AGRICULTURE AND FOOD AUTHORITY

HORTICULTURAL CROPS DIRECTORATE

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AFRICAN NIGHTSHADE- (*Solanum spp.*)
GROWERS MANUAL

PREFACE

Kenya has been endowed with an enabling environment for production of horticultural crops that attracts high demand both in the domestic and international markets. Production is mainly by smallholder farmers, many of whom require skills and knowledge on good agricultural practices (GAP) to produce and handle the fresh produce. According to the Economic Survey 2022 published by the Kenya National Bureau of Statistics (KNBS), horticulture is among the leading sub sectors in agriculture. Therefore, enhancing the capacity of these producers could be of immense beneficial to the Kenyan economy.

Agriculture and Food Authority – Horticulture Crops Directorate (HCD) is a government agency mandated to Regulate, Promote and Develop the horticulture industry in Kenya. In carrying out its mandate, the Directorate through the Technical and Advisory Services department (TAS) has developed this grower's manual for its stakeholders. The manual has been designed with a simple language and where necessary photos have been used to highlights all processes from plough to plate. HCD envisages that by using this grower's manual, its stakeholders especially the smallholder farmers, extension staff and trainers would upgrade their knowledge and skills to enable them increase production of the crops thereby improving on food security, household health, as well as create employment and generate income.

The content has largely been developed from the TAS field staff experiences in the 26 stations spread across the country (*Collins & Dinah – Nairobi [NHC], Antonina – Nakuru, Miriam - Nandi, Grace – Homabay, Barnabas- Eldoret & Iten, Carol - Bungoma, Peter- Busia, Charles -Kisumu, Irene - Narok, Lal – Kisii, Victor – Mombasa, Crispin – Kibwezi, Esther Ngutho– Kitui, Esther Kabatha – Nyandarua, Susan – Taveta, Syphrosa – Machakos, Catherine – Yatta, James – Kitale, Julius – Kajiado, Amedeo & Brenda – Meru, Mary – Kericho, David & Delphina – Mwea, Fridah – Nyeri, Emma – Sagana, Sarah – Limuru*), some content were reviewed from literature and images used properly acknowledged. Technical editing and reviewing of the manuals were done by Mary Chacha, Syphrosa Wanyama, Barnabas Kiptum, Antonina Lutta, Carol Soita, Amedeo Muriungi, Peter Mwanja, Victor Omari, Emma Ndirangu, Esther Kabatha, David Makori, Dinah Karimi, Collins Otieno, Dr Jacqueline Oseko the acting Deputy Director, Technical and Advisory Services department and Director Benjamin Tito all of Horticulture Crops Directorate.

AFRICAN NIGHTSHADE- (*Solanum spp.*) GROWERS MANUAL.
Common Name*; MANAGU*

Source: http://www.farmlinkkenya

Introduction:

African nightshade is one of the most important African vegetables in Solanacea family grown in Kenya. It is of economic importance with a very viable market both in rural and urban areas. Nightshade has nutritive value of 4% protein, 6% carbohydrates, phosphorous, iron and a high amount of vitamin A, C and E. It also has medicinal and therapeutic values.

Common cultivars in Kenya include;

- *Solanum eldoreti* has broader leaves and produces small greenish to purplish fruits.
- *Solanum villosum* grows well in low altitude areas and produces orange-coloured fruits which are edible.
- *Solanum americanum* produces small black fruits and grows well in hot and humid areas.
- *Solanum scabrum* has big leaves and black fruits it grows well in medium altitude areas with high rainfall.

In Kenya, the leading Counties producing African nightshade are Kisii, Kericho, Migori, Kisumu, Siaya, Nandi, Usain Gishu, Bungoma, Kakamega, Vihiga, Trans Nzoia, Nyeri, Kirinyaga, Taita Taveta and Kilifi.

Ecological requirements:
Altitude **-** 0 -2400m above sea level.

Temperature ranges - 15^{o}C-30^{o} C.

Rainfall**-** annual 500mm-1200mm.

Soils **-** well-drained soils, which are high in organic matter content with a pH of 5.8-6.6. The crop grows well in soils, which are covered by ash.

Good Agricultural Practices (GAP)

The Horticultural industry in Kenya is guided by the Horticultural code of practice (KS 1758- 2016 Part 11) which is a Standard for fruits. Vegetables, herbs and spices for both local and export market. The standard aims at ensuring food safety, environmental sustainability and social accountability by following Good agricultural practices from production, processing, transportation and marketing of fresh produce. It is essential to keep accurate records for all operations for ease of traceability.

Propagation material.

African nightshade can be direct seeded, started in a nursery bed or potted seedlings can be sourced from commercial seedling nurseries. Use of certified seed is recommended to avoid seed borne diseases.

Soil testing.

Soil testing is recommended before planting to guide on fertiliser and manure application.

Land preparation.

Prepare a deep fine tilth land for field establishment incorporating the organic matter. If possible, observe minimum tillage during land preparation.

Planting and Sowing

Transplanting and spacing.

Seedlings are transplanted 30 days after sowing or when having 6 true leaves and have attained a height of 10 – 15 cm. Seedlings are planted at spacing of 30 cm between the row and 10 – 15 cm between plants.

Seeds are drilled thinly in rows 30 – 40 cm apart. To ensure uniform distribution, mix the seeds with the soil or sand at a ratio of 1:15 or 1:20, respectively. Direct seeding enables the plant to establish well and faster which leads to faster production of bigger leaves. Seed germination takes place between 4 – 7 days. Thin the seedlings to attain a spacing of 15 cm between the plants after 30 days. A seed rate of 1kg/acre is economical.

Pinching and deflowering.

Pinching is done by cutting the apical shoot to encourage branching and production of more new shoots. Continuous deflowering is done to encourage vegetative growth.

Fertilizer application and Irrigation.

Apply fertilizer and manure at the following rates:

Manure alone: 8 tons per acre. Manure and DAP: 4 Tons manure together with 40 kg DAP per acre or DAP 75 kg per acre. Foliar fertilizer is used to boost vegetative growth.

African nightshade requires regular water supply and therefore in the absence of rainfall, irrigation is recommended to encourage vegetative growth.

Weeding.

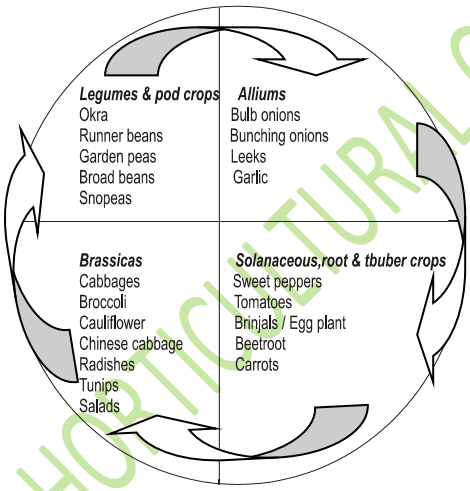
African nightshade fields should be kept weed free. Mechanical weeds control is recommended. Weeds are alternative hosts to a number of pests and diseases, and competition for nutrients.

Pests Control.

Use of Integrated Crop Management (ICM) is a more recommended strategy for pest and disease control in African night shade crop. ICM strategy integrates use of biological (resistant/tolerant varieties, predators, and parasitoids), mechanical (mass trapping, screen house, hand picking, and ploughing), and cultural (mixed cropping system, field sanitation, staking/trellising, crop rotation, and solarization) practices.

Crop rotation replenishes soil nutritional status and prevents pest and disease build-up. It is recommended to rotate African night shade crop with those from different families, an effective rotation program should last for 3 – 4 years.

The following is a recommended rotation for horticultural crops.



Source: https;//infonet-Biovision

Major African night shade Pests

Common Pests (insects)	Symptoms Identification	Control
Root-knot nematodes (*Melodogyne spp.)*  *Source:* https://www.infonet-biovision.org/PlantHealth/Indigenous/African	-Swellings of the roots commonly referred to as galls that inhibits translocation of water and mineral salts thus resulting in stunted plant growth.	-Crop rotation -Keep weed free land fallow for one or two seasons -Intensive use of manure -Use Abamectin.
Cutworms (*Agrotis segetum*)  Source: https://www.infonet-biovision.org/PlantHealth/Indigenous/African	-Grey to black caterpillars that feed at night, biting out the side of the stem at ground level causing the plant to fall over. -Often found hiding in soil near the cut seedlings.	-Hand picking of the pests -Early weeding to destroy sites for egg laying -Use of products containing Imidacloprid. -Soil drenching with insecticides and seed dressing.
Flea Beetle (*Epitrex fuscula*)  Source: http;//www.commons.wikimedia	-Feeds on leaves and creates big holes on the foliage. -The damage is serious in young plants.	-Practice crop rotation, -Destroy plant debris that act as hosts. -Ensure field Sanitation. -Plant trap crops earlier than main crop to trap the beetles. -Use, predatory insects, use organic insecticidal oils like neem oils.

Aphids (*Aphis solanella*)  https://www.infonet-biovision.org/PlantHealth/Indigenous/African	-Most destructive pest for this crop. -This pest suck sap from the tender shoots causing curling of leaves. -This in turn reduces the quality of leaves.	-Control with natural or organic sprays using neem and canola oils. -Employ natural predators. -Can introduce biological controls like introducing ladybird in the field, use blue and yellow traps.
Bacterial Blight (Pseudomonas savastanoi)  Source: https://www.infonet-biovision.org/PlantHealth/Indigenous/African	-Brown, circular pattern which distinguishes this disease from other leaf spots. -Thrives best under warm wet conditions. Leaf spots -first appear on the oldest leaves and progress upward on the plant.	-Practice crop rotation and multi-cropping, -grow resistant varieties, -Chemical control using combination of Menthly bromide-dicroropropene with chloropicrin.
Bacterial wilt (Ralstonia solanacealum)  Source: https://www.infonet-biovision.org/PlantHealth/Indigenous/African	-Causes rapid wilting and death of the entire plant without any yellowing or spotting of leaves. -All branches wilt at about the same time. -When the stem of a wilted plant is cut across, the pith has a darkened, water-soaked appearance.	Discard infected plants as soon as possible Crop rotation to alternating crops from different families over period of four years. Growing resistant varieties, use disease free propagation material, No chemical control is effective.

Harvesting and harvesting techniques.

African night shade matures fourteen days after direct sowing in the field and thirty days after transplanting. Maturity indices includes leaf size and stem tenderness. Harvesting is done by cutting the apical shoot to encourage branching and production of more new shoots. Harvesting can be by thinning or after every two weeks pluck the young shoots and continue harvesting every one to two weeks for 3 to 4 Months. Plucking method determines the longevity of harvesting. Regular removal of flowers ensures longer harvesting period.

Post-harvest Handling.

Packaging and transportation of African night shade after harvesting should be done to maintain quality as per the Horticultural regulations 2020.

Sorting

Sorting of harvested leaves should be done to remove insects infested and yellow or damaged leaves before packing.

Cleaning

Dirty or soiled Leaves should be removed.

Grading

Grade the leaves by size, bunching those of the same size and tying in small bundles before packing in well-ventilated container for transportation to markets.

Transport after harvesting

Packing and transportation of African nightshade should be done to maintain quality as per the Crops (Horticultural crops) regulation 2020.

Preservation/value addition.

For later utilization or export of dried African night shade leaves are blanched in hot water, then iced and dried under the shade or sun dried and stored in vacuum sealed packages.

Storage

Fresh leaves should be stored in the refrigerator or stored in cool place.

Expected Yields

Yields range from 4.8 tons to 8 tons of foliage per acre depending on the variety and the management of the crop.

Gross margin analysis –for 1 Acre (2023).

Gross margin for African nightshade for one Acre. Expected yield of 4.8-8 tons/crop				
Gross Income (GI)	**Kgs**	**8000**	**20**	**160,000.00**
Item	**Unit**	**Quantity**	**Cost/unit**	**Total cost**
Variable costs				
Seeds	Kg	1	1000	1000 .00
Ploughing	Acre	1	4000	4000.00
Harrowing	Acre	1	2500	2000.00
Soil test	1	1	2000	2000.00
Manure	tons	8	1000	8000.00
Fertilizers (NPK/DAP)	Kgs	80	120	9600.00
Fertilizer(CAN)	Kgs	50	120	6000.00
Foliar fertilizer	Ltr	3	500	1500.00
Fungicide	Kgs	2kg	1500	3000.00
Insecticide	Ltr	3	2000	6000.00
Nursery-establishment &management	Mds	10	500	5000.00
Transplanting	Mds	8	500	4000.00
1st Weeding	Mds	5	500	2500.00
Top dressing	Mds	5	500	2500.00
Second weeding	Mds	5	500	2500.00
Spraying	Mds	2	500	1000.00
Harvesting and sorting	Mds	10	500	5000.00
Marketing Costs				5,000.00
Total Variable Costs				**71,100.00**
Gross margin(Gross income-total variable costs) **Net Income**				**160,000-71,100** **88,900.00**

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