Strengthening Community Resilience to Change:

Combining Local Innovative Capacity with Scientific Research (CLIC–SR)

Prolinnova–Kenya progress report for

January–May 2016

Budget-Neutral Extension

June 2016
<table>
<thead>
<tr>
<th>Acronym</th>
<th>Description</th>
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<tr>
<td>ASCCA</td>
<td>Africa Symposium for Climate Change Adaptation</td>
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<td>CLIC–SR</td>
<td>Combining Local Innovative Capacity with Scientific Research</td>
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<td>CP</td>
<td>Country Platform</td>
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<td>IST</td>
<td>International Support Team</td>
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<td>JE</td>
<td>Joint Experimentation</td>
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<td>KALRO</td>
<td>Kenya Agricultural and Livestock Research Organization</td>
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<td>LISF</td>
<td>Local Innovation Support Fund</td>
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<td>Local Steering Committee</td>
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<td>M&amp;E</td>
<td>Monitoring and Evaluation</td>
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<td>Natural Resource Management</td>
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<td>National Steering Committee</td>
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<td>PID</td>
<td>Participatory Innovation Development</td>
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<td>PK</td>
<td>Prolinnova–Kenya</td>
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<td>PARI</td>
<td>Program of Accompanying Research for Agricultural Innovation</td>
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EXECUTIVE SUMMARY

This report summarizes the progress of CLIC–SR project for the period January–May 2016. It outlines the objectives and achievements for the underlined period.

The following activities were carried out during this implementation period:

- Farmer-led joint experimentation on four innovations
- Supporting innovations through the Local Innovation Support Fund (LISF)
- Local Steering Committee (LSC) meetings
- Monitoring, evaluation and documentation of LISF-supported projects
- Participation in the African Symposium for Climate Change Adaptation conference 2016
- Final evaluation of the CLIC–SR project
- Joint Experimentation Writeshop
- International Partners Workshop
- National Steering Committee meeting

These activities achieved the following results respectively:-

- 4 innovations identified and improved through joint experimentation
- 10 proposals supported through the LISF
- Progress of LSC monitored
- LISF-supported innovations monitored and documented
- Knowledge sharing and learning, dissemination of the concepts used in Prolinnova.
- CLIC–SR project evaluation
- Process documentation of joint experimentation process
- Widespread knowledge sharing, learning and dissemination
- Highlights of 2016 shared and way forward charted
**A: INTRODUCTION**

The Combining Local Innovative Capacity with Scientific Research (CLIC–SR) project promotes farmer-led joint innovation that builds on the creativity of local people through building local adaptive capacities and strengthening community resilience to change, including climate change. This project is being implemented in two counties in Kenya – Baringo and Machakos – which are vulnerable to change inclusive of climate change.

A budget-neutral extension was granted for the CLIC–SR project allowing for extension of the project up to June 2016.

The broad objectives of this project are to:

- Strengthen the resilience to change of smallholders and their communities, especially women, by enhancing their innovative capacity and thus their livelihood security through Participatory Innovation Development (PID)
- Build the capacity of organizations working on agriculture and natural resource management (NRM) so that they can effectively work with and support smallholder communities in their efforts to adapt
- Increase insights and awareness on relevance and effectiveness of PID through sharing and learning
- Mainstream PID as an accepted approach within targeted national and international policies and programs related to agricultural development, NRM and climate-change adaptation.

**B: ACTIVITIES**

The following activities were carried out within this implementation period:

1. **Farmer-led joint experimentation on three innovations**

Farmer-led joint experimentation (JE) on local innovations involving farmer innovators and partners in extension and research was implemented in Mwingi Sub-County in Kitui County with the aim to better understand, validate and improve on local innovations. Following a field visit and engagement meetings with Local Steering Committee (LSC) members in 2015, four innovations were selected for development and improvement through JE. This was subsequent to an appraisal that identified innovations that had been previously supported through the Local Innovation Support Fund (LISF) process. This background would set the basis for initiating the process of farmer-led JE with the objective of modifying and further developing these innovations.
Consultative meetings were held between PK, farmer innovators and the agricultural extension officer from Mwingi Sub-County to underline how the JE processes would be undertaken and to stipulate what would be tested, what would be monitored during the process and to jointly come up with the most feasible experimentation pathways. Technical insights and ideas from various sector experts were shared with the farmer innovators to enhance the farmer-led innovation process prior to beginning the JE. This allowed for inclusion of both local and scientific knowledge, the latter through scientist and extension representatives. The four innovations experimented on were:

- **Joint development of an egg selector**

  Christine Kilonzi, a farmer from Mwingi, came up with a technique to pre-determine the sex of eggs; whether they would hatch into either hens or cocks. During JE planning meetings, farmer innovators who were part of the LSC present at the meeting established that Christine’s technique was part of her tacit knowledge and was not easily transmittable or articulated, despite the fact that she had trained farmers within her local area. The concept behind her egg selection technique was well understood by some farmers, especially the women farmers whom Christine had trained and who thereafter formed a group with her to raise poultry together. The men within the LSC stated that they had been trained but they sometimes needed guidance when undertaking selection. This was also seen during the JE when they sought clarification from Christine as they were selecting. Further discussions led to one farmer stating that it may be easier and more widespread if there was a machine to help with the selection. This idea set off discussions of possibilities of building a prototype gadget to undertake selection. PK took the lead in fronting the idea to several stakeholders, including Kenya Agriculture and Livestock Research Organization (KALRO), and it was through further engagements that an information science expert (Samuel Mbuthia) from Kenyatta University (KU) heard of the idea and stated that it was feasible and could be actualized. He expressed interest to be part of the team to develop the prototype.

  PK together with Samuel Mbuthia initiated the process to develop a prototype gadget. Samuel’s role was to analyze Christine’s technique and interpret it into a computer programme. The formulated information would then set the background to develop the prototype gadget that would stipulate if eggs of different shapes are male or female.

  The initial data set consisted of 120 eggs that were sourced locally from farmers in Mwingi. These eggs were separated into those that could hatch into cocks and those that could hatch into hens and thereby marked either male or female. Christine usually tested for viability of an egg to hatch by looking through it under direct light, based on experience she had gained after years of rearing poultry. She would then set aside for hatching those eggs with clear contents inside. Out of the 120 eggs, 100 eggs were seen to be viable, according to Christine.
Samuel took photos of the profiles of the 100 eggs, marked either female or male, and through a computer programme he generated the parameters (diameter) that defined each of the 100 eggs and noted an average range.

The prototype gadget would therefore be developed from this information and would be able to measure factors characteristic or representative of a female or male egg.

The final outcome of the experiment would be determined once the chicks had hatched in order to benchmark prediction accuracy against the actual outcome of the hatched egg. Preliminary results before hatching that took into consideration several factors indicated that the sexing technique Christine used had an accuracy of 68% - 75%.

The results of the experiment were, however, inconclusive as the eggs did not hatch after 21 days. This was attributed to the fact that most eggs that were bought from local farmers were unfertilized.

Despite the results, Christine did the experiment once again, and it is currently ongoing.
Rejuvenation of old pawpaw trees through capping

The longevity of pawpaw (papaya) trees depends on many factors but, in all cases, the production of the trees drops with age. In order to address this challenge, Gloria Musyoka, a farmer in Mwingi, came up with a method to rejuvenate her pawpaw trees by capping the shoots to encourage new growth. The objective of this JE was to try out this approach to prolong the productivity of pawpaw trees.

The idea behind capping the pawpaw shoots was to delay senescence and increase the tree’s productivity by ensuring reduced competition of nutrients. The experiment reduced the tree’s crown so as to promote general plant health and ensure reasonable height whereby reaching the fruits was also attainable.

The initial impact of capping the trees was stress, which led to the abscission of leaves and fruit. This could be attributed to the loss of a lot of sap (white) from the tree. This occurred during the first month of capping. Re-establishment of the plant was therefore a process that could be seen after several months. After the second month, new branches had formed and the pawpaw trees starting fruiting from the fifth month with fully established fruits at the eighth month.

Notable changes could be seen in the between the capped and uncapped trees:

<table>
<thead>
<tr>
<th>CAPPED PAWPAW TREES</th>
<th>UNCAPPED PAWPAW TREES</th>
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<tbody>
<tr>
<td>1. Capped tree produced 4 new branches each at a height of over 2 m</td>
<td>1. Only one new branch formed in each of the uncapped trees</td>
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<tr>
<td>2. The four new branches had 33, 22, 29 and 34 fruits respectively</td>
<td>2. The new branch had 13 new fruits</td>
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<tr>
<td>3. Fruits formed are bigger and oblong shaped</td>
<td>3. Fruits were round in shape and small</td>
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<tr>
<td>4. Fruiting was continuous into the next season</td>
<td>4. Fruiting is nominal after the first season</td>
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<tr>
<td>5. Fruits are formed at reasonable heights</td>
<td>5. Fruits are formed at great heights, making harvesting difficult</td>
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Photo iv) Before capping
Photo v) 8 months after capping
Determination of watering regimes for vegetables planted in waste polythene bags

Off-season crop production in semi-arid environments is a challenging task due to lack of moisture and the high evapotranspiration rates. A farmer, Mr Mwanzia, came up with a method to produce off-season vegetables in polythene bags. The frequency of watering, quantity of water required as well as the economics of this production have not been determined and hence the aim of the JE was to work with the innovator to determine this vital information. The experimental design for this JE was developed through ideas from the Mwingi LSC with the guidance from the agricultural extension officer from Mwingi Sub-County and PK. At the onset of the JE, however, the area experienced heavy rainfall thereby hindering the experimentation from taking off.

Dividing/multiplying stingless-bee colonies

Production of stingless bees is a potential income-earning activity and a few farmers have taken it up. Farmer Parmenas Kongo came up with a method to collect stingless bee colonies, which involved destruction of the original colony and transferring it to a site next to his compound. Initially, the farmer used plastic jerry cans as simple hives in which he would transfer stingless bees to his home. The innovator would identify colonies to divide by establishing colonies that had eggs and bee cocoons.

Kongo had achieved some level of success with this innovation but there was need to further improve on it through joint experimentation. When designing the experiment, he made decisions jointly with the LSC, the extension officer from Mwingi Sub-County and PK to advance the stingless-bee innovation. When one farmer, Mwanzia, stated that throughout his childhood he noticed that bees would always be found on wooden doors or window panels, he proposed that Kongo experiment with alternative material. Kongo therefore built seven wooden boxes (13 cm x 13 cm x 30 cm) with which he would undertake the experiments. KALRO Apiculture Research Institute guided Kongo to divide the colony by finding the queen bees and putting them in his new hives.

Kongo had also found out that, once he transferred the eggs and cocoons from the original colony to another place, the bees migrate in search of them and establish a new home there. During the experiment, he smeared bee wax both inside and outside the wooden boxes to attract the bees. In the forest, he identified old and large stingless-bee hives that usually have two queens, and transferred one queen, the eggs and cocoons to each of his new hives. After three days, bees migrated into these new hives, and here they re-established their homes. After two weeks, the bees started producing in their new hives.

In comparison, the bees were seen to produce faster in the wooden boxes than in the plastic jerry cans. Additionally, Kongo noted that the wooden boxes were more durable as compared to the jerry cans, especially during the rainy season when the experimentation was undertaken. Through the rate at which the brood combs in the
wooden hives were being developed, Kongo estimated that the hives could potentially produce up to one kg of honey in six months in a good season where flowers were present or the colony was fed on finger millet flour or threshed sugarcane.

![Photo vi) Wooden-box hive](image1)

![Photo vii) Kongo transferring bees from the forest to his home](image2)

2. Supporting innovation through LISF

Ten proposals from farmer innovators were funded through the Local Innovation Support Fund (LISF) in Baringo and Machakos Counties, with the main objective of further encouraging and catalyzing locally defined innovations (Appendix 1). The proposals underwent several stages of screening and vetting, and finally approval and fund disbursement. The funds were disbursed to LSCs, who are responsible for managing the fund at grassroots level. The innovations supported were:

**Baringo**

- Honey production through traditional beehives with locks made out of tire rubber and locked with a metal padlock
- Control of pests and diseases using tobacco leaves
- Use of *Aloe vera* sap mixed with water to treat poultry disease outbreaks
- Improved nutritional garden (using runoff water from dug trenches for irrigation)
- Chicken production with an improved cock

**Machakos**

- Potato production through use of animal manure mixed with rock badger droppings in arid and semi-arid lands
- Use of indigenous plants as manure/insecticide for increased yield and control of pests in food and fruit production
- Use of locally invented oxen/human pulled planter for maize and bean crops by use either one person or one oxen or two oxen to ease planting system used
• Root mulching to plants for climate change adaptation for high yield production and soil fertility addition
• Indigenous weeds to attract for bees into hives for honey production

3. Meetings of the Local Steering Committees (LSCs)
The Baringo and Machakos LSCs held meetings in the first quarter of 2016 with the main objective of rolling out the LISF process, a mechanism that encourages and catalyzes locally defined innovations. Following the receipt of LISF funds, the LSC designed a program that would support the monitoring of both the LISF process and the utilization of LISF funds. The LSCs were further responsible for drawing up agreements between the grantees and the LSC, establishing the terms of disbursement as well as stipulating the implementation schedule. At the end of the implementation, the LSCs reported back to the National Steering Committee (NSC) with their developments.

4. Monitoring, evaluation and documentation of LISF-funded projects
PK identified the Network for Eco-farming in Kenya (NECOFA), a local NGO in Baringo, and INADES–Kenya in Machakos to undertake external monitoring and evaluation (M&E) of the LISF-supported activities. The main purpose of the M&E was to track implementation of the activities to ensure they were undertaken as planned and the funds were used efficiently. The process involved a structured M&E framework that allowed for mid-term and end-term evaluation of the implementation of the activities. Recommendations were further given by the NGOs to the LSCs before they completed the implementation so that the expected outcomes of the process could be realized.

4. Africa Symposium for Climate Change Adaptation 2016
PK took part in the Africa Symposium on Climate Change Adaptation (ASCCA) that was held on 21–23 February 2016 in Addis Ababa, Ethiopia. PK together with members from the International Support Team (IST) developed and submitted an abstract that was accepted and further developed into a full paper titled: ‘Supporting farmer innovation for climate change adaptation and improvement of resilience in the farming systems of Machakos and Kitui Counties, Kenya’. The paper was amongst 45 papers presented at the symposium. This platform promoted international dissemination of the LISF concept as an adaptation mechanism for climate change. It further led to increased awareness of the important role of farmer innovation in dealing with climate change and other challenges to improve food security and NRM. The paper was finally accepted for publication by Springer International Publishing AG, an international publishing company of academic journals and books.

5. CLIC–SR final evaluation
PK was amongst the Country Platforms (CPs) that was included in the final evaluation exercise of the CLIC–SR project. An external consultant engaged PK for three days and
had discussions with members of the NSC including a one-day field visit. The findings of the evaluation allowed for the various CPs to learn from their experiences and also supported them in planning for the future of the network. The report also provided recommendations to support improvement of CPs operations; such recommendations include: i) use of evidence generated from joint experiments to develop/complete policy documents that address a related policy issue; and ii) CPs to develop and agree on a basic structure that enables the effective functioning of national and local partnerships.

6. Joint experimentation workshop

PK held a one-day “writeshop” on 10 May 2016 for consolidation of the joint experimentation (JE). The writeshop, facilitated by Eunice Karanja and Makonge Righa from PK, convened four farmer innovators whose innovations were experimented upon. The agricultural extension officer for Mwingi Sub-County, who backstopped the experiment, also attended. The main objective of the writeshop was to review the process and results of the JE and to document the process of the experimentation. This was achieved through structured questions, whereby the farmers gave their perceptions of the process and thereafter, in a participatory session, gave their recommendations for future plans as regards catalyzing locally defined experimentation.
7. International Partners Workshop (IPW)

The IPW 2016 was held in Thies, Senegal, on 15–19 May 2016. It brought together 45 participants from various CPs, the IST, the Prolinnova Oversight Group (POG) as well as Friends of Prolinnova to review progress made during the past year. The workshop provided an avenue to share progress as well as lessons and experiences gained from the respective regional projects. The focus of the deliberations during the IPW centered around the next phase of Prolinnova, which involves the regionalization of Prolinnova that would decentralize operations to Africa, Asia and Latin America, as embedded in the strategic plan for 2016–2020.

8. National Steering Committee (NSC) meeting

The NSC held a meeting on 3 June 2016 to discuss pertinent network issues, appraise progress and determine general direction of the network. The meeting focused on CLIC–SR project updates, including the completion of the project, final reporting as well as suggested the need for a final evaluation workshop in July 2016 after final reporting, if funds are availed.

Other issues deliberated on included opportunities for funding for farmer innovators, network finances and resource mobilization. The meeting appraised the future and sustainability of the network in depth, and established the need to increase the vibrancy and membership of the network and to focus on diversifying funding sources.

Other activities that were implemented in the reporting period that added value to the network included the following engagement and networking meetings to seek out collaboration and linkage possibilities:

➢ Engagement meetings:

i) Workplan meetings: Several planning meetings were undertaken with selected NSC members to gauge progress of implementation of activities, as well as to roll out plans for the rest of the implementation period.

ii) International Year for Family Farming meetings: PK as a member of the National Steering Committee of the International Year for Family Farming (IYFF), Kenyan Chapter has been actively involved in IYFF initiatives in Kenya. The chapter’s main objective is to support smallholder farmers in Kenya. This is being actualized through a project titled Promotion of public policies in favor of family farming in Uganda and Kenya supported by the World Rural Forum (WRF).

iii) Program of Accompanying Research for Agricultural Innovation (PARI): PK was approached by PARI, which will be implementing innovation contests in Kenya, Malawi and Zambia with the aim of identifying promising bottom-up innovations; it would like PK’s participation in organizing the contests to be held on 29 November 2016 (International Farmer Innovation Day).
CHALLENGES

The main challenges faced during the implementation period were bordering around the JE process and included:

1. Time constraints: the experimentation processes are extensive and dependent on seasonality and therefore cannot be implemented at simply any time of the year.

2. Unsuccessful outcomes during the first round of experiments therefore bringing about the need for undertaking several trials to obtain usable results and also to reduce experimental errors or chance for bias.

LESSONS LEARNT

Some lessons learnt during the implementation period included:

1. Both crop- and livestock-based experimentation processes were impacted depending on the season, i.e. some experimentation processes thrived better in the dry season while others were successful in the rainy season. Better analysis on seasons will allow for successful outcomes of the experiments.

2. Several trials and larger sample sizes/ data sets are required during experimentation to increase the validity of these innovations.

3. Participatory processes that involved farmer innovators in decision-making during the JE process allowed for more detailed experimental pathways that permitted the inclusion of indigenous and scientific knowledge.
Appendix 1: LISF innovations

Baringo County

1. Honey production through traditional beehives with locks made out of tire rubber and locked with a metal padlock: John Lekituli, a beekeeper, was faced with several challenges in his honey production efforts including destruction of beehives by honey badgers and theft of honey by other community members. As a result of these challenges, John embarked on activities that would secure his hives and honey. He started by securing his hives by using old discarded tires to act as hinges. A net of binding wire was used to keep the hives closed and, in its absence, the bark of a tree was used. By doing so, he was able to solve the problem temporarily; however, after a while, the honey badger was able to overcome the string net and reach the honey. He finally resolved this challenge by using padlocks to secure the hives.

2. Control of pests and diseases using tobacco leaves: Tobacco was previously grown in Marigat as a cash crop and currently remnants of this crop grow in the wild. Stanley, a horticultural farmer in Marigat, noticed that the tobacco plant was never infested by pests. He rinsed some leaves in water and left them to stay overnight. He applied this mixture on a few tomatoes and watermelons. He noticed that the pests, normally white flies, had disappeared the following day and moved to the plants that had not been sprayed. With time, he managed to spray an acre and he noticed that the mixture stuck on the plant and hence there was no need for an adherence substance like the “sticker” which is normally used with commercial pesticide. He noticed that, when tobacco leaves are used in controlling pests, they have the ability to both repel and kill the insect.

3. Use of Aloe vera sap mixed with water to treat poultry disease outbreaks: Eldume city women are a group of 15 agro-pastoralists. Amongst their activities, the group raises chickens. Each member contributed a chicken. After a while, 12 chickens died due to Newcastle disease. The disease affected the whole sub-county. The remaining three chickens were fed on Aloe vera locally known as sukuroi. Each of the remaining hens hatched eight chicks, which have been multiplying. After using Aloe vera, the remaining chickens survived, the only surviving flock in the neighborhood.

4. Improved nutritional garden (use of run-off water from digging of trenches for irrigation). The Namunyak women group cultivate small kitchen gardens where they plant diverse crops mainly to be consumed at home. Adverse climate has led to perennial drought in the area. Insecurity between the local people has also contributed to the farmers fleeing their productive large irrigation schemes to concentrate on smaller gardens near their homesteads, which they can tend to anytime. To address the challenge of shortage of rain, the women constructed trapezoidal bunds which help to conserve water, an idea one of the group members had seen elsewhere and together with her group tested and improved on locally. To start with, they
constructed a trench after every 3 m about 1 m deep. They then constructed sunken beds between the trenches. The trenches hold the water when it rains, while the sunken bed teeming with crops absorbs the water slowly to maturity.

5. **Chicken production with an improved cock.** The Abigail Baringo women group had started rearing chickens and have a kitchen garden. The group had 60 chickens that had not started laying eggs. The period the chickens were taking to start laying eggs was more than six months, which was too long. With goat rearing being the common practice in the area, the women group had little knowledge on chicken rearing. One group member convinced other members to introduce an improved cock, as she had heard they start laying eggs at an early age. The main aim was to test if the improved cock would impact the rate at which their local breeds develop by reducing the time it took to mature. The group introduced a cockerel from KALRO. Within a few months after the cock was introduced, the women noted that the chicks hatched were much bigger and developed faster than their local breed of chicken.

**Machakos County**

1. **Potato production through use of animal manure mixed with rock badger droppings in arid and semi-arid lands.** The Muti Nzuki local chicken group is a local women’s group who, besides keeping poultry, grow potatoes for sale. They discovered that mixing animal manure with rock badger droppings, locally available in the hilly area, enhanced the effectiveness of the manure. The supplementation of the droppings of the rock badger with farmyard manure substantially increased soil fertility, retained the soil moisture level and ultimately increased yields.

2. **Use of indigenous plants as manure/insecticide for increased yield and control of pests in food & fruits production.** Philip Kilaki, a local crop farmer in Machakos, was faced with various challenges in his crop production such as attack by pests in his farm. He realized that the presence of certain indigenous crops around his farm kept away pests, allowing for increased crop production. With the indigenous plants being cheap and locally available, Philip has fully embraced this innovation as a method of pest control by planting these plants around his farm.

3. **Use of locally invented oxen/human pull planter.** Martine Kyengo, a crop farmer in Machakos who primarily grows maize and beans, designed and custom made a planter (sowing device) that positions seeds in the soil and then covers them. The device plants seeds at equal distances and the required depth. It ensures that the seeds also get covered with soil. With this innovation, Martine is able to overcome challenges such as his seed being eaten by birds. The planter is therefore an alternative to planting by hand, which can be wasteful, imprecise and leads to poor distribution of seeds, resulting in low productivity. Martine’s planter can be operated by either one person or one or two oxen.
4. **Root mulching to plants for climate change adaptation for high yield production and soil fertility addition.** Simon Masila, a finger millet farmer, uses farm waste materials in modified zai pits for root mulching. Due to prolonged drought periods in his area, this farmer utilizes this method to improve on water conservation. After a harvest, he preserves all waste material from his farm and uses it to mulch his crops. This method therefore retains humidity in the soil, thereby increasing soil fertility and essentially the health of the soil. Simon also experiences a reduction in weed growth, therefore improving his crop production.

5. **Indigenous weeds to attract bees into the hives for honey production.** Over recent years, Sospeter Kioko, a beekeeper in Machakos, realized that his honey production has been on a steady decline due to prevailing weather conditions that render his area dry, thus affecting flowering crops and ultimately honey production. Faced with this challenge, Kioko has been looking for various ways to increase his production. He discovered that bees were attracted to a certain weed in his area that gives off a specific scent. This farmer now collects these weeds and places them near his hives to attract bees, thereby increasing his honey production.