

ONION CULTIVATION: Seedling Sowing, Care, and Transplanting Procedures



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INTRODUCTION: ONIONS AND THE CARIBBEAN

The all-purpose and very popular onion is a well-established staple in Caribbean kitchens and worldwide. Onions are versatile, and can be adapted in a variety of dishes through baking, boiling, braising, grilling, frying, roasting, sautéing, or as a raw ingredient. While a staple in Caribbean households, onions are still mostly imported into the Caribbean – in fact, over 8,000 tonnes of onions, mainly from the Netherlands, USA and Spain, are imported annually into the Caribbean. Aiming to reduce the importation bill of Caribbean states through savings in import substitution, PROPEL has been working with various local partners to facilitate the introduction and further propagation of this crop for cultivation in Jamaica, Guyana, St. Lucia, Barbados, and Dominica. While the choice of direct seeding or transplanting is left to the producer, PROPEL has introduced onion transplanting as a viable choice for those interested in cultivating onions. There are a variety of benefits that

can be derived from the transplantation of onions; for instance, seedlings afford producers more control and predictable results in the field, and may provide a huge jumpstart on the season, as they mature sooner, giving producers an earlier harvest (contingent on planting conditions). Further, transplants can offer producers a great boost with subsequent planting per season, and ensure a continuous harvest. Most importantly, transplants can be more resistant to insect and other pest pressure due to their stronger and more mature standing when they are put on the field for the first time. While transplanting does require up-front investments in time, inputs, and labour, it has nonetheless been demonstrated as a viable, cost-efficient alternative to producers. Advances in technology related to its production, such as the introduction of vacuum seeders and seedling transplanters have further contributed to reductions in the time and cost associated with transplanting -- further enabling the successful adaptation of this practice for local or commercial production of onions. Within this context, this small guide is introduced by PROPEL as a starting point in the sowing and management of onion seedlings.

SEED QUALITY

Onions are classified as short, intermediate or long-day types. Each classification represents the hours of sunlight (day length) which will trigger bulb formation. The day length for short, intermediate and long days are less than **12 hours**, **12-14 hours**, and greater than **14 hours**, respectively.



The mean monthly sunshine hours between March 12 and September 26 are 12.7, and the onions best suited for this period are the intermediate types. Short day onions will produce better between September 27 and March 11, with a mean of 11.5 sunshine hours. Daily sunshine hours in the Caribbean do not exceed 14 hours, and thus long-day onions should not be grown in the Caribbean.

Mercedes, Arad, Superex and the Grano type onions are recommended for cultivating between mid-October and December. For March/April planting, Orlando, Caballero, Yellow Granex hybrid and Noam are the varieties that will produce good yields.

SEED MANAGEMENT



Controlling temperature and relative humidity is very important when storing seeds. Humidity should not exceed **40-50%**, while temperature should be optimally kept at **5 degrees Celsius**. The best place to store seeds is in the fridge; however, in the absence of a fridge, store in a cool, dry place with relative low humidity. Seeds should not be left in the greenhouse or in places where they are exposed. When opening a package, the entire package should be used if possible. Failure to control relative humidity and temperature will result in reduction in germination percentage (how many seeds will germinate), will increase the time needed for seeds to germinate once planted, and can decrease the vigour of the produced seedlings.

MATERIAL TO BE USED IN TRAYS: GROWING MEDIUM

The best materials to use when preparing growing medium for seedlings are: **Pro-mix, coir dust, or peat moss.**

The texture of the mix is an important factor to take into consideration, as excessive coarse materials in the mix can impede the seedling from shooting straight up. At PROPEL, a mixture composed of peat moss, perlite, and vermiculite has proven to be an effective potting mix, as it aids in aeration and drainage.



HOW TO SEED: THE SOWING PROCESS



Seeding can be done by hand or with use of an automated seeder. A simple machine, such as the vacuum seeder, can sow **50-100 trays per hour.** By hand, it would take an individual approximately 25 minutes to seed a 512-cell tray. For large scale production, it is recommended that vacuum seeders or a similar sowing machine are procured.



PRODUCTION CONTAINERS

Containers come as Multi-cell molded polystyrene or vacuum-formed plastic trays. The number of cells varies depending on the size of cells. Trays with 1 in² cell size will house 240 seedlings, while trays with 1.50 in² cell sizes will house 128 seedlings.



When filling the trays, the potting medium should be moist. Each tray cell should be filled to the top, ensuring that corners of trays are filled. Apply light pressure to each plug to take out excessive air space and possible air bubbles. An empty tray can be used as an overlay to depress media in cells. There are two methods that can be used to prepare the trays. If using secondary trays or reused trays, the following steps should be taken prior to reuse: 1) wash; 2) sterilize using a 10% bleach solution (1 part bleach to 9 parts water), and 3) store in a cool dark dry place until needed.



METHOD 1: TRENCHING THE TRAYS

After filling the tray to completion, each plug should be “trenched” to create a hole/depression where the seed is going to be housed. This can be done using a thin stick such as the one shown in picture. The depth of the created hole in each plug is dependent on the type of seed being used. Generally, a **hole with depth 2.5 times the diameter of the seed** should be created to house the

seed.

METHOD 2: DEPRESSION METHOD

Take an empty seed tray and put it on top of seed tray that is 2/3 to 3/4 filled with potting medium, then press down lightly. This will create a depression for sowing of the seed(s). Place seeds, then cover the tray with growing medium until it reaches the top.



SOWING THE SEEDS

Manually, sowing should be done in comfortable surroundings by a patient person. One seed should be used per cell, although in cases where seeds have poor germination, or variable viability, 2-3 seeds per cell can increase overall germination numbers. Some separation of seedlings may be needed in such cases during transplanting. Once seeds are sown, trays should be covered with vermiculite/media. The newly sowed trays should be immediately irrigated, and frequently given water until germination. Once germinated, avoid overwatering plants.

GERMINATION

A germination chamber can be improvised by covering the trays to help germination along. Enclosing trays in a black garbage plastic bag, place in a warm dark area for three days. While not necessary, the use of germination chambers can help in faster germination in some cases.



WATER MANAGEMENT

It is recommended that a water analysis be undertaken at the start of the season for all water sources being used in seedling and crop cultivation (chemical and pathogen level). It is important to note that water should only be applied to germinated seedlings when necessary: the media should be kept moist but not continually wet. Water frequency will depend on cell type, growing media, production house conditions, and weather.

WAITING PERIOD FOR TRANSPLANTING AND BEST CULTURAL PRACTICES

It is recommended that seedlings be kept in trays until **3-4 true leaves** have emerged. This will take place approximately **4-6 weeks** from sowing.



GROWING OUT OF THE SEEDS

Seed trays should be examined at least twice a day. Once seeds germinate, trays should be placed on racks, in a growout area. Seedlings should be fed and nurtured so that they can develop cleanly and vigorously. For instance, a 20-20-20 blended fertilizer can be used at a rate of one teaspoon per gallon of water, twice a week, starting when seedlings get 2 leaves, until transplanted.

CULTURAL MANAGEMENT

All infected plants or plant tissues should be rogued. Good air movement should be promoted through proper ventilation (continuous air flow), with humidity levels below 85%. When watering the seedlings, water early in the day so as to leave the foliage dry overnight. Avoid over fertilizing seedlings with high nitrogen fertilizers, as this could result in the production of lush, succulent plant tissues that are prone to disease infestations. Never extend sterile potting mixes with the inclusion of field soil or other local vegetative materials that have not been properly composted or sterilized, as this can introduce disease to the seedlings. It is highly recommended that producers avoid reusing the germination mix; however, if such cannot be avoided, the material should be thoroughly sterilized prior to reuse.





HARDENING OFF

Hardening off transplants is simply getting them used to being outdoors instead of in a shade house/greenhouse. To harden off your seedlings, take your trays outside into an open area. Set them outside in partial shade, protected from wind, for 2 to 4 hours for the first day. Over the next 4 to 6 days gradually increase exposure to sun until you reach a full day. By the fourth day, drench seedlings with a high phosphate soluble fertilizer.



LAND PREPARATION

Land preparation encompasses the activities taken to produce a soil condition that is suitable to optimal crop production. This involves land clearing, ploughing, harrowing, rotovating, rolling, and bed-shaping. Drains should also be constructed to prevent waterlogging of fields.

For onions, land preparation is very critical, and must result in a soil that is crumbly and of fine tilth. Beds must be **flat** and at least **15-20 cm (6-8 in) high**. Bed height should be lower for furrow irrigation. With clearing, ploughing and harrowing, weeds are destroyed. This is very important, as onions do not compete well with weeds. Although not common with onion cultiva-





tion, putting down a layer of mulch can help keep weeds in check and conserve water.

There should be sufficient time between land preparation and planting so that the soil is properly weathered. During this period, the stale seed bed technique should be practiced. Before you plant your seedlings, work compost or fertilizer into your soil, then smooth the surface.

STALE SEED BED TECHNIQUE

This cultural practice, if properly carried out, shows great potential for crops such as onions, which are known to compete very poorly with weeds.

The stale seed bed is a weed management technique that generally involves the preparation of a seedbed in which weed seeds in the shallow soil zone germinate naturally or via pre-irrigation and then emerge. The emerged weeds are then killed with minimum soil disturbance or herbicides as necessary, giving an advantage to the intended crop, which is promptly seeded or transplanted into that mostly weed-free soil.



HOW TO PREPARE A STALE SEED BED:¹

The stale seed bed technique should be used to prepare beds some weeks prior to transplanting the crops. It is important that this process is well coordinated for maximum results (lowest amount of emerging weeds after crop establishment).



Weeds must be tilled/howed or otherwise destroyed before they themselves can create new seeds. While a 7-10 day period is recommended here as general guidance, it is NOT a strict timeline; if weed seedlings emerge and grow to the third leaf stage faster than the 7-10 period, then proceed to destroy weeds. To cultivate the weeds do not till the soil deeper than **3 to 4 cm** to avoid bringing weed seed from deep in the soil. Use a rake, not a shovel!



General guidelines:

1. The area should be smooth and ready to plant.
2. Irrigate area or wait for rain to germinate weeds.
3. Once weed seedlings have grown, perform shallow tillage, or spray a non-selective herbicide to destroy weeds.
4. If necessary, repeat steps 2 and 3 before planting.

Please note that weeds that take a long time to grow may not be managed well with this technique, which depends on soil conditions such as moisture and temperature.

¹Finnemore, Steve. *Stale seedbed preparation*. UC Davis University of California, horticulture.ucdavis.edu/main/FennimoreSeedbedPrep.pdf.



10 GOLDEN RULES OF TRANSPLANTING

1. Seedlings must be kept in a cool and shaded area until they are ready to be hardened.

2. Transplanting should be done early in the morning, or late in the afternoon.

3. Soil moisture should be at field capacity, not flooded.

4. Roots must be wetted just ahead of transplanting.

5. Seedlings should be transplanted to field at the depth similar to what obtained in the trays. Spacing and plant population are similar to that for direct seeding.

6. To transfer the seedling, lay the plant on your index finger, and push your finger with the onion on it about two inches into the soil.





7. Lift up your finger and the onion just a bit (this gets the roots headed in the right direction - seedlings must be planted straight and not root bound), then slide your finger out of the hole and firm the soil around the plant. (You can also use a stick/ device to make the holes for the plants).



8. Seedlings must be irrigated immediately after transplanting.

9. Irrigation should occur for a couple of days following transplanting in high frequency, short intervals, and small volumes. One week after transplanting, irrigation should be undertaken in low frequency, longer intervals, and larger volumes.

10. Fertilization (or, if fertigation technique is used) should start within 2-3 days, after the development of new roots.



QUICK FACTS SHEET

Time of Production & Seed Type

March – September: intermediate onions (e.g., Orlando, Caballero, Yellow Granex hybrid and Noam)

September – March: short-day onions (e.g., Mercedes, Arad, Superex and the Grano)

Seed Storage

Keep refrigerated at 5 °C; humidity 40-50% maximum.

Materials for growing medium

Coir Dust, vermiculite & Peat Moss

Sowing Process

Manual or automated (vacuum seeder: use one seed per cell, except in cases where seeds suffer from poor germination; in such cases, use 2-3 seeds per cell).

Water management

Potting medium should be kept moist at all times, but not continuously wet. Frequently irrigate until seeds germinate, but avoid overwatering plants once germinated. Water early in the morning to avoid leaving plants wet overnight. Water seedlings for 3-4 days consecutively every week until transplanted, and water for the remaining days of the week.

Application of nutrients

Applying soluble fertilizers suitable for seedling production such as 20:20:20 (Bluetrex) and Miracle Grow. Use low dosages so as to prevent any damages to seedling roots or foliage. Recommended dosage is 5 ml of fertilizer to 1 litre of water.

Hardening off seedlings

Start by exposing seedlings to 2 to 4 hours of sunlight (protected from wind), then gradually increase sunlight exposure over the next 4 to 6 days. Remove trays from sun when the intensity becomes too hot to encourage evapo-transpiration and drying out the medium (pro-mix).

Waiting period before transplanting

Wait until seedlings sprout 3-4 true leaves (approximately 4-6 weeks after sowing).

Cultural management

Remove infected plants or plant tissue; ensure proper ventilation; keep humidity levels below 85%; avoid over-fertilization with nitrogen; do not extend potting mix with field soil.

Land preparation

Land clearing, ploughing, harrowing, rotovating, rolling, and bed-shaping. Drains should also be constructed to prevent waterlogging of fields. Beds must be **flat** and at least **15-20 cm (6-8 in) high**. Bed height should be lower for furrow irrigation. Work compost or fertilizer into the soil prior to transplanting, then smooth surface.





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