



Growing Pineapples in Guam

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Contents

Foreword	i
Introduction	1
Crop Cycle.....	2
Variety	3
Planting Material	4
Soil	4
Field Preparation and Layout	5
Plant Spacing.....	5
Mulching	5
Weed control	6
Fertilization.....	7
Irrigation	8
Harvesting	8
Fruit Handling.....	9
Stripping.....	10
Pruning.....	10
Pest Control.....	11
Safety	12
Forcing	12
References	13

Foreword

The original version of this publication was made available to the general public over 30 years ago. Much of the information it provided still applies today for successful production of pineapple on Guam.

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Foreword to the Original

The pineapple symbolizes the allure and romance of the South Seas. This theme can enhance the appeal of Pacific Islands, like Guam, which are developing visitor industries. This tropical fruit is prized by hotels where it is used in a variety of island dishes. Tour buses can visit the neat, orderly fields. The packaged fruit has the potential for being a popular gift item for departing tourists to take home to family and friends. This nutritious fruit, rich in Vitamin C, also can be marketed through roadside stands and grocery stores. Furthermore, the compact plants are largely resistant to damage by typhoons or tropical storms.

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Introduction

This bulletin is intended for farmers on Guam who are growing pineapple for the first time. It begins with a brief explanation of the basic cycle of a pineapple planting. Then, step by step, describes the techniques for growing a one-acre field of pineapples.

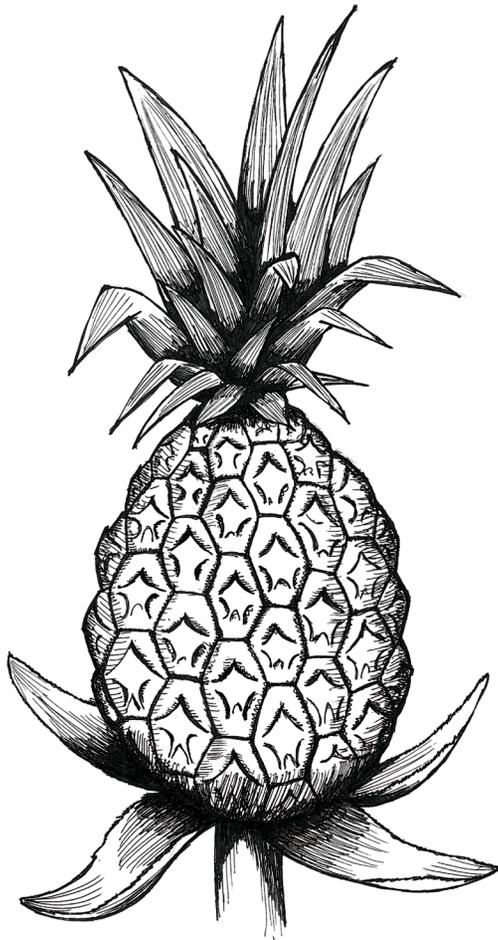


Fig. 1. A ripe pineapple.

Crop Cycle

A new pineapple planting, called a plant crop, characteristically requires 18-24 months until the first harvest. On Guam pineapples tend to ripen naturally May through July. For natural ripening, initial planting should occur between June and December. A technique called “forcing” is used by commercial growers to target desired harvest dates in which initial plantings may vary. After bearing a single fruit, usually in June, the mother or original plant gradually withers. A “sucker” or “shoot” then emerges to replace the fading mother plant. These suckers produce a single fruit 12-14 months after the first or plant crop harvest.

The second harvest is called the first “ratoon crop”. Ratoons are additional crops from the original planting. This process can be repeated with new suckers arising and in the following year a second ratoon is occasionally harvested, but more typically a crop cycle will include only the plant crop and first ratoon (Fig. 2). After the first ratoon, the planting is usually knocked down and the field replanted. Thus, each pineapple planting typically requires a cycle of 2 1/2-3 years. During this cycle, each plant produces two fruits. The size of the fruit diminishes with each ratoon but sweetness tends to increase. Established fields also produce new planting material with each fruit harvest. This material can be used for replanting or expanding production.

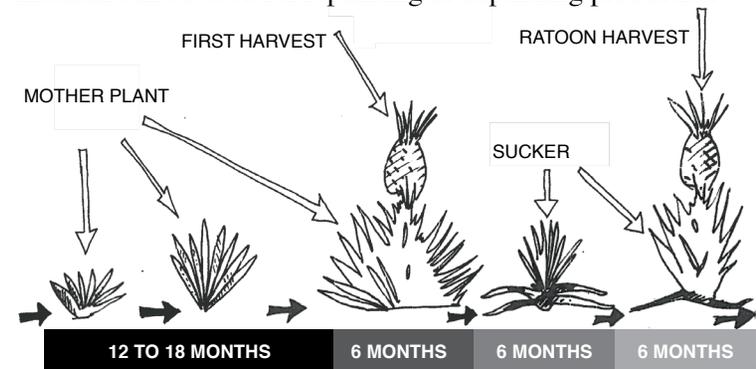


Fig. 2. The life of a typical pineapple planting is 2½- 3 years. During this time each plant produces a total of two fruit.

Variety

There are a handful of pineapple varieties that can be found on Guam. “Smooth” Cayenne or Hawaiian pineapple, as it is known in Guam, is the most important variety in commercial production throughout the world. It is called smooth because of its nearly spineless leaves and Cayenne for the area in South America where it originated. This variety is favored because of its large fruit that is equally suitable for the fresh market and canning. Smooth Cayenne is the focus of this publication.

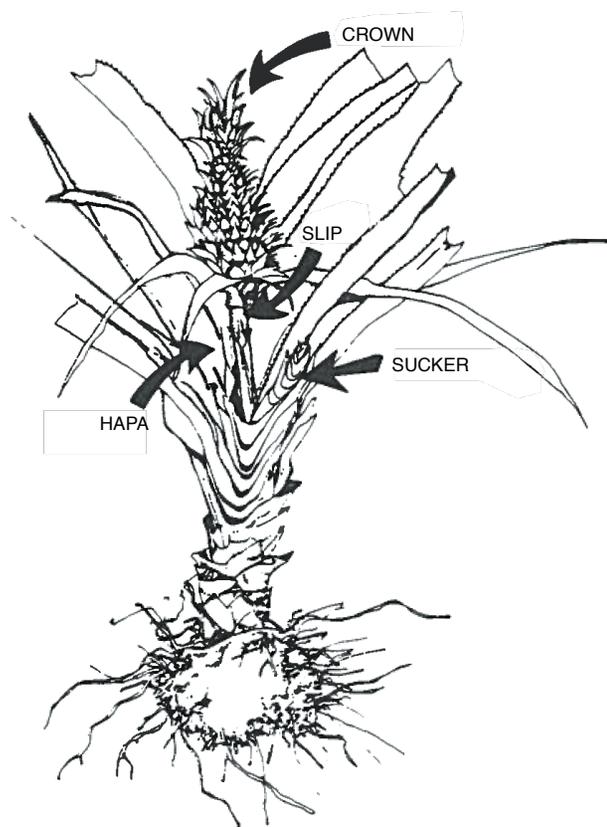


Fig. 3. Cross-section of a pineapple plant showing the four kinds of planting material.

Planting Material

There are four types of planting material: crowns, slips, suckers and hapas (Figs. 3 and 4). Crowns are the green leafy tops of the fruit. Slips are vegetative growths that develop on the stem of the fruit. Suckers emerge low on the mother plant. They produce the ratoon fruit, but excess ones can be used for planting material. Hapas are found between slips and suckers on the mother plant. The name comes from a Hawaiian word meaning ‘half’. As a planting material they are usually grouped with slips.

Slips are preferred for planting on Guam. They are sorted and planted according to size: small, medium, and large. This helps to insure uniform growth in the field.

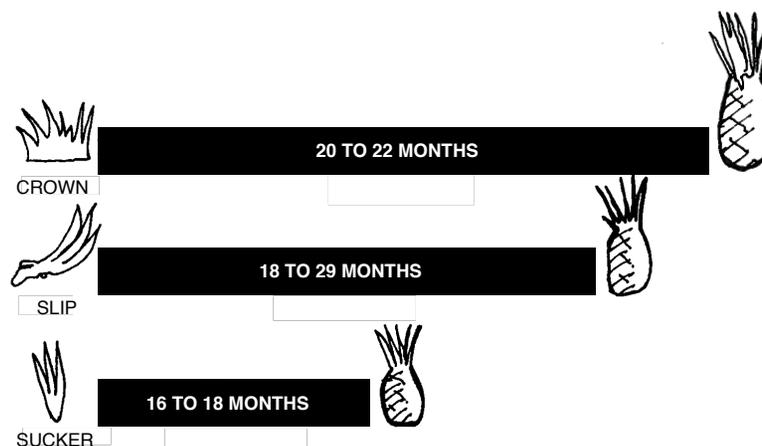


Fig. 4. Different pineapple planting materials result in different lengths of time required before harvest.

Soil

Most pineapple varieties prefer soils that have a pH within the range of 5.5-6.5, but can tolerate a pH range of 5.0-7.0. The planting site should be a sloping, well-drained area. For example, avoid areas where puddling occurs after a rain.

Field Preparation & Layout

Fields are typically deep plowed or subsoiled. This is followed by discing or rotary plowing. The final step is ridging or furrowing. The goal of this land preparation is to create a contoured field with raised beds. Contouring minimizes erosion and the raised beds lessen the likelihood of fungal rots.

When planning a field, roadways 10-12' wide should be laid out through and around the perimeter of the planting. Roadways can facilitate maintenance and harvesting. Particularly important is the perimeter road which can serve as a barrier for snails. Snails feed on pineapple roots, which results in loss of production.

Plant Spacing

There are basically two planting schemes: single and double rows. They are both illustrated in Fig. 5. The first scheme, with 3' between rows and 1' between plants, results in 14,520 plants per acre. The double row scheme, which is preferred, has a spacing of 3'x2'x1'. It results in 17,424 plants per acre.

The individual plants need very little space. When the plants are heavy with fruit, the closeness of their neighbors can prevent the fruit from toppling over. It is partially for this reason that pineapples are planted close together with a spacing of 1' or less along the row.

Mulching

Generally, pineapples are planted in beds that are covered with black plastic mulch.

Advantages of using plastic mulch are weed and erosion control and retention of soil moisture.

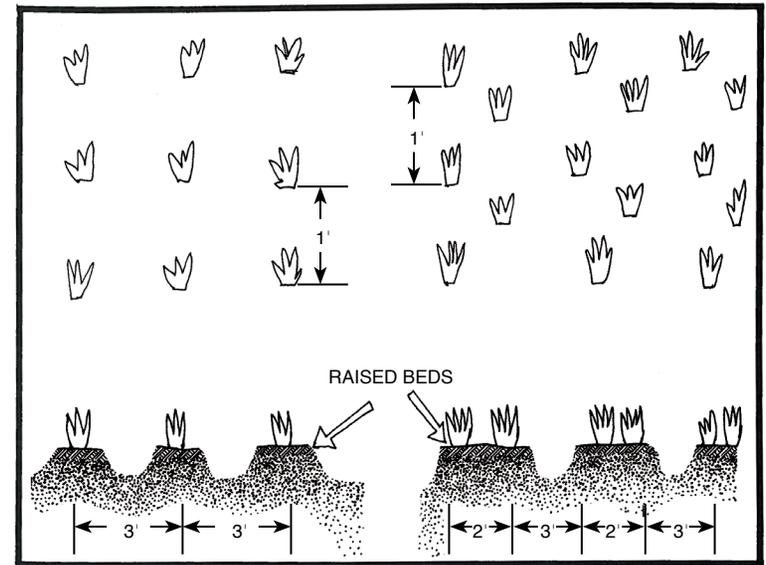


Fig. 5. The double row scheme has a spacing of three feet by 2' x 1', resulting in 17,424 plants per acre.

Weed Control

The best time to control weeds is before planting. A new field requires at least 18 months until the first harvest. During this period, weeds have ample opportunity to overtake the crop. Also, the sharp leaved plants are difficult to weed by hand. In other areas of the world, the use of herbicides legally registered for pineapple has proven to be an efficient control technique. When used correctly, they kill the weeds without harming the pineapple plants (Fig. 6).

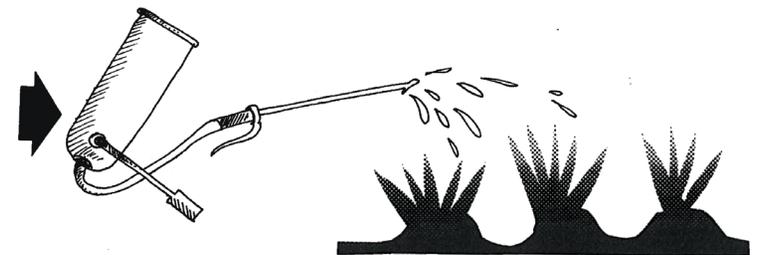


Fig. 6. Herbicides can be used for pineapple weed control.

To avoid contaminating the fruit, no herbicides are applied after flowering. Application can resume after the harvest as allowed by the pesticide label.

Before using an herbicide for the first time, it is advisable to carefully read the label and ensure the herbicide is registered for pineapple. It is also advisable to apply the herbicide to a small area to evaluate its effect. Ensure that a sprayer used for herbicides is designated for herbicides only. A separate sprayer should be used for applying insecticides or fungicides to crops. Serious crop damage can result.

Fertilization

Fertilizers, or plant foods, are applied in two stages, first, as a pre-plant application and then as a program of foliar sprays. Foliar fertilizer application should follow label recommendations to avoid potential leaf burn.

It is best to have soils tested to determine a more accurate pre-plant fertilizer amount. If no soil tests are available, the

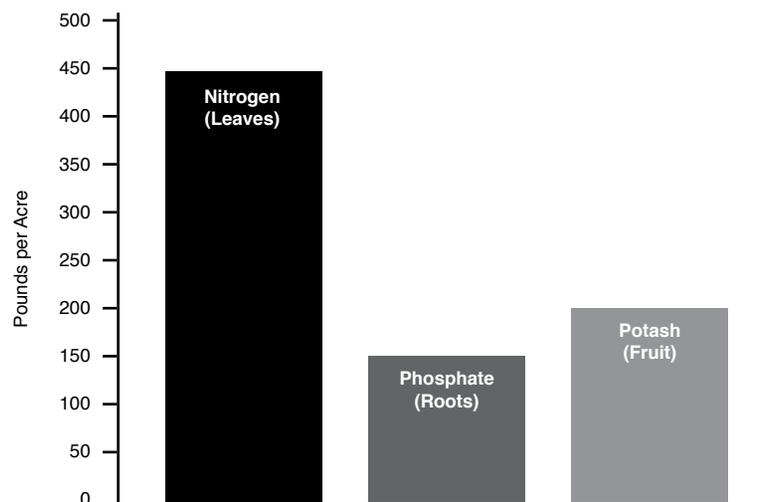


Fig. 7. A successful plant crop or first harvest requires large amounts of fertilizers, especially nitrogen fertilizers such as urea or ammonium sulfate.

recommended amount of pre-plant fertilizer for a single plant is 3/4 tablespoon of 10-20-20 or similar fertilizer. For an acre use 625 pounds.

Pineapple plants are slow to root and begin active growth. Applying additional fertilizers during this early period is a poor investment. After planting, most growers prefer to wait 3-4 months before beginning additional fertilizer applications. Once started, fertilizers are applied every 2-4 weeks or as the need arises. The goal is to maintain a dark green leaf color. This is accomplished by using nitrogen fertilizers such as urea or ammonium sulfate. This plant food is responsible for green vegetative growth. There is a need for nitrogen when the plants begin to gradually turn yellow. Guam soils are often low in micronutrients. This is particularly true for iron and zinc. Small quantities of these plant foods are usually added to fertilizer sprays. Follow recommended application amounts indicated on labels of all foliar fertilizers.

Pineapple plants prefer to take in their food through tiny buds at the base of the leaf or on the leaves themselves. This is why fertilizers are mixed in water and applied to the foliage.

The fertilizer applications are stopped when the plants begin to show signs of flowering. After the harvest, the sprays are resumed to promote growth in the ratoon suckers.

Irrigation

The pineapple is drought tolerant. At planting time, plants should receive immediate irrigation with enough water to moisten the soil. After establishment, apply sufficient water once every 3-4 days during dry periods. When rainfall is minimal, commercial fields should be irrigated at 5000-10,000 gallons per acre per week, and smaller fields, watering should occur at least once a week at 0.2-0.4 gallons per week per plant.

Harvesting

On Guam pineapples tend to ripen naturally from May through July. The ripening begins with a gold or yellow color developing at the base of the fruit. This gold color will gradually advance up the fruit. For fruit that will be transported to market, it is best to pick them when the lower one half to two thirds is a golden yellow (Fig. 8). For home consumption it might be desirable to wait until the fruit is almost completely yellow.

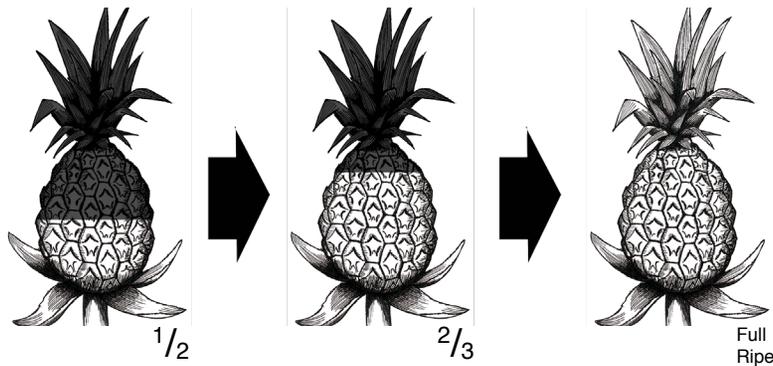


Fig. 8. Simple fractions, such as $\frac{1}{2}$ or $\frac{2}{3}$ ripe, are used to estimate the best time to pick the fruit.

The fruit is picked by grasping the crown and pushing down with a quick movement. It will easily snap off the fruit stem. A knife is not necessary in harvesting.

Fruit Handling

Care should be taken to avoid bruising the fruit while harvesting or transporting them to market. Bruises result in softened flesh with brown discolorations. Also bruising can cause the fruit to leak or ooze juice which will reduce salability and shelf-life.

When temporarily storing fruit on the farm, it is best to leave them in a cool, shaded area. For longer periods of time, it is advisable to refrigerate them at 45°F and 60% relative humidity.

Contrary to popular belief, pineapples do not require any sort of shelf ripening. They taste their best when eaten as soon as possible after harvesting.

Stripping

As the fruit matures, slips or leafy growths will develop on the fruit stem. Several weeks or months after the harvest, the slips and hapas are stripped and removed. The ideal time to do this is when the slip weighs 10-16 ounces as these slips make the best planting material. Slips can be easily removed with the fingers. The ones to be used for planting material are laid butt up on the plants in a dry well-ventilated area where they can dry or cure for a week or more. They are then gathered for planting. Slips that are too small, too big, or damaged can be discarded.

Even if the slips are not desired for planting, they should be stripped from the plants, as they are an unnecessary drain on the plant and will reduce the size of the ratoon fruit.

Slips and other planting material can be stored for several months, but should be kept in a dry, well-ventilated area away from sunlight.

Pruning

Pineapple plants tend to produce one or two, but sometimes more, suckers during the last stages of fruit development. The ideal number is one sucker per mother plant as this number results in the best ratoon fruit. If mother plants have a large number of suckers, it is advisable to prune off the extra suckers with a well-sharpened knife. It is best to leave the suckers that are lowest on the mother plants. These tend to be the most sturdy. If the pruned suckers are to be used for planting material, it is recommended that they be removed when their average weight is one pound.

Pest Control

Few insects or diseases attack pineapple. The tough leathery leaves are resistant to most pests, but there are five potential problems that growers should be aware of: fungal rots, mealy bugs (order - Hemiptera), nematodes (*Meloidogyne spp.*), snails and rodents.

There are basically two types of fungal rot: butt rot (*Ceratocystis paradoxa*) and heart rot (*Phytophthora spp.*). The former attacks planting material and the latter infects growing plants. Butt rot can be avoided by curing or drying new planting material for at least a week and/or dipping in a fungicide approved for use on pineapple.

Heart rot can be avoided by:

1. Planting in acid soils (pH between 5.0-6.9).
2. Planting on raised beds where the root-zone is well drained.
3. Avoiding getting soil into the heart of the plant.

Certain mealybugs are capable of infecting plants with a wilt.

Nematodes are microscopic worms that live in the soil. They get into the roots where they clog the passageways that transport food and water. Their activity in the root system causes the plants to suffer a “slow death.” When growing pineapples on new soil, nematodes are rarely a problem, but repeated planting on the same soil encourages their populations to build up to threatening levels. Plant materials with living roots that contain nematodes can introduce nematodes if planted in a new field.

African snails, slugs and rats are occasional pests. The snails attack young plants, and rats can damage ripening fruit. Commercial baits can be used for their control.

Safety

The needle sharp leaves of a pineapple plant pose a danger to field workers. Boots, long pants, long-sleeved shirts, gloves with wrist guards, and most important, eye protection are considered routine field clothing.

The danger is particularly acute for the eyes. Eyeglasses, sunglasses, or other eye protectors are essential for anyone working with pineapple plants.

Forcing

An important event in a pineapple plant’s life is when it switches its energies from producing leaves to developing a flower and fruit. This is known as “differentiation” or “kicking over.” Differentiation can occur naturally or be induced by chemical agents. Induced differentiation by chemical agents is called "forcing". Broadly speaking, on Guam, plants that are three feet tall and weigh five pounds or more will kick over naturally during December. Calcium carbide is a common chemical that can be used to stimulate a plant to kick over. One-half teaspoon is dropped into the heart of the plant where in the presence of water it dissolves and releases acetylene. This gas is absorbed and acts to induce flowering. As a management tool calcium carbide enables the grower to advance the time when his plants would normally flower and bear fruit.

More sophisticated forcing agents, such as Ethrel and SNA are now available. Their application requires precise dosages and careful sprayer calibration. Improper application can result in distorted, unmarketable fruit. For this reason growers are encouraged to be cautious if considering the use of forcing chemicals.

On Guam, pineapples tend to ripen naturally in May through July. As more farmers engage in production, an over supply

of pineapples in the market can occur and prices can drop significantly. The importance of forcing is that it can be used to schedule harvests and thus avoid the feast or famine cycle that often characterizes agricultural marketing on the island.

For further information concerning pineapple cultivation, farmers are encouraged to contact the Cooperative Extension Service at the College of Natural & Applied Sciences, University of Guam.

References

1. Collins, J. L. (1968). *The Pineapple: Botany, Cultivation, and Utilization*. Leonard Hill. London.
2. Purselove, J. W. (1972). *Tropical Crops: Monocotyledons*. Longman Group, London.
3. Py, C., Tisseau, M., Oury, B. and Ahmada, F. (1957). *The Culture of Pineapple in Guinea: A Manual for Planters*. English translation by Pineapple Research Institute of Hawaii.
4. Sanford, W. G. (n.d.). 'Pineapple Culture.' Class handouts for Agronomy 412, University of Hawaii.

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