

Enhancing Seed Potato Production

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Traditionally, farmers source potato seeds from their farms, local markets and neighbours. The seeds are of poor quality and susceptible to diseases which results in low productivity. This is largely because they do not know that potato seed quality reduces with each generation and that diseased seeds are transferred from one field to the next. Seed quality significantly contributes to the quantity and quality of produce.

Institutions such as Agricultural Development Cooperation (ADC), Kenya Agriculture Livestock and Research Organization (KALRO), International Potato Centre (CIP), private sector players and specialized farmers grow and sell certified seeds which are of high quality and high productivity. The certifying body in Kenya is

the Kenya Plant Health Inspectorate Services (KEPHIS). However, certified seeds are not affordable to small scale farmers as a 50kg bag of seed ranges between KES 2,500 and 3,000. This implies that an acre of land would require 16 bags of seeds amounting to not less than KES 40,000.

Since certified seeds are costly and difficult to get, some suppliers sell clean seeds which are reproduced from the certified ones. The yield is lower than that of certified seeds but higher than farmer saved seeds. Small scale farmers can produce seed easily compared to certified seeds which have more rigorous processes and standards.

Potatoes are also susceptible to various pests and diseases such as cyst nematodes, early and late blight, bacterial wilt and black leg. This requires farmers to have good agronomic skills and working knowledge on land selection, planting and management.

Intervention

In order to solve the problem of availability of quality seed among small scale farmers, Egerton University through Community Action Research Project (CARP+) supported six farmer groups led by the following:

- Elburgon: Richard Mbaria;
- Turi: Joseph Karangathi
- Mauche: pastor Terer;
- Likia (Kiahiti B): Joseph Kinyanjui;
- Kasambara (Gilgil): Beatrice; and
- Egerton, Njoro: Darwin Kenai, Elite (youth group)



Community Action Research Project Support

Community Action Research Project (CARP+) provided the following support to all the farmer groups:

Seeds: All farmers groups were given two bags of 50kg each of the Shangi certified seeds, bought from ADC Molo and Jelly bought from Charvi Ltd. Shangi was selected because it is a common variety grown in the area and Jelly is preferred for its large size by markets for french fries (chips). Jelly is a new variety and has characteristic of long (>2.5 month) tuber dormancy.

Fertilizer: The groups were also provided with fertilizers-NP: 23:23:0 blended by Baraka fertilizer and DAP bought from Nakuru, MOAL&F.

Fungicides and herbicides: Farmers were given Ridomil, Revus and later Infinito to combat late blight infections which were severe in June 2017.

Training: During planting time, technicians from ADC Molo and Egerton University staff trained the farmers and students on good agricultural practice. The learning was experiential. The students and farmers on the six sites were shown how to space the plants on rows (75 cm x 30 cm) with a ridge formation and seeding depth of 6 inches. Spraying was done immediately infections of late blight and pests were noticed.

Baraka Agricultural College (BAC) a Technical and Vocational Education and Training (TVET) institute in Nakuru also undertook similar training independently on their farms in Molo and Kuresoi North. The college uses experiential learning in training its students and it engages in outreach to farmers. Baraka Agricultural College is a valued partner of the CARP project.

How the groups were selected

The selection criteria for the farmer groups varied. For example, the Turi group was identified with the assistance of Nakuru Smallholder Farmers Association (NASFA), the farmer cooperative group and partner in the CARP+. Some groups were selected based on the initiatives of leaders who were personally growing and selling “clean” seed potato.

For example, leaders like Mbaria of Elburgon and Joseph Kinyanjui from Likia had experience in producing and selling seed potato. Lastly, two of the groups were included in the program after they had invested in their own resources such as purchasing of certified seeds and management of the crop. They include Kasambara and the Egerton University student’s youth group called Elite. All the groups were supported with fungicides, herbicides (after planting) and fertilizer. This was done by sending it through a youth farmer (Stephen Njihia) who was engaged as a casual and doubled up as a trainer too. Kasambara paid for all their own agronomic management, while Elite was partially supported. Groups were picked based on their past experience in seed potato farming (e.g., Elburgon and Likia groups of Mbaria and Joseph, respectively, and their individual initiative (e.g., Kasambara of Mwenja and Elite Youth group of Darwin), and recommendation by NASFA (Molo group of Karangathi and Mauche CBO group of Terer (recommended by one of the EU co-investigators).



Land preparation in Turi Molo, Kenya



Students demonstrating to farmers Planting potatoes in Likia Mau Narok, Kenya

Training

Training in Good Agricultural Practices (GAP) skills are given in the Table below.

Table 1.: *Experiential learning by farmers, students and staff on GAP of seed potato production on six demo plots in Nakuru County*

Activity	Group Name Site	Green Vision	Giteru	Chomoza	Kiahiti B	Elite	Kasambara		Cost of production (KES)	Remarks
							Bidiii	Kasambara		
Land preparation	Primary digging	1	0	1	1	1	1	1	1,500.00	Farmer operation
	Making furrows	1	1	1	1	1	1	1	1,500.00	Farmer, students and staff
Seeds	Shangi (50kg/bag)	2	1	1	2	1	2	2	2,500.00	Price per 50kg of seed- Provided by CARP+
	Jelly (50Kg/bag)	1	1	1	1	1	0	0	3,000.00	Provided by CARP+
Transport	Of seed								2,000.00	
	Fertilizer								2,000.00	
	Agro chemicals								1,200.00	
Seeding	Planting	1	1	0	1	1	1	1	1,500.00	Mauche only 2 men were trained with Likia farmers. They planted one month later because they did not have the land.
										Farmer, students and staff
Fertilizer	DAP	1	1	1	1	1	1	1		Farmer, students and staff
	NP (23:23)	1	1	1	1	1	1	1		Farmer, students and staff
Spraying	Fungicide	6	3	3	5	6	5	5		Farmer
	Pesticide	3	2	1	2	3	3	3		Farmer, students and staff
Weeding	Herbicide	1	0	1	1	1	1	1		Farmer
Harvesting										Farmer harvested
										Farmers harvested. We did not get any yields from Maunch due to insecurity challenges
Yields	Shangi	526	70	0	400	477	0	0	463.00	
	Jelly	300		0	175		450		-	
Total		826	70	0	575	477	450	450	463.00	

As indicated above, training for all the groups included;

- i. Land preparation;
- ii. Provision and transportation of seed fertilizer and crop protection agro chemicals;
- iii. Planting methods: making furrows and ridges, planting depth, fertilizer application, weeding, earthing up; and
- iv. Crop protection.

Reality on ground

Timing of certain operations such as planting, earthing up or hilling-up and crop protection differed from site to site. It depended on the motivation and commitment of the lead farmer and his group in following up with the field operations. The season was characterized by high rainfall and low temperatures resulting in high incidence of late blight infections. This was particularly evident with Jelly, which is an imported variety in the higher elevations of Molo and Likia. Extra spraying to control late blight was necessary. Farmer groups in Turi, Likia and Mauche did not apply extra sprays of fungicides. They ended up having infected crops which lowered yields.

Germination of Jelly potato seed was not as good as that of Shangi. It also had high incidence of upward curling of leaves caused by leaf roll virus. Continuous rainfall hindered harvesting of potato tubers in Njoro and Turi. Jelly took four months while Shangi took three months to mature.

NPK fertilizer at rate of 23:23:0 was applied to boost the foliar at the time of planting.

The approximate average cost of production per group was 22,575 KES only. This was, exclusive of approximately 18,000 to 23,000 KES support towards costs for each group. This depended on the distances from Egerton and number of visits.

How we did it

1: Site Selection and Land Preparation

On 20th October 2017 Egerton University organized an awareness meeting to sensitize group members on key considerations for site selection. Non-previous use of land production in the last two years was important for breaking the cycle of pests and diseases. In addition, that land should be about 0.125 of an acre, preferably of good soil fertility and also good drainage to avoid water logging.

Land preparation involved slashing to clear the thick bush. Tilling was done to break down the clods using hoes to desired tith for favourable growth of potatoes and rows made at a spacing of 75cm. Tuber spacing was 20 to 25 cm. Farmers used their feet to approximate the distance.

Characteristics and observations of farmer group operations and outcomes

Green Vision Group (Elburgon)

Leader: Richard Mbaria,

The group was started in 2011 through the help of Ministry of Agriculture to aid in collective marketing of ware potato and also to take part in environmental conservation. Green Vision is composed of 16 members: eight men, four women and four youths (2 male, 2 female). Initially, the group's main activity was growing seed through positive selection. This is the process of improving

quality of seed potatoes whereby potato growers practice their traditional way of selecting healthy plants with desirable traits. The seed potato is then stored and used for the next growing season. The group was engaged in the activity from 2011 to 2016. It was therefore easy for them to embrace the production of clean seed when CARP+ project was initiated. They believed that this would increase their potato production compared to positive selection. Farmers and the students of Egerton University planted the seed potato on 27th of April 2018. The farmers reported that the yields from certified seeds were better than the ones obtained from positive selection.

Giteru (Turi)

Leader: Joseph Karangathi

This group is made up of internally displaced persons (IDP) who were displaced following the post-election violence of 2007. They were not very well organized. At planting, they had not prepared the land as required. Very few of them (eight group members) and young people (not farm owners) came for the training. Weeding was poorly done and harvesting delayed due to rains and lack of labour. The crop was highly infected by late blight. Only 250kgs of Shangi was harvested and no Jelly was harvested due to late blight susceptibility and white fly attack. Only one lead member participated in the CARP+ meetings. None of the members attended the field day in Baraka Agricultural College. Potatoes harvested were sold at the Egerton University cafeteria.

Chomoza group

Leader: Pastor Terer

The group in Mauche planted late by almost one month due to lack of land. The group was not very well organized. The follow-up was affected by insecurity and we were not able to get feedback on the production and sale of the potato. Insecurity can cause a devastating blow on agriculture production.

Shangi crop was observed to be of average yields. The Jelly variety was devastated by late blight just three weeks before harvesting.

Kiahiti B (Likia)

Leader: Joseph Kinyanjui

Kiahiti B has 16 members. The group harvested eight bags (400kg) of 50kg Shangi seed, while Jelly produced about 3.5 bags (50kg seed) giving a total of 175kg. There were about 17kgs of damaged tubers due to harvesting. These were consumed in the homestead of Mr. Kinyanjui, the team leader. He said: "Lower yields are due to low temperatures and high rainfall experienced during the growing season, leading to high incidence of late blight." The Jelly variety was much more susceptible to late blight attack and suffered severely despite having sprayed up to three times a week with fungicides.

Mr Kinyanjui sold the 575kg of tubers at 2,000 KES per 50kg bag. He kept 25 kgs as seed for future planting. He made 23,000 KES (230 USD) from the total 11.5 bags (of 50 kg seed) for the 3.5 and four months maturing period for Shangi and Jelly varieties, respectively. The cost of production was approximately KES 22,000/-, giving a net profit of approximately 1,000 KES.

Elite youth group (Egerton, Njoro)

Leader: Darwin

This is a group composed of eight (6 males, 2 females) BSc students of Egerton University. This group was registered in January 2017. Each member contributed KES 5,000/- , raising the necessary investment money of KES 40,000. They bought their own seed and CARP+ assisted the group with agro-chemical sprays. They were actively engaged in participating in all of the crop production practices as well as storage and field days. They even exhibited their potato at the Global Business Round Table Annual Meeting at the Kenyatta International Conference Centre June 2018. They got business opportunity to supply ware potato to schools in Nairobi by the Nairobi Women Rep. However, the timing was not right as they are still students; the volumes were large and requires time and resources for production, which was challenging.

They harvested good yields of over 450kg per bag of 50 kg seed potato planted. They had storage challenges, especially when they harvested during the rainy season. About 78 kgs of their jelly variety was also stolen from the stores.

Kasambala Bidii (Gilgil)

Leader: Beatrice

This group farmed in the relatively warmer, drier and rocky area in Gilgil sub-location. They did not have high incidences of late blight. However, they had high incidences of white flies demanding them to spray up to four times. This was higher than the other groups.

This group was highly motivated. They invested in buying an extra 100kgs of Shangi certified seed from ADC Molo. They harvested over 450kgs from each 50kg bag of Shangi seed potato planted, giving a multiplicative ratio of 1:8, almost similar to that harvested by Green Vision of Elburgon.

Observation: Due to the cold weather and high rainfall in 2018, high incidences of potato late blight were observed throughout Nakuru. Production is estimated to have fallen by over 30% from previous production levels (as observed in 2016 and 2017).

Lessons

1. The groups that partially invested in the production process (Elite and Kasambala Bidii) performed better than those that had not made any investment.
2. Groups led by farmers having experience in seed production performed well for example, Green Vision and Kiahiti B.
3. Late blight can be a devastating disease in high rainfall (> 800 mm seasonal) and low temperature (< 11 oC). This enhance late blight incidence and lowering of the surface leaf area. It demands use of extra fungicides that leads to increased cost of production.
4. Most Small holder farmers lack sufficient funds to purchase extra fungicides. They need to prepare beforehand or get emergency loans for purchase of the fungicides for use during an outbreak.
5. Growing potato varieties that are highly susceptible to early and late blight diseases such as Jelly, can lead to up to about 75 percent loss of the crop.
6. Diligent hard working and resourceful farmers (who invest their own money), are likely to have better yields than those that are resource poor and lack energy to follow-up on disease management.

7. Insecurity due to political unrest weakens the farmer group structure and community structures leading to low participation, poor learning outcome and lower yield.

Challenges

1. Delayed payments of ware potato from customers (for example the Egerton University mess).
2. Post-harvest losses caused by poor storage for the potatoes. This forces the farmers to sell off their potatoes at low prices, especially during glut periods. Post-harvest loses also happens due to crude harvesting methods that destroy the harvest.
3. Poor implementation of government policies, for example, government delays in implementation of the standard 50kg bags leading to exploitation of the farmers.
4. Unreliable weather patterns, characterized by unpredictable rainfall and temperature changes.
5. Inconsistent/insufficient quality seed supply.
6. Lack of market for the produce leading to low prices for the potatoes and exploitation of the farmers by middlemen.
7. Lack of emergency funds to control pests and disease attack, especially late blight and pests like potato tuber moth, cutworms and aphids. This affect the potato yields.

Way forward

- Construct cold storage to enable farmers store their produce and wait for better prices.
- Value added to circumvent the lack of markets at end of rainy season, when every farmer harvests his/her tubers.
- Inculcate the discipline of keeping records. This will help in evaluations for enabling improvement.
- Mitigating risks of diseases and insecurity through planning and budgeting.



Students and farmers planting in a demonstration plot in Elburgon, Kenya

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