



ONION PRODUCTION GUIDE



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This production guide was developed to complement existing Information, Education and Communication (IEC) materials available on the Agronomy of selected commodities under the "Planting forFood and Jobs" campaign.It is designed for use by Agricultural Extension Agents and other farmers who can equally use to train their colleague farmers.

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1.0 INTRODUCTION

Botanical name: Allium cepa

Onion (*Allium cepa*) originated from Central Asia, possibly Iran and Pakistan. It was first grown in Ghana at Bugri, near Bawku and from there it spread to other parts of the Northern and Upper regions of Ghana.

Onion belongs to the family, Alliaceae. It is an annual. The bulbs are round in shape and consist of thickened bases of leaves attached to a small conical stem. The bulbs vary from flat to round in shape. The leaves are long, long, cylindical and hollow, often bluish in colour. The flowers are small in terminal umbel and corolla colour is often greenish white.

It is grown by smallholder farmers in more than 100 tropical and subtropical countries. Onion is one of the widely consumed vegetables in Ghana; it adds essential vitamins and minerals to our food daily. Onion also has anti-oxidant properties and industrial use.



Typical Onion Farm

2.0 GROWING REQUIREMENTS

Select well drained soil on a gentle slope with a pH of 5.0-7.0 (slightly acidic to neutral)onion require sunny, semi-tropic or tropical conditions and annual rainfall of between 600mm to 1,250mm. Low humidity will result in bad fruit set due to dropping of flower buds. The ideal temperature for good growth is between 18-32°C.

3.0 SITE SELECTION

- Select sites easily accessible by vehicles and other farm machines.
- Select sites located close to a reliable source of quality water.
- Select an open site with a deep, well-drained sandy loam soil or clay loam soil.
- Choose soils with a pH range of 5 7.0.
- Choose sites with annual rainfall of between 300-600mm well distributed throughout the year.
- Site should have gentle slope, ideally land with 1-2% inclination
- Site must have a temperature range from 24-32°C.
- Avoid sandy and heavy clay soils. (Clay soils have poor drainage capacity and hence prone to water-logging.)
- Avoid sites previously cropped with plants in the same family as onion e.g. garlic, shallots, leeks etc.

4.0 SEED/VARIETALSELECTION

Use certified, high-yielding onion seeds from recommended Agro - Input dealers. Decision on which variety to cultivate must be based on target market.

Good Quality onion seeds must have the following characteristics:

- Virus and disease resistant
- High germination percentage i.e. between 95-100%
- No pest or mechanical damage.
- No foreign matter e.g. weeds seeds, dead insects, stones etc.

Well packaged and properly labelled. The Labels should provide the following information:

- Variety
- Date of packaging
- Percentage germination
- Percentage purity
- Seed treatment
- Net weight

4.1 Nursery Establishment

Determining a good nursery site:

- Nursery must be located near a good permanent source of water.
- The nursery should be located about 20 meters away from pepper, tomato and garden egg plants to prevent transmission of diseases to the seedlings.
- The site should be well drained and free from troublesome weeds like (nut-grass and spear grass).
- Good sanitation must be practiced at the nursery. (All trash must be burnt between each production cycle.)
- The nursery must be located close to the farm.

Seedbed Preparation

Steps in preparing a proper seedbed:

- Prepare seed bed by digging 15 cm deep and breaking up the lumps into fine tilth.
- Raise the bed for about 15-20cm above the ground level to allow good drainage.
- Make sure the surface of the bed is smooth and remove all stones, roots, and weeds.
- Bed size should be 1m wide by any convenient length.
- Sterilize the soil by heaping dry grass on it and spot burn to control most soil borne diseases and pests.
- If the area has been continuously cropped spread one bucket of well-decomposed animal manure (poultry manure or cow dung) on a bed of size 1m×10m.
- Mix soil and manure, then water thoroughly and leave for one week before nursing.
- For one hectare plot an area of 71.5 square meters may be needed for the nursery. This area should be divided into four beds 1m×10m each. Leave an alley of 0.5m wide between beds and at the ends of the beds to allow for easy movement within and around beds.

5.0 LAND PREPARATION

- Plough across the slope to a depth of 20-30cm and harrow to a fine tilth (double plough if necessary).
- Incorporate well decomposed poultry manure at the rate of 20-30ton/ha at land preparation preferably between the first and second ploughing. In the absence of poultry

manure, apply cow dung or other animal droppings at a rate of 30-40ton/ha. This should be ploughed in 4-5weeks before planting (NB: spot or row application can also be done).

• In low lying areas plant onion on ridges. Create ridges of 100 cm width and 15 cm height. Distant between ridges should be 60 cm apart.

5.1 Germination test

- Sow fifty (50) onion seeds in a germination tray or a small nursery bed
- Place the tray in a warm area and keep it moist.
- Between 5-8 days count all seeds that germinate for cayenne and 8-12 days for scotch bonnet and cherry pepper seeds,
- Late germinators are weak seeds, reject them.
- Determine the viability rate (germination percentage) by dividing the number of seeds that germinated by number of seeds sown (50) and multiply by 100.
- Do it in triplicate and take the average.
- The germination percentage is good if test results show 85% and above.

Alternatively conduct a floating test to isolate good seeds from bad seeds.

- Pour seeds into a basin half-full of water
- Discard seeds that float on the surface of water. They are considered bad seed .Seeds that remains under water are considered good seed and can be nursed.

5.2 Nursery Management

- Soak seeds in clean water for two hours and dry before seeding to improve germination.
- Raise seedlings in the nursery to ensure maximum seed germination and quality planting materials.
- For farmer saved seeds, treat with recommended seed dressing or hot water at 50°C for 25mins in a water bath before sowing. (NB: seeds from certified sources are pre-treated).
- Raise seedlings in seed trays, boxes or on seed beds. Seedlings raised in trays normally have a minimum 95% establishment rate in the field since they are transplanted with the medium-root block. It is suitable under unfavourable weather conditions such as rainy seasons and dry spells.
- It is highly recommended to raise all seedlings under protected structures such as net houses or tunnels (inset image of a tunnel to illustrate what a nursery tunnel is)before they reach the hardening stage.

- Hand pick weeds as and when necessary
- Rogue out slow growing, etiolated, diseased and malformed seedlings

Hardening-off

Harden-off seedlings 5-9 days before transplanting by withholding water and increasing exposure to sunlight (partial removal of shade).

Transplanting

- a. Transplant early in the morning, on a cloudy day or late afternoon. This is usually after 3 to 4 weeks in the nursery or transplant seedlings when they attain 5-true leaf stage.
- b. If it is done in the hot afternoon, then heavy irrigation is recommended just after transplanting.
- c. Adopt the recommended spacing depending on variety. See table below for planting spacing for some varieties.
- d. Water seedlings very well 2 to 3 hours prior to transplanting.
- e. Set seedlings in the transplanting hole to the seedlings' soil level and firm the base.
- f. Irrigate immediately after transplanting (even if it has just rain before the transplanting begins) in order to establish good root soil contact. Thereafter, irrigate frequently until seedlings are established.

Transplanting Procedure

- Harden seedling 4-5 days before transplanting. This is done by withholding water and exposing them to strong sunlight by removing shade between 11.0am and 2.00pm.
- Start transplanting 28 days after germination.
- Water seedling very well the day before transplanting.
- Transplanting early in the morning or late in the evening or when the weather is dull.
- The ideal seedling for transplanting should be stocky with 5-6 leaves, disease-free, having lots of roots, succulent and without flower buds.
- Transplanting younger seedling can result in considerable loss due to cricket damage.
- Dig a hole deep enough to cover the root and firm soil well around the roots.

Raising seedlings Sowing seeds on nursery bed

- Make rows of 15cm apart and 0.5cm deep on seed bed
- Drill seeds ensuring that no seed rests on another
- Cover thinly with sterilized soil
- Water carefully with a watering can or hose fitted with a fine rose
- Treat seed bed with recommended insecticide to prevent removal of seed by ants and other pests
- Mulch bed thinly with dry grass, straw or plastic film until seeds emerge
- Ensure seed bed is kept moist by watering lightly as and when necessary, preferably in the morning and evening

Sowing seeds in Nursery Trays

- a) Use 50-90-hole seed tray.
- b) Fill the seedling tray holes with a sterilized and well-drained fertile medium such as potting mix, coco peat or carbonated rice husk, compost.
- c) Place a seed in each cell at about 0.5 cm deep and cover with media
- d) Cover the holes with a thin layer of the medium.
- e) Water immediately and every morning or as needed using a fine sprinkler (overhead misting systems, watering can, well calibrated Knapsack to give shower etc)
- f) After seeding, cover seed tray with cocopeat, or vermiculite or newsprints to enhance germination.
- g) Place the trays on raised areas such as benches in a sheltered place
- h) Seeds should emerge within 5-7 days depending on the variety

Post-emergence care of seedlings

- Seedlings emerge 5-6 days after sowing. But in the scotch bonnets, emergence can be delayed for up to 9 days.
- Remove mulch as soon as seedlings begin to emerge
- Erect a light shade over the seedlings using palm fronds, dry unseeded grass, dark saran cloth, mosquito net or floating row cover (Lutracil) over a wooden, metal or other frame.
- Spray appropriate pesticides to prevent pest and disease damage where necessary
- Keep soil moist but not wet. Water preferably in the morning.
- prick out seedlings 10-12 days after emergence, if overcrowded.

Spacing for onion varieties

Between rows	Within rows		
30cm	7.5 cm		
30cm	12.5 cm		
40cm	7.5 cm		
40cm	12.5 cm		



Onion farm with good spacing



Bawku red

Texas granoRed creole

Soil Fertility Management

Conduct soil test to determine fertility status and adjust fertilizer recommendations rates to meet the crop's nutrients requirements.

At flowering, side dress with 0.003kg (one crown cap) of NPK per plant of Potassium nitrate

6.0 FERTILIZER APPLICATION

6.1 Inorganic fertilizers (Option 1)

a. The major nutrients required are 102 kg/ha of N, 41 kg/ha of P_2O_5 and 112 kg/ha of K_2O .Compost may be applied at the rate of 2.5tons/ha 3 weeks before planting.

6.2 Inorganic fertilizers (Option 2)

Type of Fertilizer	Time of application	Rate	Mode of application	Placement point
NPK 15-15-15 (solution-1 milk tin to 15liters of water)	At transplanting	1 milk tin/ plant	Starter	Base of plant
NPK 15-15-15	10-14 days after trans-planting	6g/plant (2 crown caps)	Side dressing	5cm from plant
Sulphate of Ammonia	Flowering stage	3g/plant (1 crown cap)	Side dressing	5cm from plant
Potassium nitrate	3 weeks after flowering	1.5g/plant (1/2 crown cap)	Side dressing	5cm from plant
Foliar fertilizers	1, 3 and 5 weeks after flowering	As recom- mended by the manufacturer	Sprayon foliage	On leaves

6.3 Organic fertilizers:

6.3.1 Farmyard manure

- Apply poultry manure at 20 t ha⁻¹ or cattle manure at 40t ha⁻¹ before planting or as side dressing.
- Depending on the availability of resources half rate of NPK and farmyard manure can be used.

6.4 Irrigation

Provide supplementary irrigation to maintain a good moisture level throughout the growth period

- Water plants the day after transplanting using furrow, drips sprinkler or spot irrigation.
- Irrigate when the soil is half wet or when plants start to show signs of wilt.

7.0 WEED CONTROL/MANAGEMENT

- Control weeds by hoeing before plants are one month old in the field.
- Weed 2-3 weeks after transplanting.
- At each weeding, earth-up around the stems to make plants strong to withstand lodging.
- Repeat weeding every 3 weeks or weed when necessary.
- Mulching can be done to control weeds.

Weed timely to avoid drastic yield reduction as a result of weed competition. Onion is propagated from seeds. Seeds are nursed in a seed box or other containers and later, transplanted onto the field. Seedlings raised in containers are transplanted onto the field at 5 to 8 weeks (longest leaf about 15cm).Plant 2kg-4kg of seeds per hectare.

7.1 PESTS & DISEASES MANAGEMENT

(a) Insect pest of onion

(i) **Thrips**(*thripstabaci*)– These are the most serious pest of onions. They pierce and suck the sap which results in twisting of the leaves.

Signs and Symptoms

- Silvery spots and patches on leaves
- Excreta of thrips visible as small black dot on leaves



Silvery patches on leaves

Thrips damage

Management

Prevention

- Remove, dry and burn old material from the field as well as alternate host plants which includes many types of weed (e.g. nutgrass, speargrass and *Musa* spp.)
- Raise seedlings in thrip free region so that seedlings are not carrying the pest
- Intercrop onions with carrots which repel thrips
- Avoid planting onions near and existing infested fields

Monitoring

- Scout field regularly starting at the 4-th leaf stage, check spaces between newly emerged leaves, stem and inner neck of the onions for signs of the pest
- Look for silvery leaf spots and patches and excreta of thrips visible as small black dots on the leaves
- Inspect seedlings when transplanting for any possible thrips infestation on leaf folds
- Use yellow sticky trap as monitoring device

Control

- Encourage predator activities to reduce thrips population e.g spiders and predatory mites
- Spray with Cypermethrin +Dimethoate products at the rate of 60-80g/L
- Spray Lambda–Cyhalothrin based products at a rate of 35-40mls/15Lof water

(ii) Cutworm (*Agrotisipsilon, A. segetum*): Cutworms chew through plant stems at the base. They primarily feed on roots and foliage of young plants and can cut off the plant from underneath the soil. Severe damage causes the upper part of the plant to shrivel and die.

Signs and Symptom

- External feeding on leaves by young caterpillars results in the presence of timely round window panes
- Feeding on the leaves, stalks and stems results in falling leaves
- Small holes in the stem or cut stems
- Damage on the root's ranges from small and superficial to very large deep holes





Cutworm

Cutworm damage on onion



Cutworm damage

Management

Prevention

- Practice farm sanitation. Keep nursery and field free of weeds and ratoon crops that may act as alternate host and reservoirs to the cutworm
- Remove and burn all crop residues before planting
- Intercrop onion with mustard at every 15 rows of onion as a trap crop
- Conserve natural enemies such as spiders, parasitic wasp, praying mantis, ants and birds by minimizing the use of insecticides.Do not spray insecticides when natural enemy numbers are high in the field.

Monitoring

- Start monitoring at seedling stage, look for dry wilted and discolored onion plants. Infestations may show in small restricted areas. If moths are present, scout for presence of larvae
- Check daily for caterpillars at base of the plants and inside the leaves. Look for stout bodied green to dark-brown caterpillars (5-10mm) with stripped margins at the back

Control

- Remove and destroy egg masses and caterpillars from plant and crush them
- Flood the area to suffocate the larvae in the soil if you are growing onion in deep soils
- Spray Bt based products
- Spray Lambda–Cyhalothrin based products at a rate of 35-40mls/15Lof water

(b) Diseases

(i) **Basal rot:** Fusarium basal rot is caused by *Fusariumoxysporum* f. sp. cepae, a soil-borne pathogen that can survive in soil for many years as chlamydospores or as a saprophyte on crop residues. The pathogen infects the onion root and basal plate areacausing a dry rot.

Signs and Symptoms

- Curving, yellow or necrotic leaves. Necrosis begins at leaf tips and moves downward
- Wilting plants, infected bulbs may be brown and watery with rot spreading from stem plate to basal leaves and stem plates may have brown discoloration.





Basal rot damage

Management

- Regular cleaning of equipment. Practice a four-year or longer rotation to non-hosts such as maize
- Transplant into disease free areas with adequate drainage

Basal rot damage

(ii) Downy mildew: Downy mildew is characterized by pale–green, yellowish to brownish areas of irregular size and shape (oval to cylindrical) on infected leaves or seed stalks. It appears like tread- like powdery substance on the leaves and leaf tips which collapses

Signs and Symptoms

- Light green/yellow round, angular spots on leaves, particularly older leaves
- Spots merge and turn brown sometimes becoming soft and slimy
- White cotton-like growth develops on the underside of leaves in cool and humid conditions





Downey mildew damage on onion

Management

Prevention

- Do not plant crop next to or downwind of infected fields since downey mildew spores spread through wind
- Keep fields free from weeds, particularly those in the daisy or sunflower family as these species are hosts of downey mildew. Removing weeds also improves aeration (the pathogen favours wet environments)
- During crop growth, remove any infected plants immediately and destroy by burning or burying deeply
- After harvest, collect plant remains and burn or bury deeply (at least 1m)

Monitoring

• Inspect crop weekly for symptoms. The disease starts from lower mature leaves and spreads progressively to younger leaves

Control

- Remove highly infected lower leaves to reduce disease spread
- Downey mildew does not survive on dead plants/crop debris so there is no need to burn or plough in crop remains
- (iii) Damping Off : It is a rot that occurs at soil level of the young crop (seedling stage). The disease is caused by fungi.

Signs and Symptoms

- Wilting, collapse and death of seedlings
- Dark shriveled stems around the base and brown rotten roots



Damping Off damage on onion

Management Prevention

- Solarize the soil of nursery beds before planting using clear plastic to sterilize. If the problem persists, consider changing nursery sites
- Clean or disinfect tools (tillers, cutlasses and hoes) using 10% bleach solution
- Sow seeds thinly to ensure aeration. Plant in raised beds to maintain good drainage and avoid over watering

Monitoring

- Monitor nursery daily for symptoms such as wilting, collapse and death of seedlings
- Look for seedlings with dark shrivelled stems around the base and brown rotten roots

Control

- Remove infected plants as soon as symptoms appear and destroy way from nursery
- Avoid excessive fertilization at nursery to reduce damping off
- Treat seed with Mancozeb 800g/kg, Folpet 500g/lat 3-4g/kg

Purple blotch

The disease is favoured by high humidity and can occur as a secondary infection on plants damaged by other pests, e.g. onion thrips.

The fungus survives on crop debris in the soil for at least a year. Spores of the fungus are produced in the brown to purple blotches and are spread by wind and rain splash.

Signs and Symptoms

- White lesions on leaves or stalks developing into oval brown to purplish areas (blotches)whichlater merge together as they enlarge and become several centimeters long
- Light and rings may appear around the blotches and pin-head sized dark brown to blackdotsmay appear within the blotches
- Leaf tips are commonly affected. They blacken, hang down, wither and die



Oval, purple spots on onion Leaf tip dieback

Management

Prevention

- If planting your own stored bulbs, ensure that they have been stored in dry aerated stores and that any infected bulbs have been disposed off
- Plant the seedlings or bulbs with proper spacing: 10x 10 cm for bulb crop. This will help prevent the buildup of humid conditions favoured by the disease

Monitoring

• More attention should be paid to older leaves as they are more commonly affected than younger tissues

Control

Remove infected plant parts and dispose by burning

8.0 HARVESTING

Onions mature 80-105 days after transplanting. The leaves of mature bulb topple over from the neck when leaves are still green. The leaves then gradually turn yellow and ultimately brown. Harvest the bulb by lifting and dry them in the sun for about a week





Matured onion ready for harvesting

8.1 Yield:

Onion yields about 15-20tons /ha depending on variety and adherence to good agricultural practice.

The yield is very much dependent on the climate during the growing season and very unpredictable. Very often the yield does not exceed 0.9mt but when the weather is cool during the night and warm during the day, higher yields can be obtained with fertilizers.

8.2 Packaging and storage:

Clean harvested bulb gently without removing or damaging outer protective coat. Dry the bulbs in a warm airy place under shade until the leaves have shriveled. Cut the dry leaves leaving about2cm to avoid entry of decay organisms. Remove immature and soft ones and store only healthy and attractive bulbs. Store onions in a shaded and well ventilated room

8.3 Grade and package:

Grade onions according to sizes and Package onion in 10, 20 and 50kg jute sacks for transport to the market or for storage.

8.4 Marketing

Onion will continue to deliver good value to the smallholder farmers involved in its production. There are major markets where onions can be sold for income. It can also be dried powered or processed into paste.