



KENYA AGRICULTURAL AND LIVESTOCK RESEARCH ORGANIZATION

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**FACTSHEET FOR TECHNOLOGY INNOVATORS WORKING WITH SMALL HOLDER
FARMERS IN KENYA**

Irish potato production



Introduction

Local names in Kenya: (*Viazi*, *Rabuoni*, *Waru*)

Potato (*Solanum tuberosum* L.) is a major food and cash crop in high altitude areas of Kenya, widely grown by small-scale farmers.

It is one of the most consumed produce, acting as a staple food as well as a cash crop, and its production has been growing rapidly due to increased urbanization and fast food industries.

Nutritional value

Irish potatoes are a rich source of nutrition and energy. They are rich in vitamins, minerals and essential organic compounds.

Benefits include:

- Rich in iron, calcium, phosphorous, magnesium and zinc essential in building and maintaining bone structure and strength.
- Fibre which helps lower the total amount of cholesterol in the blood.
- Rich in Choline which helps with memory, brain development and muscle movement.
- Source of vitamin B6 which helps in energy metabolism by breaking down carbohydrates and protein into glucose and amino acids.
- Folate important in DNA synthesis and repair.
- Good source of vitamin C.

Consumption and uses

Household consumption (10 percent), fresh potato markets (70 percent), seed potato (18 percent) and processing (2 percent). Per capita consumption in potato growing areas is 116 kilograms while in other areas it is 30 kilograms.

Potatoes are used as vegetables for cooking, fed to cattle, pigs and chickens; processed into starch for industry; and sometimes re-used as seed tubers for growing the next season.

Industrial processing

Potato starch used by the pharmaceutical, textile, wood, and paper industries as an adhesive, binder, texture agent, and filler, and by oil drilling firms to wash boreholes. Potato starch is a 100% biodegradable substitute for polystyrene and other plastics and used, in disposable plates, dishes, and knives.

Potato peel and other “zero value” wastes from potato processing are rich in starch that can be liquefied and fermented to produce fuel-grade ethanol.

Market requirements

Potatoes grown for seed should consist of a uniform grade of small, well-formed tubers usually 30-55mm diameter size range (as specified by KEPHIS). For the fresh market, tubers need to be consistent in shape and size (45-85mm), with good skins free of blemish.

Dry matter (DM) content is also important as tubers with a DM above 18-20% are more susceptible to bruising and may disintegrate when boiled during cooking.

Potato growing regions in Kenya:

The major Irish potato growing regions in Kenya include Nyandarua, Nakuru, Elgeyo Marakwet, Meru, Nyeri, Kiambu, Taita Taveta, Narok, Bomet, Trans Nzoia, Bungoma, Uasin Gishu, West Pokot, Kisii, Nyamira, Kirinyaga, Murang'a, Baringo, Nandi, Laikipia and Kericho

Ecological requirements

- Site of production should be free from pests and diseases such as bacterial wilt, blight and nematodes.
- Well-drained loamy to sandy loam soils
- The soil pH should range between 5.0 and 7.0 but the ideal pH should be 5.5
- High altitude areas between 1,500 and 3,000 meters
- Average daily temperature of between 15 to 18 C
- They require between 400 and 800 mm of rains during the growth period

Stakeholders in the value chain:

The potato value chain builds on five main processes from research and development to production, processing and consumption.

The major potato value chain actors are:

Research & Development Agencies, Production, Transportation, Storage & Marketing, Processing, Marketing & Consumption

Commercial ware potato production

The next most important task after an overview of the varietal characteristics and ecological requirements for potato is to understand what opportunities exist in the market before production commences. This is to ensure that production is aligned to customer or market needs. Secondly, for a potential investor to become successful in commercial potato production they need to have entrepreneurial attitudes. An entrepreneurial attitude is a business attitude, which starts with identifying

the market needs, planning and budgeting for production, and implementing the production and marketing plan. Other skill needed is the ability to carry out simple calculations that will assist in computing cost-benefit analysis for the production plan.

Potato growing

Nutrients management in potatoes

The potato plant has a shallow root system; with a high demand for nutrients. It requires 14 soil derived elements, both macro and micronutrients, for proper growth and optimal yields.

Rotational planning

Rotate after every 4 years with non-root and tuber crops, preferably cereals and legumes to break pest and disease cycle such as carrot and improved fallow either under *Crotalaria ocreoleuca* or *Leucaena* and *brassicas*. In general avoid solanaceous crops.

Land preparation

Land preparation should depend on tuber use for consumption or seed

Steps during land preparation

1. Plough when soil is dry
2. Plough the farm to appropriate tilth 45cm- 50cmdeep
3. Add manure and fertilizers to the soil in the right amounts to provide the required plant nutrients for vigorous crop growth

Planting

- Plant at 5-15 cm depth but deeper and 30-40cm for white varieties under warm dry conditions
- Place tubers with sprouts facing up
- For consumption purposes, plant at a spacing of 75cm x 30 cm between rows and 30-40 cm within rows
- Seed rate for tubers is 2-2.5 tons per ha. Seed rate depends on soil fertility status, rainfall availability and tuber use
- The larger the seed size, the more the amount required
- Make wider ridges or mounds if intercropping with annual crops e.g. maize and legumes
- For seed potatoes, plant at a spacing of 15-20cm within rows, at 50kg bags per acre

Weeding

Weeding should be done 2 weeks and 5 weeks after emergence. Avoid weeding after flowering because it predisposes the crop to infections and may injure the tubers.

Earthing up / hilling

Earthing up should be done at 2-4 weeks after emergence to; enhance for tuber expansion, control potato weevil and prevent greening.

Potato diseases and pests management



Bacterial disease



Verticillium wilt



Rhizoctonia solai (Black scurf on tubers)

Conduct bacterial wilt and nematode (PCN) test before planting.

Bacterial diseases included: late and early blight, bacterial wilt, verticillium wilt, soft rot and black scurf.

Viral diseases include: potato leaf roll and yellow virus, common scab, powdery scab and wart.

Fungal diseases include: Verticillium wilt, Rhizoctonia solani (Black scurf).

Disease management strategies

- Plant; resistant varieties, certified and clean seed
- Conduct bacterial wilt and nematode (PCN) test are crucial before planting
- IPM with enhanced scouting
- Field sanitation/hygiene is more important; clean field, remove of harvest residues plant new fields away from old fields
- Remove diseased plants Do not use diseased plants in compost
- Crop rotation with non-solanaceous crops
- Spray with recommended fungicides to control blight under IPM program
- Test for bacterial wilt through KALRO or KEPHIS

Potato pest and management

Potato pests include;

Aphids, white flies, tuber moth, potato cyst nematodes (PCN), root knot nematodes, cutworms, leaf miners and thrips

Pests control strategies

- Certified seed.
- Test for potato cyst nematodes (PCN) on soils before planting.
- Integrated Pest Management (IPM), including use of repellents.
- Crop rotation to be observed closed season for crops in Solanacea family field sanitation, including removing harvest residues.
- Organic pesticides (Bio-T-Plus).

Harvesting and post-harvest handling

Dehaulming:

Dehaulming is the act of detaching the vegetative part of the potato plant, found above the ground, from the root tubers

There are three methods of dehaulming, namely:

- **Haulms cutting:-** method whereby a sharp object such as a panga is used to cut off the vegetative part.
- **Haulms pulling:-** method of detaching the foliage from the root tubers by pulling them using hands.
- **Paraquat spray:-** a chemical method of doing away with foliage

Harvesting

Cut foliage close to soil base if vines have not dried after attaining maturity for the purpose of hardening the tubers.

Harvest 7-14 days after dehaulming by digging up the tubers carefully using a forked *jembe* to avoid damaging them.

Tubers are then dried for a short period of time in rows before gathering them.

Potato will produce up to 40tons per ha (16tons per acre) with good crop management.

Packaging and transporting

If the potato farm is far from the store or homestead, there will be need for packaging and transporting from the field using carts, wheelbarrows, pickups etc. Package the potatoes in bags weighing not more than 50 kilograms for ease of handling and to avoid damaging the tubers.

Sorting and grading

Select and remove the damaged/bruised, diseased, deformed tubers and any other foreign material such as soil clods. All damaged and cut tubers should be removed after harvesting to discourage infestation by PTM and rotting in the case of cut tubers. Grading should be carried out to separate the ware, seed and chatts. It is advisable that each bag is well labeled according to variety description and weight for ease of identification.

Curing

Curing causes the skins of potatoes to thicken and slows the respiratory rate of the tubers, preparing them for storage. To cure potatoes, brush off any remaining dirt and store dry potatoes between 45 to 60 degrees F and a relative humidity of 85 to 95 for 10 to 14 days.

Storage

If long storage period (longer than 5 months) is anticipated, the tubers must be stored at temperatures of between 4-8°C in dark cool conditions to prolong dormancy. To achieve this, maintain a 95% relative humidity at all times. Good storage conditions should be cool, dry, dark and well ventilated so as to: keep tubers alive, reduce deterioration through natural process of starch breakdown, reduce storage pest infestation and damage, and reduce storage losses through rotting, greening and increase tuber dormancy period. The store should be sprayed with insecticides to kill tuber moth adults. Spread the tubers on crates and turn once in a day to prevent spoilage. Also you can place Mexican marigold or Eucalyptus leaves and branches on the tubers to repel Potato Tuber Moth (PTM) infestation.

Tuber quality

Tuber quality is influenced by the fact that the potato is maintained in a fresh state. The nutritional value of potato tubers is influenced by several factors which are: soil factors, such as pH, available nutrients, texture, organic matter content and soil-water relationships; fertilizer applications; cultural practices; weather and climatic factors, including temperature, rainfall and light intensity; the variety; also postharvest handling and storage.

Processors require tubers with high dry matter content, as this produces a product with higher consumer acceptability. Specific gravity is widely used as an alternative quality attribute of tubers and is quick and easy to measure. It is used as an estimate of the solids or dry matter content of tubers. The higher the dry matter content, the lower the water content and the higher the specific gravity. The specific gravity of a tuber depends not only on the percentage of dry matter in it but also on the density of the dry matter and the percentage of air in the tissue.

Market requirements

Annual price trends at farm gate level, aggregation (broker) level and at wholesale market level.

- Market players (aggregators, transporters, wholesalers, retailers, consumers and market managers) and their roles.
- The customer behavior and preferences in terms of variety preference, amounts demanded, quality required, payment modes among others.
- Cost benefit ratios of marketing own produce verses selling through brokers.
- Identify competitors (other farmers) including an assessment of their strengths and weaknesses.

Market assessment

1. Steps in preparing market assessment
2. Steps in market data collection
3. Steps in analyzing, concluding and action planning

Planning and budgeting for potato production

The planning for production involves tasks that require having knowledge in units of land, manure, fertilizer, pesticides rates, volumes, weights of common containers on the farm and record keeping.

Gross margin analysis

GM is the difference between total sales of item (potatoes) and the total costs of producing that item. $GM = \text{Total Sales} - \text{Total Costs of Production}$

Step 1: Calculating the total production costs – inputs and operational costs

Step 2: Calculating marketing costs

Step 3: Calculating the sales values

Step 4: Calculating the GM and net income

Records keeping

The key records required for a potato enterprise include: • Previous records of potato land used

- Soil tests results
- Rotational plans
- Activity calendars
- Financial records – inputs, operations, sales and GM tabulation

References

National Potato Council of Kenya 2018. A Guideline for Framers and Trainers, A Potato Production

KALRO, Series 2017. Information brochures