculture practices help small-scale farmers improve their soil structure, increase soil health and biology while minimizing soil erosion.

**Baseline assessment and interview:** Only a few beneficiaries were practicing no-till or minimum-till. Some of the beneficiaries were practicing conservation agriculture.

**Project intervention:** The permaculture project assisted farmers with building permanent double-reach raised beds on contour lines for vegetable production- these permanent beds need not be stepped on, therefore reducing soil compaction and eliminating the need to plough. Conservation agriculture plots were also recreated (from traditionally ploughed plots) for staple crop production. These plots were further subdivided for crop rotation purposes. Small-scale no-till seed planters were supplied to each of the project areas - the planters sow seed (of various sizes) by pushing a seed into the ground as you push it along.

**Sustainability:** Beneficiaries need further support on how to use the no-till seed planters and conservation agricultural practices over the next few seasons. The MAFS has indicated they will provide the necessary support to the farmers.

**Scalability:** No-till, minimum-till, and CA farming can be demonstrated at the FFS's and the permaculture open days, and If there is an interest in the small-scale farming equipment, it can be purchased from Jandrall hardware in Mohale's Hoek.

**Reflections:** The beneficiaries we worked with and other farmers we engaged with during the project had an appreciation and understanding of the need to farm in ways that conserve soil. CA is already widely practiced

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<sup>14</sup> A fedge is a fence made up of living plants that provide food, i.e. a food hedge.

with technical expertise in the Ministry. No – and minimum-till holds great potential to assist the Basotho to combat land degradation.

#### **Recommendations:**

The MAFS shall:

- Undertake, as part of the scaling up of permaculture in Lesotho, a needs assessment of farmers in terms of the training required to use farming equipment and link it with further capacity building through extension support and training
- Explore the feasibility of subsidising adequate equipment (e.g., no-till implements) and provide ongoing technical support on the no-till approach for the benefit of farmers as part of permaculture upscaling.

#### **4.7.9 Building soil and soil health through processing and applying organic inputs**

**Relevance:** Applying organic inputs such as compost, mulch (dried grass, leaves, maize stover), kraal manure, and making compost and compost teas helps to build soil and improve soil structure.

**Baseline assessment and interview:** Applying kraal manure is widely practiced. However, very few beneficiaries were applying dry mulch, and no beneficiaries were making compost teas. Careful attention needs to be paid to this traditional application of dry, uncomposted kraal manure, which constitutes a sub-optimal practice from a fertility management perspective. Caution: To maximise the use of dry kraal cow manure, training on composting rolled out as part of future projects spearheaded by the MAFS and MFRSC (but also within the FFS manuals) should emphasise the need to compost the kraal manure -if it is applied raw, the three key steps of composting are missed (mineralisation, humidification, decomposition) - these still need to happen and will happen much quicker in a compost heap than being applied directly on the land.

**Project intervention:** The permaculture project assisted farmers with compost and hay bales that were applied to their raised vegetable beds and used in planting fruit trees and berries, and training was given during the permaculture 5-day course in May on soil building and making compost and compost teas. Two one hundred litre tanks were supplied to all 20 sites, specifically for making compost teas.

**Sustainability:** Many of the inputs and materials of this intervention are produced or readily accessible by farmers making the intervention self-sustaining.

**Scalability:** The principles and practices of building soil and soil health through making and applying organic inputs can be promoted and taught at the FFS', permaculture open days, and through the projects implemented by the MAFS and MFRSC, and through their general extension work in the communities.

**Reflections:** This intervention shows great promise in being widely adopted and is already been incorporated and promoted in the MAFS.

#### **Recommendations:**

The MAFS and MFRSC shall:

- Incorporate training on building soil and soil health through processing and applying organic inputs during open days and through future projects implemented, as well as through their general extension work in the communities.

#### 4.7.10 Reversing soil erosion through slope planning

**Relevance:** Mitigating soil erosion through slope planning forms part of a broader land use management discussion. In the context of permaculture, slope planning is a central element of planning: appropriate placement and cultivation practices need to be determined according to the slope gradient. i.e., agroforestry can only be implemented on slopes with a gradient greater than 15% and vegetable and staple crops on slopes with a gradient ranging between 0-15%. The land degradation due to inappropriate land management such as ploughing and overgrazing, particularly on steeper slopes, is very evident in Lesotho. Farmers plough their fields off contour, causing further soil erosion through runoff.

**Baseline assessment and interview:** None of the beneficiaries were using A-frames or other equipment to work with the contours. On several sites, the cultivation of crops such as maize was taking place on steep slopes that were causing degradation.

**Project intervention:** The permaculture project assisted farmers with slope planning, designing, and laying out of their farms: steeper slopes were planted to trees; staple crop plots were laid out on contour lines (with trees and vetiver plants planted in-between to contain erosion); where appropriate; swales (ditches on contour) were used to harvest rainwater runoff, irrigate trees and catch sediment; training was provided for all the beneficiaries and technical staff on slope planning and how to construct and use A-frames; dig swales; and, contour planting.



SOURCE: RORY CLARK (2021)

FIGURE 40: SLOPE PLANNING FOR STEEPER SLOPES

**Sustainability:** A-frame level markers are very easy to construct from local materials. They are also very easy to teach and use.

**Scalability:** The principle of mitigating and reversing soil erosion through slope planning can be promoted and taught at the FFS', permaculture open days, and through the MAFS and the MFRSC projects, and their general extension work in the communities.

**Reflections:** This intervention shows great promise in being widely adopted and having long-term benefits for the environment. It can be included in the education efforts of land rehabilitation and restoration projects and by teams on the ground in assisting with the use of A-frames to lay stone lines and plan farm layouts.

**Recommendations:**

The MAFS and the MFRSC shall:

- Upscale the dissemination of knowledge on soil erosion management through slope planning through FFS', permaculture open days, and through their general extension work in the communities.
- Once this knowledge on slope management is assimilated (with the use of A-frames and design of swales.) it can also easily be shared through farmer-to-farmer knowledge exchanges, which the ministries could also facilitate.

#### 4.7.11 Practicing rainwater harvesting, and agricultural water conservation

**Relevance:** Although Lesotho is considered a water-rich country, many communities lack the infrastructure to take advantage of this valuable resource. Recent droughts in the country have triggered states of emergency. Climate change is expected to cause further disruptions of precipitation patterns. By practicing rainwater harvesting and agricultural water conservation, farmers can increase their water security, which would directly influence food and livelihood security.

**Baseline assessment and interview:** Water supply and infrastructure were cited by farmers as their most critical need. Few beneficiaries had a water supply to their gardens, and some needed their pipelines repaired or were confronted by issues of water rights; some had drip irrigation, but it was not connected (or they had no water supply); some lacked water storage; no beneficiaries were practicing mulching, and few were harvesting rainwater from their roofs.

**Project intervention:** The permaculture project assisted farmers by providing them with: pipe installations connected to water sources to connect their farms and households with water; tanks on tanks stands; tanks connected to roofs (where needed); drip irrigation for trees and vegetable beds; taps in the garden and by animal structures; swales for harvesting and controlling rainwater runoff to irrigate trees; raised vegetable beds on contour to control rainwater runoff.



FIGURE 41: PIPE IRRIGATION OF GARDENS

**Sustainability:** Simple techniques, such as mulching, that reduces evaporation and therefore the need for irrigation water are easily taught, and local materials such as dried grass and leaves can be used. Low-pressure irrigation systems (that don't run on pumps but use gravity) are easy to install, and generally, farmers and communities have the knowledge and skills amongst themselves to help each other. Drip irrigation is promoted by MAFS, and there are irrigation technical offices that are available to assist farmers.

**Scalability:** The principle of practicing rainwater harvesting and agricultural water conservation can be promoted and taught at the FFS'S, permaculture open days and through the MAFS and the MFRSC projects,

and their general extension work in the communities. Drip irrigation systems can be demonstrated at the demo gardens, and farmers can be taught how to install these.

**Reflections:** The project prioritized water availability and infrastructure with consistent and adequate water supply to ensure crop health and yield. This has the potential to greatly improve farming outcomes, and farmers can have the confidence to guarantee supply to shops and markets. By installing low-tech, water-conserving drip irrigation systems, time spent by farmers on watering has been reduced, and they can tend to other important farming activities. At the time of project closeout, most of the systems were up and running and were proving to already have a great impact on the farmers' lives.

#### **Recommendations:**

The MAFS shall:

- Further capitalise on its existing promotion of drip irrigation as part of the scaling up of permaculture in Lesotho, whilst combining it with a very proactive promotion of mulching as a best practice that should accompany the roll-out of any irrigation support. Drip irrigation systems can be demonstrated at the demo gardens, and farmers can be taught how to install these.
- The irrigation technical offices should revise their brochures/training materials to incorporate this requirement to apply deep mulch to any planted fields and underline its benefits not only in terms of saving water but also in terms of building and protecting the soil.

#### 4.7.12 Adopting a holistic approach to animal husbandry and wellbeing

**Relevance:** The foundations of permaculture are its core ethics: People care, earth care and fair share. Earth care is a broad term which includes the ethical treatment (holistic) and care for livestock (and other animals). Animal welfare is also a key component of organic standards, and certification will be denied to any farm production where animals cannot exhibit their natural behaviour, or where they have inadequate shelter/housing/roaming space. The requirement is also for them to be fed feed from an organic and localised source.<sup>15</sup>

**Baseline assessment and interview:** The condition in which the livestock were kept and housed at many of the beneficiary sites was not good. Many had very limited space to move, little and inadequate shelter from the weather, and not enough food or opportunity to fulfil social needs and behaviour.

**Project intervention:** The permaculture project assisted farmers by providing them with: chicken coops and runs (a large house with nesting boxes, with outdoor fenced area for chickens to free-range); pig pens and runs (well-constructed housing with a large fenced area for free-ranging); well-constructed sheep/goat pens and housing, with large fenced off areas for free-ranging); solar electric fencing to allow foraging and grazing in the agroforestry systems. Annual and perennial fodder crops were also supplied; water taps were constructed close to the animal structures; beneficiaries and technical staff were trained in holistic animal husbandry practices at the courses in May 2021. One of the prerequisites for participating in the project was

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<sup>15</sup> This is true of all internationally recognised organic standards. An explicit reference to this can be found for instance in the South African Standards for Organic production and processing v7. 2020. Available from: <https://www.saoso.org/about-organic-standards>

to untie animals such as the farm dogs to allow freedom of movement and to provide adequate housing for animals (where the project couldn't assist).

**Sustainability:** The materials used to create chicken runs, pig pens and sheep/goat pens were purchased from a local hardware in Mohale's hoek: Treated gum poles, roof sheeting; weld mesh and timber purlins were the main materials used are easily obtainable.

**Scalability:** The principle of the holistic approach to animal husbandry and well-being can be promoted and taught at the FFS, during permaculture open days, and through the MAFS and the MFRSC projects, and their general extension work in the communities.

**Reflections:** There is a long road ahead in changing perceptions regarding the ethical treatment and rearing of animals and ensuring all the basic needs of animals are met. However, healthy and happy animals translate into better animal products and dignity in the production thereof. From an organic commercial perspective, animal welfare is a key component of organic standards, and certification will be denied to any farm production where animals cannot exhibit their natural behaviour or have inadequate shelter, housing, and/or roaming space. The requirement is also for them to be fed from an organic and localised source.

#### **Recommendations:**

The MAFS and the MFRSC shall:

- Proactively promote and teach the holistic approach to animal husbandry and well-being at the FFS, during permaculture open days, and through future projects and their general extension work in the communities. Farmers should be invited to the demo farms to showcase these improved animal housing and fencing facilities.
- Develop an illustrated manual specifically focusing on the holistic approach to animal husbandry and well-being (it could be inspired by the South African or IFOAN organic standard, for instance, and be adapted to the Basotho context).

## **4.8 Scalability Potential**

The following opportunities have been discussed with the management of MAFS and MFRSC for the Mohale's Hoek district to scale up the permaculture project.

#### **Linking with the "Improving the adaptive capacity of vulnerable and food-insecure populations in Lesotho" (IACOV) project**

IACOV is a project funded by the adaptation fund and managed by WFP, UN, and MFRSC and is being implemented between 2020-2026 in the three districts of Mafeteng, Mohale's Hoek and Quthing

The project aims to improve adaptive capacity for vulnerable and food insecure populations and assist communities in adapting to the impacts of climate change. The project interventions include weather forecasting (establishing early warning systems - such as rains that may be forecasted at different times); climate information and dissemination components; land rehabilitation; and a food security component.

Nkuebe Lerotholi, the District Coordinator for MFRSC, has indicated that he would look into opportunities for incorporating permaculture principles and practices into the food security interventions of the project.

### **Expanding permaculture into other Community council areas**

As mentioned in the references to sustainability in the above section, the MAFS and the MFRSC have pledged they will incorporate permaculture into their extension services and program. This will include expanding permaculture into their resource centres in other community council areas – there are ten community councils in the Mofale District, the RVCC permaculture project worked in three of the ten. They will also conduct permaculture training for the new staff in those areas. Where possible, they will replicate the concept of permaculture demonstration gardens and will also hold permaculture open days for the communities.

### **Exhibition days and field days**

MAFS has indicated they will include permaculture into their “exhibition days” for farmers at the resource centres where they have animal exhibitions and market days. They can also include permaculture into their “field days,” whereby they invite communities to view the results of studies on new crops and agricultural practices conducted in the farmer’s areas.

### **Other potential partners**

There is scope for partnering with other organizations in Lesotho. The PIC has been in contact with the following two organizations that are in alignment with permaculture practices and principles:

- Macro Organics PTY LTD, contact Teboho Spirit, +266 5776 3205
- Bethel Business and Community Development Centre, [ivan.yaholnitsky@gmail.com](mailto:ivan.yaholnitsky@gmail.com)

### **Permaculture open days and Farmer Field schools**

As mentioned in section 3.5.1, the permaculture open days have been well attended and received by the farmers that surround the beneficiary sites and have helped the project to broaden its reach. This intervention has great potential in upscaling the permaculture project and showcasing various permaculture principles and practices. The MFRSC and MAFS have pledged their support to continue holding open days in the future and even to take them to the other eight district areas.

### **Policy, management plans, and strategic plans**

Policy, management plans, and strategic plans form the foundational ideas and plan that direct decision-making to achieve specific outcomes. It has been suggested by Nkuebe Lerotholi, District Coordinator for MFRSC, that permaculture principles can be included in the new policy for the MFRSC that is to be revised soon.

There is a policy brief that has been written by the PIC for permaculture in Lesotho which can be found attached with this report in Annexure C. This policy piece could inform any future policies, management, and strategic plans that are written by the government for Agriculture and Forestry, and Climate Change. and other organizations needing to include sections on permaculture principles or agroecological practices in the future and thus contribute to the upscaling of permaculture in Lesotho.

## 4.9 Uncompleted actions

The following are actions that still needed to be completed at the time of the closeout report; for various reasons, some suppliers/installers were unable to deliver on their agreements by the time of the project closeout. Some goods could not be delivered due to logistic challenges in the final month of the project; certain seeds still need to be planted and can only be done so during the first rains that are expected in mid-November. Please see Table 19.

**TABLE 19: ACTIONS TO BE CONCLUDED**

| Actions still to be concluded        |                                                                     |                                |
|--------------------------------------|---------------------------------------------------------------------|--------------------------------|
| Responsible party                    | Description                                                         | Completion Date                |
| UNDP                                 | Deliver chicken tractors & chicken feed                             | 8 <sup>th</sup> October 2021   |
| UNDP                                 | Deliver balance of compost tea containers                           | 8 <sup>th</sup> October 2021   |
| MFRSC                                | Plant fodder & forage cover crops                                   | 30 <sup>th</sup> November 2021 |
| MAFS                                 | Plant CA plots                                                      | 30 <sup>th</sup> November 2021 |
| Skill Capacity                       | Training needs to take place for farmers on how to catch the swarms | 31 <sup>st</sup> October 2021  |
| Super Power PTY LTD                  | Complete Irrigation Installations                                   | 31 <sup>st</sup> October 2021  |
| Particles Civil Works & Construction | Complete tank and tank stand installations                          | 31 <sup>st</sup> October 2021  |

## 5 RECOMMENDATIONS AND CONCLUSION

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### 5.1 Recommendations

The previous section includes extensive recommendations to the implementing ministers. Over and above these, some overarching recommendations are formulated here:

#### [Harness the potential of disseminating distributing Open Pollinated Variety seeds](#)

The project has several Open Pollinated Variety (OPV) seeds that it has purchased to distribute to the homesteads around the beneficiary sites in the three community councils through a program of Open Days - one-day workshops held at the project's developed demonstration permaculture gardens. It is recommended that the MAFS and the MFRSC create a program to continue to hold these open days and disseminate the seeds post-project closeout.

At the open days conducted during the project, the technical staff and offices from the Ministries were taught how to introduce the importance of OPV's and the relevance to building resilience to climate change, food, and livelihood security to the farmers.

#### [Expand the reach of the project through the extension officers](#)

As mentioned in section 3.5.3, the PIC has had meetings and discussions with Mme Malerato Lekhooa, District Agriculture officer from the Ministry of Agriculture and Food Security and, Nthate Nkuebe Lerotholi, District Coordinator for the MFRSC, during this closeout period on how to incorporate a permaculture program into the relevant Ministries, build on the foundational work that has been achieved by the project and broaden the reach of permaculture further into the current community councils and into the other council areas in the Mphahle's Hoek district and then onto other districts in Lesotho.

The PIC has recommended the following steps be taken:

- Set up an Ecological Organic Agriculture (EOA)/permaculture committee that would include members from relevant Ministries and their departments and that should meet on a quarterly basis to plan activities and interventions.
- Secure funding from UNDP or elsewhere and budget specifically for permaculture interventions (linked to the EOA-I action plan outlined in the policy brief)
- Include the development of a targeted number of gardens per annum
- Include a targeted number of permaculture 5-day courses and 1-day open days per annum
- Include ongoing skills development of select trainers from the various Ministries
- Ensure that the FFS's teach permaculture according to the amended curriculum (that has permaculture newly integrated into it)
- Look at including the following permaculture interventions into future permaculture initiatives: agroforestry; restoration of degraded sites; holistic animal husbandry; minimum or no-till & cover cropping practices for staple crop growing (CA)
- Include ongoing monitoring of the development of the permaculture garden/systems and uptake of principles with the current project beneficiaries

- Include specific monitoring of the species and varieties of trees through the MFRSC and provide extension support to ensure that they flourish.

## 5.2 Conclusion

The RVCC permaculture project has impacted many Basotho in the Lower Senqu valley. Twenty permaculture gardens have been created over the Mohale's Hoek district, directly contributing to the lives of the farmers and their families that work these gardens – approximately 178 people (homestead garden beneficiaries, plus members of each community garden) have benefited directly from the project.

These farmers are now better equipped to face the challenges of climate change and land degradation. Their farms equipped with rainwater harvesting tanks and rainwater runoff harvesting earthworks; raised vegetable beds with many types of open-pollinated crops; conservation agriculture plots with cover crops; drip irrigation; holistic animal structures; traditional breed chickens; bee hives; fodder and forage crops; fruit and nut trees, different types of berries; fences with vine crops growing on; herbs and medicinal plants; kitchens with seedbanks and preserved products, will serve as model examples for their neighbours and communities at large to follow.

The project has further equipped the various Ministries by developing the necessary capacity amongst its staff to carry on the legacy of the project into the future. They will be able to continue to facilitate training workshops and open days and create new permaculture gardens in other community council areas.

The permaculture policy brief will inform and guide the incorporation of permaculture into future policy documents and strategic plans, thus ensuring national government and institutional support to where it is needed on the ground.

The permaculture seed has been planted in Lesotho and is starting to grow.....

## 6 APPENDICES

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### Appendix A. Citations from farmer-beneficiaries extracted from the close-out interviews

Some of the questions asked in the closeout interview:

Did you find the permaculture project addressed some of your (you, your family & farm) needs? Note: Make sure to ask them why it has improved things compared to how it was before?

*"Yes, it has; I used to plant for subsistence, but now the aim is commercial."* ~ Maitumeleng Mabaka

*"It improved the skills and knowledge we had. It has given us fruit trees and fenced our garden."* ~ Itekeng ha Ntseno (Community garden Lithipeng)

*"Yes, it has; I used to plant maize and pumpkin in my yard, but now the yard is suitable for vegetables and other things."* ~ Marou Lenkoe

*"Yes, as I said, bookkeeping, even though we are not well experienced in bookkeeping, we try all means to record everything we buy and sell, unlike before when we just sold good without records."* ~ Palamang Ranku

Is there any input that you would have liked to have received by the permaculture project but didn't receive?

*"I just want them to tell me where I can get seedling compost because it's very helpful."* ~ Retselisitsoe Mahloko

*"Tunnel"* ~ Bataung Mafereka

*"Rake"* ~ Mamorena Seqao

Please describe how the input: access to water (via spring, river, or other), has benefited you? And whether there has been an issue with the new system?

*"I share a source with the community, so it was not easy watering with a hosepipe, but now that water comes into my yard, conflicts have reduced."* ~ Marou Lenkoe

Please describe how the input: Tank installation and taps, has benefited you? And whether there has been an issue with the new system?

Can you describe some of the ways the project inputs have benefited you (you, your family & farm)?

*"We practice conservation agriculture in our group, so the tools given to us are very suitable for the practice."* ~ Ha tooa mose mosali (community garden)

Please describe how the input: Raised vegetable beds, has benefited you? And whether there has been an issue with the new system?

*"They reduced weeding costs because it's easy to mulch them. They are very attractive and easy to work on."*~ Palamang Ranku

*"They have made my yard very beautiful, and they are easy to work on."*~ Malebohang Maribe

Please describe how the input: Sheep/goat pen & run, has benefited you? And whether there has been an issue with the new system?

*"During winter, my lambs do not die of coldness which is very important to me. Even harsh climatic conditions don't affect my animals."*~ Malebohang Maribe

Please describe how the input: Pigpen & run, has benefited you? And whether there has been an issue with the new system?

*"The pigs have enough space for eating, relaxing, and their movements aren't restricted."*~ Maitumeleng Mabaka

What was your experience at the course?

*"Bethel was an amazing place to take the course; seeing how people use locally available resources to make a living was perfect"*~ Tsoha o iketsetse (community garden)

*"It changed me from buying chemicals to organic means of controlling pests and insects in my garden."*~ Retselisitsoe Mahloko

Have you recommended permaculture to friends, neighbors, or family? If so, share a few words about whom and what you recommended?

*"Yes, I have taught few permaculture principles in a village primary school and at village public gatherings"*~ Zachariah Litlama

Have you found permaculture easy to adopt and practice?

*"It is provided you want to change."*~ Seli laka mponesetse tsela (community garden)

What do you appreciate most about permaculture?

*"I appreciate the use of available resources that are very cheap to get. Like maintaining the fertility of the soil, we are advised to use organic manure."*~ Malebohang Maribe

*"Interactions with nature, I have learned the importance of every organism living in my garden"*~ Marou Lenkoe

*"I appreciate the use of natural plants to control pests and insects."*~ Retselisitsoe Mahloko

## Appendix B Training budget

Training budget for 3 courses (60 people):

| Training Budget for 3 Courses        |     |              |                     |
|--------------------------------------|-----|--------------|---------------------|
|                                      | QTY | Amount       | Total               |
| <b>Plant &amp; Planting Material</b> |     |              | R 9,540.00          |
| Trees/shrubs/herbs/                  | 3   | R 1,500.00   | R 4,500.00          |
| Seedlings                            | 3   | R 1,000.00   | R 3,000.00          |
| Seeds                                | 3   | R 100.00     | R 300.00            |
| Compost & Seedling mix               | 18  | R 40.00      | R 720.00            |
| Haybales                             | 9   | R 100.00     | R 900.00            |
| Organic Fertilizer                   | 3   | R 20.00      | R 60.00             |
| Soil amendments: Lime etc            | 3   | R 20.00      | R 60.00             |
| <b>Other</b>                         |     |              | R 2,070.00          |
| Pens & Notebooks                     | 63  | R 25.00      | R 1,575.00          |
| Natural pest control                 | 3   | R 15.00      | R 45.00             |
| Value adding                         | 3   | R 150.00     | R 450.00            |
| Materials for board game             | 1   | R 600.00     | R 600.00            |
| Persihables for food preserving      | 3   | R 100.00     | R 300.00            |
| Seed saving                          | 3   | R 40.00      | R 120.00            |
| <b>BCDC-Training venue</b>           |     |              | R 219,075.00        |
| Accommodation Sharing (2/room)       | 325 | R 230.00     | R 74,750.00         |
| Dinner                               | 325 | R 138.00     | R 44,850.00         |
| Breakfast                            | 325 | R 115.00     | R 37,375.00         |
| Lunch                                | 300 | R 138.00     | R 41,400.00         |
| Morning Tea                          | 300 | R 34.50      | R 10,350.00         |
| BCDC Facilitators                    | 3   | R 3,450.00   | R 10,350.00         |
| <b>Printing &amp; Laminating</b>     |     |              | R 11,340.00         |
| Manuals                              | 63  | R 150.00     | R 9,450.00          |
| Certificates                         | 63  | R 30.00      | R 1,890.00          |
|                                      |     |              |                     |
|                                      |     | <b>Total</b> | <b>R 239,955.00</b> |

## Appendix C. Course Outline

| PERMACULTURE & REGENERATIVE AGRICULTURE 5 DAY COURSE |                          |                                                                       |                                       |                                                                                                        |                    |  |
|------------------------------------------------------|--------------------------|-----------------------------------------------------------------------|---------------------------------------|--------------------------------------------------------------------------------------------------------|--------------------|--|
| Day 1: Introduction to Permaculture                  |                          |                                                                       |                                       |                                                                                                        |                    |  |
| Day                                                  | Time                     | Lesson/Activity & facilitator                                         | Themes                                | Demonstrations & Practicals                                                                            | Resources required |  |
| 1                                                    | 8.00                     | Course registration & orientation.<br>Everyone.                       | ○ Introductions                       |                                                                                                        |                    |  |
|                                                      |                          | ○ Course orientation                                                  |                                       |                                                                                                        |                    |  |
|                                                      |                          | Introduction to Permaculture & Regenerative agriculture.<br>Everyone. | ○ What is Permaculture & regen Ag?    |                                                                                                        |                    |  |
|                                                      |                          |                                                                       | ○ Comparisons to conventional farms   |                                                                                                        |                    |  |
|                                                      |                          |                                                                       | ○ The founders                        |                                                                                                        |                    |  |
|                                                      | 13.00-14.00              | Lunch                                                                 |                                       |                                                                                                        |                    |  |
|                                                      |                          | Tour of BCDC.<br>Ivan.                                                | ○ Tour lead by Ivan Yaholnitsky       | ▪ Comprehensive tour of BBCDC                                                                          |                    |  |
|                                                      | 15.00-17.00              | Ethics & Principles. Everyone.                                        | ○ Earth care, people care, fair share | ▪ Group exercise to find examples of Permaculture principles at BBCDC and present it back to the class |                    |  |
| ○ 12 Principles                                      |                          |                                                                       |                                       |                                                                                                        |                    |  |
| 19.00                                                | Evening Film- "Inhabit " |                                                                       |                                       |                                                                                                        |                    |  |

| Day 2: Principles of Permaculture Design & Building Resilience to Climate Change |               |                                                                                      |                                                                                                                            |                                             |                                                                    |
|----------------------------------------------------------------------------------|---------------|--------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------|---------------------------------------------|--------------------------------------------------------------------|
| Day                                                                              | Time          | Lesson/Activity & facilitator                                                        | Themes                                                                                                                     | Demonstrations & Practicals                 | Resources required                                                 |
| 2                                                                                | 8.00          | Permaculture Design Principles. <b>Molefi Ramontsoe.</b>                             | ○ Design Process                                                                                                           |                                             |                                                                    |
|                                                                                  |               |                                                                                      | ○ Site assessment                                                                                                          |                                             |                                                                    |
|                                                                                  |               |                                                                                      | ○ Slope planning                                                                                                           | ▪ Making an A-Frame & marking a contour.    |                                                                    |
|                                                                                  |               |                                                                                      | ○ Sector Planning                                                                                                          | ▪ Sun dance & Compass                       |                                                                    |
|                                                                                  |               |                                                                                      | ○ Zone Planning                                                                                                            | ▪ Group permaculture design                 |                                                                    |
|                                                                                  | 13.00-14.00   | Lunch                                                                                |                                                                                                                            |                                             |                                                                    |
|                                                                                  | 14.00-15.00   | Prac build beds. <b>Everyone.</b>                                                    | ○ Zones                                                                                                                    | ▪ Group permaculture design                 | ▪ Mounds of soil & figurines; hosepipe; broken twigs for trees etc |
|                                                                                  | 15.00 - 16.30 | Climate change- Introduction, mitigation & adaption. <b>Ivan &amp; Motumi.</b>       | ○ The Earth as one big ecosystem or the Gaia concept & how it relates to climate protection                                |                                             |                                                                    |
|                                                                                  |               |                                                                                      | ○ The sustainable home-Natural building, grey water recycling, bio gas digesters & rain water harvesting, solar solutions. | ▪ Cooking meal in solar cooker & wonder bag |                                                                    |
|                                                                                  |               |                                                                                      |                                                                                                                            |                                             |                                                                    |
|                                                                                  | 19.00         | Evening Film- <i>"Before the flood"</i> or <i>"The Lessons of the Loess Plateau"</i> |                                                                                                                            |                                             |                                                                    |

### Day 3: Healthy Farm Ecosystems & Building Soil

| Day | Time          | Lesson/Activity & facilitator                | Themes                                                       | Demonstrations & Practicals                                        | Resources required                                                       |
|-----|---------------|----------------------------------------------|--------------------------------------------------------------|--------------------------------------------------------------------|--------------------------------------------------------------------------|
| 3   | 8.00 - 12.00  | Healthy Soils.<br>Motlatsi Pheko.            | ○ Introduction                                               | ▪ BBCDC composting & soil building examples including worm farming | ▪ Worm farm                                                              |
|     |               |                                              | ○ Life in the soil                                           | ▪ Making natural fertiliser (compost tea & aerated worm wee)       | ▪ 2 x Buckets, fish pond aerator, molasses, fabric; comfrey etc          |
|     |               |                                              | ○ Soil analysis                                              | ▪ Soil bottle test                                                 | ▪ Bottles                                                                |
|     |               |                                              | ○ Building soil -Crop rotation & cover crops, soil Enhancers | ▪ The sponge demo<br>§ Composting & mulching beds                  | ▪ Compost and mulch raised beds                                          |
|     | 13.00-14.00   | Lunch                                        |                                                              |                                                                    |                                                                          |
|     | 13.00 - 16.30 | Permaculture Applied Ecology.<br>Noe Likotsi | ○ Basic ecology as it applies to Permaculture                |                                                                    |                                                                          |
|     |               |                                              | ○ Principles of succession, habitat & diversity              |                                                                    |                                                                          |
|     |               |                                              | ○ Natural pest control                                       | ▪ Spray ingredients                                                | ▪ Spray ingredients<br>§ 5 lt Bucket, Kaki bos & water<br>§ Spray bottle |
|     |               |                                              | ○ Companion Planting                                         | ▪ Companion Plant beds                                             | ▪ Seedlings, seeds, flowers, org fert, dibbers                           |
|     | 19.00         | Evening Film-Living Soil                     |                                                              |                                                                    |                                                                          |

### Day 4: Agroforestry & Increasing Food availability

| Day | Time          | Lesson/Activity & facilitator                                                                                              | Themes                                          | Demonstrations & Practicals                                                     | Resources required                                                        |
|-----|---------------|----------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------|---------------------------------------------------------------------------------|---------------------------------------------------------------------------|
| 4   | 8.00 - 12.00  | Agroforestry - Tree systems.<br><b>Malepeke Lethaha.</b>                                                                   | ○ Tree guilds & Food forests,<br>○ Fodder crops | ▪ Planting a Permaculture fruit tree guild                                      | ▪ 3 x fruit trees; berries; herbs, compost, mulch, NT fix                 |
|     |               |                                                                                                                            | ○ Syntropic farming-Film                        |                                                                                 |                                                                           |
|     |               |                                                                                                                            | ○ Permaculture Plants their value & uses        |                                                                                 | § Showcase plant species being used in the Permaculture Demo Gardens      |
|     |               | Agroforestry - Conservation Agriculture.<br><b>Malepeke Lethaha &amp; lead farmers.</b>                                    | ○ Crops in Agro forestry; CA                    | ▪ Contour planting with Zai pits & Haraka planter demo; maize stova on contour. | ▪ Charaka planters; stova for mulch                                       |
|     |               |                                                                                                                            | ○ Principles of CA                              |                                                                                 |                                                                           |
|     |               |                                                                                                                            |                                                 |                                                                                 |                                                                           |
|     | 13.00-14.00   | Lunch                                                                                                                      |                                                 |                                                                                 |                                                                           |
|     | 14.00-15.30   | Agroforestry - Animal systems.<br><b>Mpolokeng Sekhesa &amp; Lead farmers.</b>                                             | ▪ Chicken tractors; solar fencing               | ▪ Chicken tractors; solar fencing                                               | ▪ Chicken tractors; solar fencing in place - with chickens & pigs         |
|     | 15.30 - 16.30 | Increasing Food security though Food preservation; Indoor greens-Sprouting & Micro greens.<br><b>BBCDC &amp; everyone.</b> | ○ Solar drying & solar air drying               | ▪ Solar drying demo & prac                                                      | ▪ Solar dryer<br>§ Electric dryer                                         |
|     |               |                                                                                                                            | ○ Indoor greens-Sprouting & Micro greens        |                                                                                 | Date balls: Date paste, sunflower seed, pumpkin seed, chocolate, coconut. |
|     |               |                                                                                                                            | ○ Planning year round food production           |                                                                                 | ▪ Dried fruit                                                             |
|     |               | Evening Film-"Life of Syntrophy"                                                                                           |                                                 |                                                                                 |                                                                           |

| Day 5: Reducing Inputs & Increasing Livelihoods |              |                                                                   |                                |                                    |                                                                        |
|-------------------------------------------------|--------------|-------------------------------------------------------------------|--------------------------------|------------------------------------|------------------------------------------------------------------------|
| Day                                             | Time         | Lesson/Activity                                                   | Themes                         | Demonstrations & Practicals        | Resources required                                                     |
| 5                                               | 8.00 - 12.00 | Plant propagation. <b>Malepeke Lethaha.</b>                       | ○ Plant reproduction           |                                    |                                                                        |
|                                                 |              |                                                                   | ○ Propagation techniques       | ▪ Propagation with seedling trays  | ▪ 4 x seedling trays<br>\$ Seedling mix<br>\$ Seeds<br>\$ Organic Fert |
|                                                 |              |                                                                   | ○ Soil mediums                 | ▪ Propagation with cuttings        | ▪ Propagation with cuttings                                            |
|                                                 |              |                                                                   | ○ Hygiene in the nursery       |                                    |                                                                        |
|                                                 |              | Value adding & livelihood generation. <b>Mabea &amp; farmers.</b> | ○ Farming Entrepreneur         | ▪ Bee products: Propolis & honey   | ▪ Bee products: Propolis & honey                                       |
|                                                 |              |                                                                   | ○ Moving beyond subsistence    | ▪ Propolis & bee wax demonstration | ▪ Propolis & bee wax demonstration                                     |
|                                                 |              |                                                                   | ○ Pricing, quality & marketing | ▪ Wrapping seedling plugs for sale | ▪ Wrapping seedling plugs for sale                                     |
|                                                 |              |                                                                   | ○ Product ideas                |                                    |                                                                        |
|                                                 | 13.00-14.00  | Lunch                                                             |                                |                                    |                                                                        |
|                                                 |              | Certificate ceremony                                              | ○ Certificate awarding         | ▪ Printing & laminating            |                                                                        |
|                                                 |              |                                                                   | ○ Photo session                |                                    |                                                                        |

## 7 ANNEXURES (SEE IN ATTACHMENTS FOLDER THAT ACCOMPANIES THIS REPORT)

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Annexure A. Concept Note for Training of Technical Officers and Lead Farmers on Permaculture Principles and Establishment of Demonstration Gardens

Annexure B. The RVCC permaculture project budget.

Annexure C. Contributing to climate change adaptation in Lesotho through policy interventions focused on scaling out permaculture principles and practice and linking with the Ecological Organic Agriculture Initiative (EOA-I)

Annexure D. Complete list of materials delivered to gardens