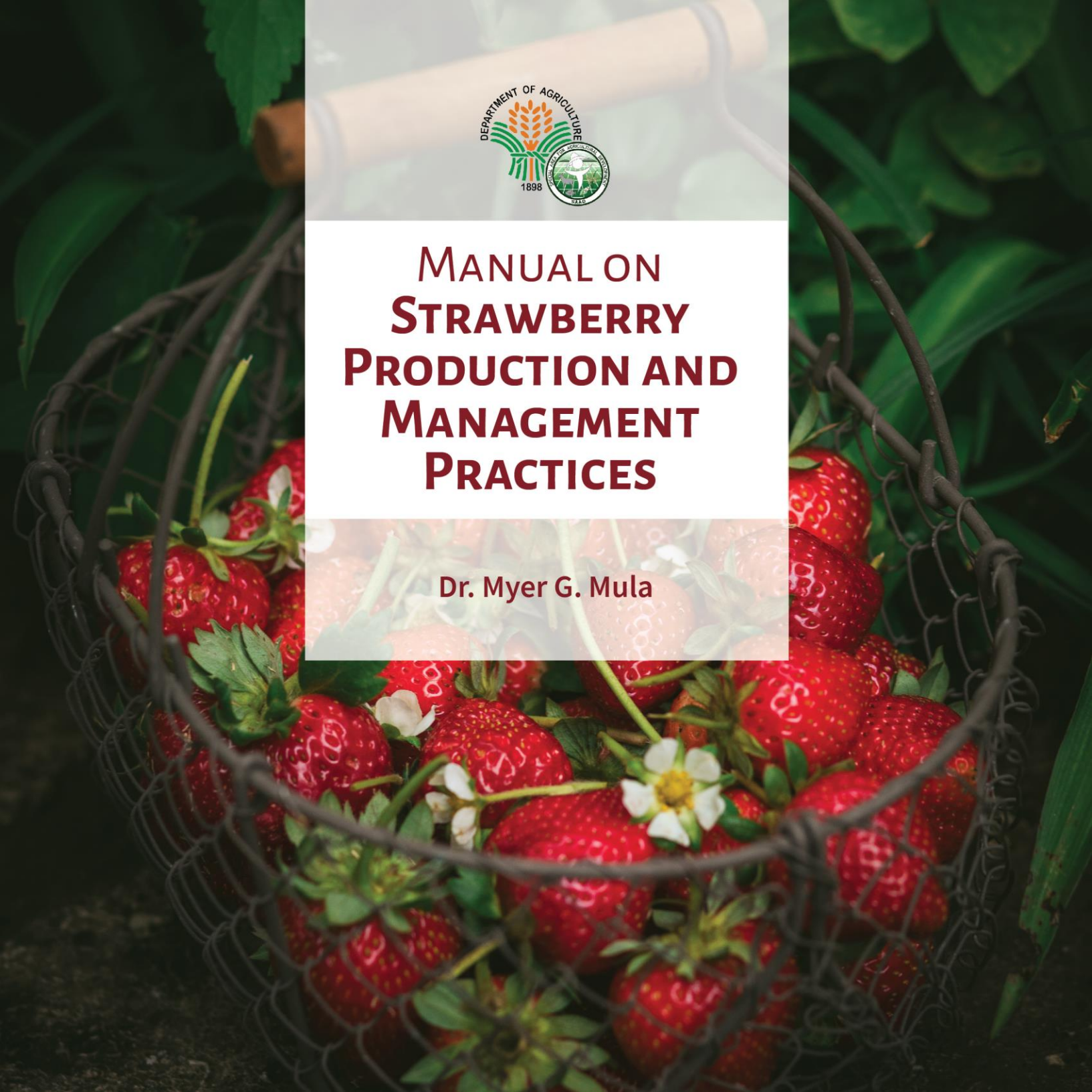

MANUAL ON STRAWBERRY PRODUCTION AND MANAGEMENT PRACTICES

Dr. Myer G. Mula

Acknowledgements

I would like to express my sincere gratitude to my wife, Rosana P. Mula, for encouraging me to write my experiences about strawberry production and in editing this guidebook. To Ms. Niharika Lenka and Ms. Jhomai S. Canlas for their hard work and contribution that they bestowed upon the task of assisting me in giving a good design and layout of this manual on "Strawberry Production and Management Practices". Furthermore, I acknowledge the sources of the strawberry images used in this manual.

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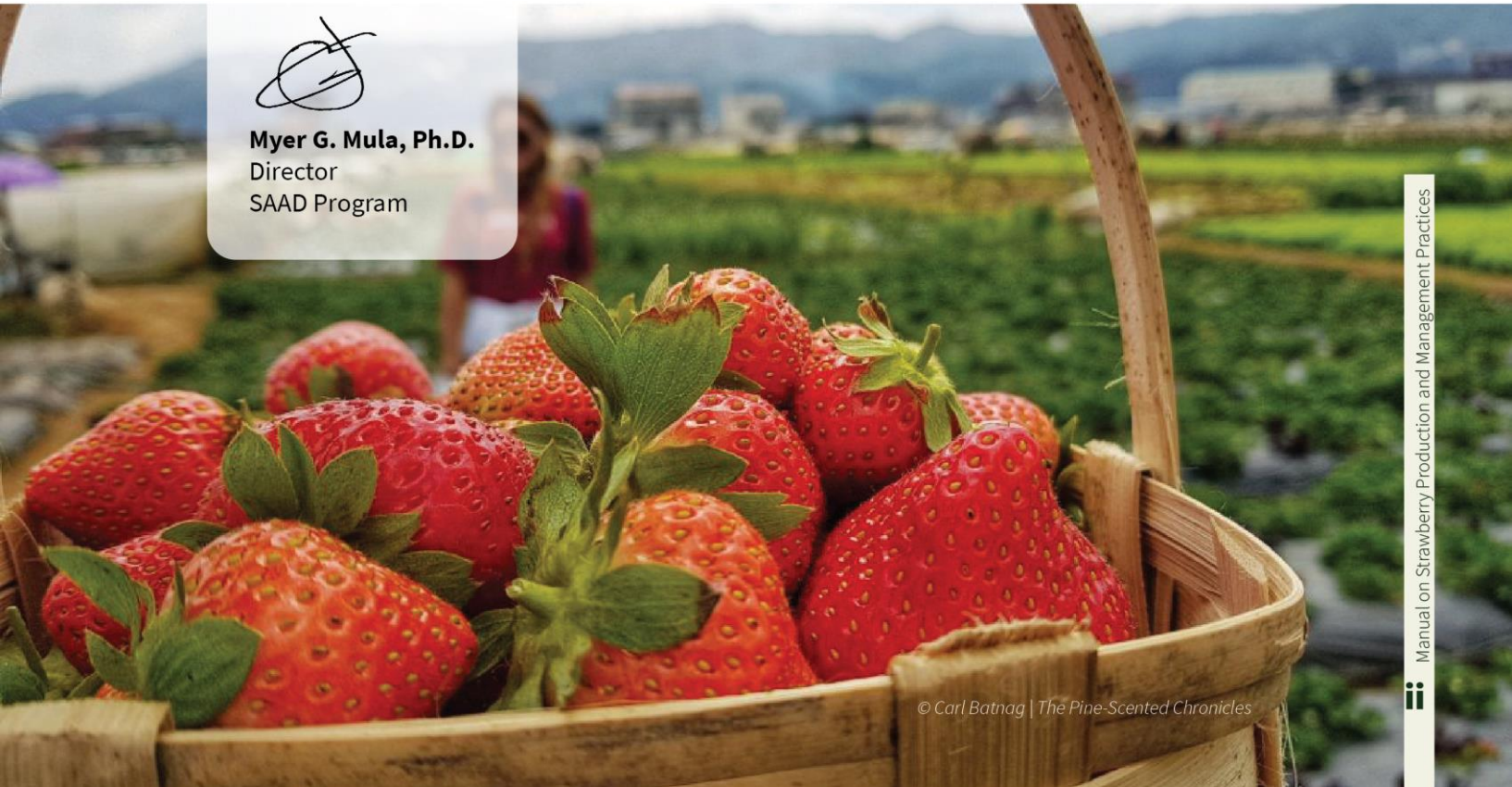
Foreword

This **Manual on Strawberry Production and Management Practices** is prepared and dedicated to the smallholder farmers whose primary or additional source of livelihood is strawberry farming. However, the said manual manifest that this type of crop can grow and produce fruits in cool temperate areas of the Special Area for Agricultural Development (SAAD) Program of the Department of Agriculture (e.g. Bukidnon and Mt. Province), and in other areas where temperature is lower (29°C) during the months of December to March.

Lessons and insights contained in this material are based on my experience as the head supervisor of a private farm in Baguio City, Philippines run by Israel Scientists. Knowledge of the strawberry production system specifically on the maintenance of planting materials' purity and productivity is the focus of this manual.



Myer G. Mula, Ph.D.
Director
SAAD Program

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About the Author

Dr. Myer G. Mula is the National Program Director of the Department of Agriculture's Special Area for Agricultural Development (SAAD) Program covering 30 poorest of the poor provinces with highest poverty incidence. Prior to joining the Department, Dr. Mula is the former Senior Scientist for Seed Systems at the International Crops Research Institute for the Semi-Arid Tropics (ICRISAT) based at Patancheru, Telangana, India from 2008 to 2016.

He earned his PhD at the Benguet State University, Philippines. Prior to joining ICRISAT, Dr. Mula was the Head Supervisor of Puyat Farms (growing strawberry and cut-flowers) at Asin Road, Baguio City, Philippines; was the head of the Planning, Monitoring and Evaluation Unit of the Cordillera Highland Agricultural Resource and Management Project (CHARMP), a foreign assisted project under the Department of Agriculture - Cordillera Administrative Region, Philippines. Then, he moved on with the Department of Agriculture as the Regional Coordinator of the High Value Commercial Crops (HVCC) Program; Rice and Corn Program; and Focal Person of the Convergence Program (DENR, DAR and DA), and Organic Agriculture at the Cordillera Administrative Region.

He has numerous international and national publications in national including magazines, newsletters, peer-reviewed scientific journals, and books. Dr. Mula co-authored books, among others are the following - Pigeonpea: A Resilient Crop for the Philippine Drylands; Chickpea (Garbanzos): An Emerging Crop for the Rainfed and Dryland Areas of the Philippines; Lifting the Level of Awareness on Pigeonpea: A Global Perspective; Agricultural Extension and Communication: A Theoretical Guide to Social Preparation of the Special Area for Agricultural Development (SAAD) Program; and Why Conurbation Needs a Sustainable Urban and Peri-Urban Agriculture.

From 2011, he is an Honorary Board Member (Technical/Editorial) of the Green Farming International Journal of Applied Agricultural and Horticultural Sciences based in India.

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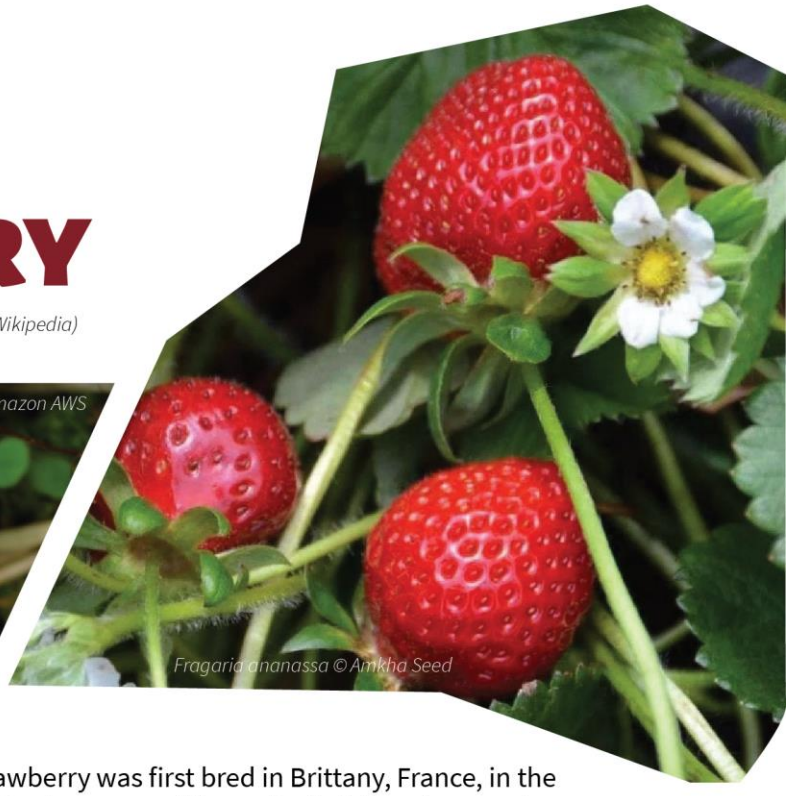
All About Strawberry

(Adapted in www.nutrition-and-you.com/strawberries.html and Strawberry Wikipedia)



Strawberry was first bred in Brittany, France, in the 1750s via a cross of *Fragaria virginiana* from eastern North America and *Fragaria chiloensis*, which was brought from Chile by Amédée-François Frézier in 1714. Botanically, the plant is a low growing runner (creeper) belonging to the family of *Rosaceae*, in the genus: *Fragaria*. Scientific name: ***Fragaria x ananassa***, with 'x' indicating a hybrid. Cultivars of *Fragaria* × *ananassa* have replaced, in commercial production, the woodland strawberry (*Fragaria vesca*), which was the first strawberry species cultivated in the early 17th century.

Strawberries are among the most popular berries due to its rich-red color and sweet, delicious yet gently tart taste. These berries are native to Europe, however, they are now cultivated as an important commercial crop in many temperate regions all over the world nowadays.

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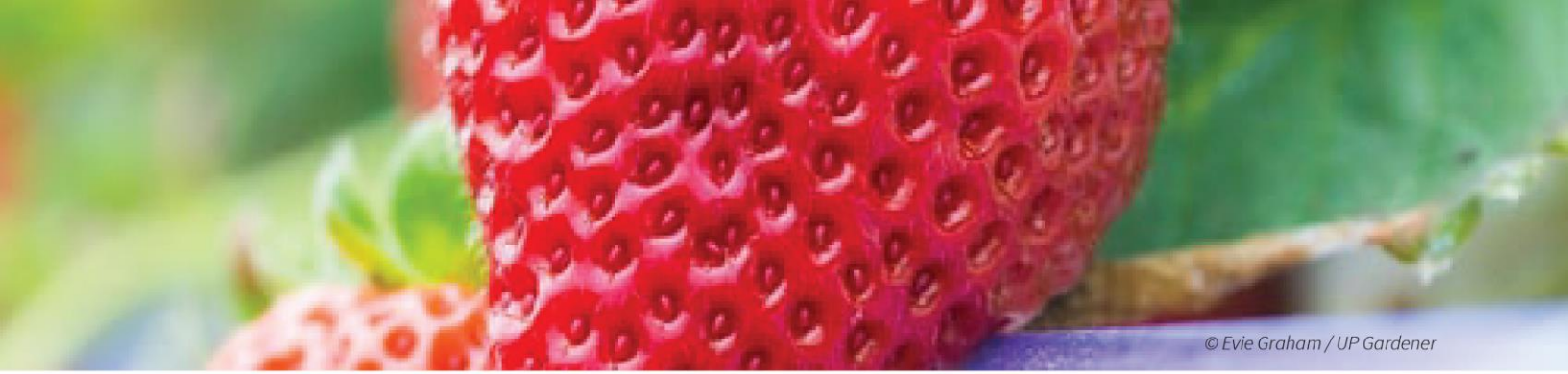
Strawberry is a small, low-lying, spreading shrub. It bears small white flowers, which eventually develop into small conical, light green, immature fruits. They turn red upon maturity with each berry featuring red pulp with tiny, yellow seeds piercing through its surface from inside. Its top end carry a green leafy cap and stem that is adorning its crown. Technically, the strawberry is an aggregate accessory fruit, meaning that the fleshy part is derived not from the plant's ovaries but from the receptacle that holds the ovaries. Each apparent "seed" (achene) on the outside of the fruit is actually one of the ovaries of the flower, with a seed inside it.

Most berries feature conical shape, weighs about 25 grams and measures about 3 cm in diameter. The berries have the taste that varies by cultivar, and ranges from quite sweet to acidic. Although wild varieties are sometimes available in the market, large-scale production uses the modern "plasticulture" system. In this method, raised beds are formed each year, fumigated, and covered with plastic, which prevents weed growth and crop spoiling.



Top Strawberry-Producing Countries (tons) from 2014 - 2018

Rank	Country	2014	2015	2016	2017	2018
1	China	2,436,496	2,501,288	2,802,738	2,843,421	2,856,928
2	USA	1,379,067	1,372,411	1,390,117	1,239,023	1,237,604
3	Mexico	402,257	455,877	393,247	649,891	658,168
4	Turkey	373,522	376,057	376,043	400,840	402,446
5	Spain	306,586	296,792	397,247	361,188	359,537
6	Egypt	268,463	290,556	434,996	321,6467	321,390
7	Korea	214,824	209,183	194,493	207,914	208,942
8	Japan	165,600			163,489	163,688
9	Russia	188,287	188,673	1892,001		174,000
10	Germany		160,948	172,590		166,159
11	Poland	195,475	202,622	204,840	178,777	178,907
12	Morocco				160,673	161,793

Source: https:/www.hortidaily.com>article>top-10-strawberry-producing-country. May 18, 2020

Health Benefits of Strawberries

Strawberries are low in calories (32 cal/100 g) and fats but rich source of health promoting phyto-nutrients, minerals, and vitamins that are essential for optimum health.

Strawberries have significantly high amounts of phenolic flavonoid phyto-chemicals called anthocyanins and ellagic acid. Scientific studies show that consumption of these berries may have potential health benefits against cancer, aging, inflammation and neurological diseases.

Strawberries have an ORAC value (oxygen radical absorbance capacity, a measure of anti-oxidant strength) of about 3577µmol TE per 100 grams.

Fresh berries are excellent source of vitamin-C (100 g provide 58.8 mg or about 98% of RDI), which is also a powerful natural antioxidant. Consumption of fruits rich in vitamin C helps the body develop resistance against infectious agents, counter inflammation and scavenge harmful free radicals.

Fruits are rich in B-complex group of vitamins and contain very good amounts of vitamin B-6, niacin, riboflavin, pantothenic acid and folic acid. These vitamins are acting as co-factors which help the body metabolize carbohydrate, proteins, and fats.

Strawberries contain vitamin A, vitamin E and health promoting flavonoid poly phenolic antioxidants such as lutein, zea-xanthin, and beta-carotene in small amounts. These compounds help act as protective scavengers against oxygen-derived free radicals and reactive oxygen species (ROS) that play a role in aging and various disease processes.

Strawberries contain good amount of minerals like potassium, manganese, fluorine, copper, iron, and iodine. Potassium is an important component of cell and body fluids that helps in controlling heart rate and blood pressure. Manganese is utilized by the body as a co-factor for the antioxidant enzyme, *superoxide dismutase*. Copper is required in the production of red blood cells. Iron is required for red blood cell formation. Fluoride is a component of bones and teeth, and is important for prevention of dental caries.

Strawberry consumption may be associated with a decreased cardiovascular disease risk as the phytochemicals present in strawberries have anti-inflammatory or anticancer properties in laboratory studies. However, limited researches have been made in this regard.

Nutrient Analysis of Strawberries ORAC* Value 3,577 Nutrition Value per 100 g		
Principle	**Nutrient Value**	**Percentage of RDA****
Energy	32 Kcal	1.5%
Carbohydrates	7.7 g	6%
Protein	0.67 g	0.1%
Total Fat	0.30 g	1%
Cholesterol	0 mg	0%
Dietary Fiber	2.0 g	5%
Vitamins		
Folates	24 µg	6%
Niacin	0.386 mg	2.5%
Pantothenic acid	0.125 mg	2.5%
Pyridoxine	0.047 mg	3.5%
Riboflavin	0.022 mg	2%
Vitamin A	12 IU	0.5%
Vitamin C	58.8 mg	98%
Vitamin E	0.29 mg	2%
Vitamin K	2.2 µg	2%

Electrolytes		
Sodium	1 mg	0%
Potassium	153 mg	3%
Minerals		
Calcium	16 mg	1.6%
Iron	0.41 mg	5%
Magnesium	13 mg	3%
Manganese	0.386 mg	17%
Zinc	0.14 mg	1%
Phyto-nutrients		
Carotene-ß	7 µg	--
Lutein-zeaxanthin	26 µg	--

**ORAC - Oxygen Radical Absorbance Capacity*
***RDA - Recommended Dietary Allowance*
Source: USDA National Nutrient database

Status of Philippine

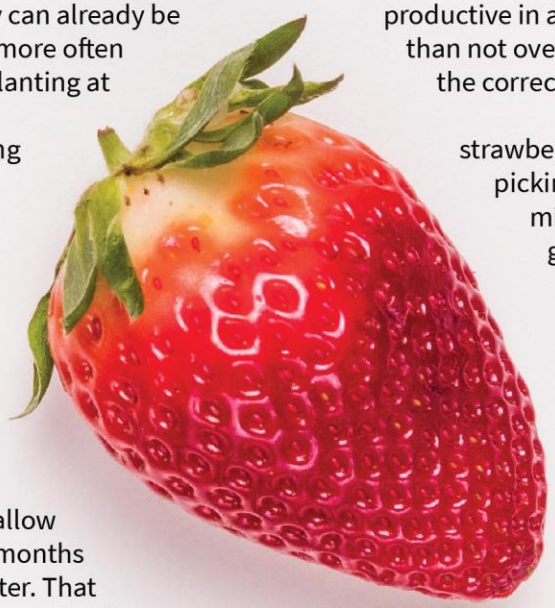
Philippine strawberry industry is faced with technology gaps which includes breeding new varieties; varietal suitability; runner production; berry production; post-harvest practices (grading, sorting, and standardization, product development, fabrication of dryers, and standardization of dehydration process); and pest and disease management. Although the Philippines have an average yield of 15 t/ha, it is still way below the production of United States (46 t/ha), Israel (42.5 t/ha), and Spain (42 t/ha).

People are accustomed to strawberries growing in cool climate areas of the Philippines, like Benguet province. The estimated area cultivated to strawberry is only recorded in Benguet (45 ha), Baguio City (7 ha), and Bauko, Mt. Province (3 ha).

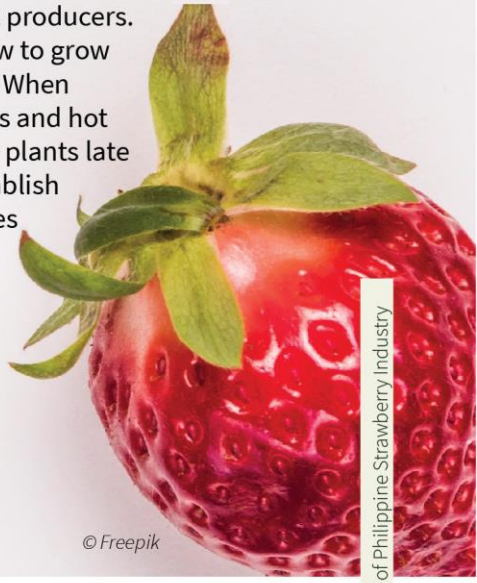
With this, the Philippines import fresh and frozen strawberries from China (60,100 kg), United States (20,300 kg), Belgium (8,500 kg), Australia (2,500 kg), Hong Kong (1,000 kg), and Malaysia (200 kg). Likewise, the country still imports preserved strawberries from the United States (92,700 kg), China (41,000 kg), Germany (3,600 kg), France (1,400 kg), Hong Kong (300 kg), and Singapore (100 kg).

Strawberry Industry

However, with the inclusion of heat tolerant lines of strawberry, growing and producing fruits in cool weather conditions during the months of December to March in some parts of the archipelago is now a reality. Strawberry can already be productive in areas where the daytime temperatures are more often than not over 29°C. This is possible with a bit of preparation and planting at the correct time of year.



The trick to growing strawberries in hot climates is to have the berries ready for picking in mid-winter (January to February). Keep in mind that strawberries take six to seven months of growth and start harvesting the fruit after a month and a half of establishment before they are ripe for harvest, and well-established plants are the most prolific producers. So, the question stands, "How to grow strawberries in high heat?" When combining strawberries and hot summer climates, set the new plants late in the summer to allow time to establish during the cooler months so the berries are ripe in midwinter. That would mean setting starts in September for harvest in January. Strawberries flower and fruit in cool to warm temperatures (16-27°C). Use varieties that thrive in warm weather such as Red Gauntlet, Tioga, Cambridge, and Turft.



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Cultural Management Practices


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Introduction

In the production of good fruit, the health and vigor of the stock is of prime importance. In many respects, this is more vital than the variety grown. There are too many gardeners attempting to grow strawberries from unhealthy stocks. It would be far more profitable to burn the old virus-infected plants and begin again with new runners that are virus-free.

Similarly like with most fruits, the strawberry only attains its full quality and flavor when allowed to ripen fully on the plants and well grown on soil that is well supplied with humus. The ripening berries should be protected from scorching sun and guarded against mold. The color of the ripe fruit varies according to variety. Unfortunately, fruit for marketing often has to be picked half ripe.


© Carl Batnag / thetorogichronicles.com

Strawberries grow well under higher elevation of 800 masl. These would include areas such as Baguio City, Benguet, Mt Province, Ifugao, Tagaytay, and Bukidnon. However, favorable growing conditions and economic conditions should both be at hand before deciding to grow strawberries on a commercial basis. The following factors should be considered:

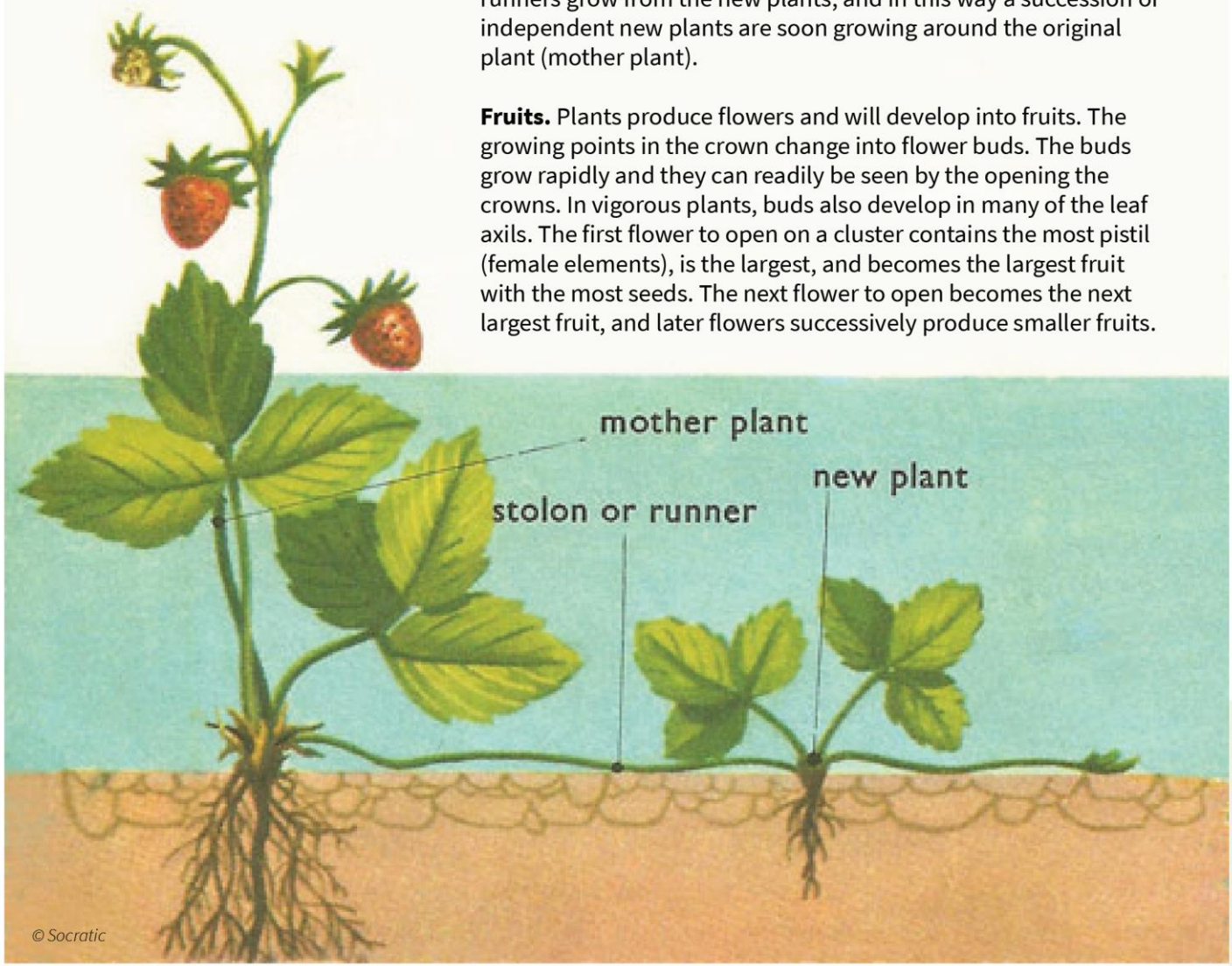
a. **Labor**. Is it possible to obtain workers when required?
b. **Market**. Is there a dependable market outlet?
c. **Planting stock**. Are plants available of the varieties you want to grow?


© Stupefying Trips

How the Plants Grow

Runners. Healthy dormant plant sets in moist soil produce new roots in a few days. In a couple of more days, each plant usually has several new leaves of normal size. After a month of planting, runners emerge where the leaves join the main stem. These runners grow from the new plants, and in this way a succession of independent new plants are soon growing around the original plant (mother plant).

Fruits. Plants produce flowers and will develop into fruits. The growing points in the crown change into flower buds. The buds grow rapidly and they can readily be seen by the opening the crowns. In vigorous plants, buds also develop in many of the leaf axils. The first flower to open on a cluster contains the most pistil (female elements), is the largest, and becomes the largest fruit with the most seeds. The next flower to open becomes the next largest fruit, and later flowers successively produce smaller fruits.



© Fiume Francesco

Varieties

The selection of varieties depends on climate, soil, and the purpose for which the crop is to be grown. Some special-purpose varieties bear firm berries especially suited for long distance shipment. Others have large attractive berries of the best quality, but their textures are too soft to transport, are good for processing and for local market. Select varieties that have long ripening shelf life especially when the market demand is good.

Preparation of Planting Stock

Obtaining Planting Stock

Make an effort to get disease-free and nematode-free planting stock from the nursery. Choose these plants from plantations that are free from diseases and insect infestations. However, this practice is not recommended if the plantation is grown on clay soils because the roots of the plants do not develop strongly. Moreover, roots have the tendency to break or easily be damaged when uprooted.

© Craigend Nursery, Cardross / Facebook

How to Prepare Plants (Characteristics of a Good Seedling)

a. For Nursery

- Pull out plants from the nursery with the use of spading fork to minimize damage to plants.
- Roots should look fresh, bright (white to yellowish in color), and long.
- Crown is plump.
- Roots should be free from any soil borne or seed borne diseases.
- Remove or cut all the leaves retaining one small leaf (heart).
- Shorten the roots to a length of 8-10 cm using pruning shears.
- Spray fungicide at the rate of 0.5 to 1 gram/liter.
- Pack 100-200 pcs of planting materials in well-sealed polyethylene plastic bags before storing to prevent them from drying.
- Keep the plants in cold storage (4°C to 5°C) for a few days (at least 1-2 weeks) or at 0°C to 3°C for longer days (2 to 3 months) prior to planting.

a. For Commercial Area

- Use spading fork to pull out plants to ensure less damage on the plants.
- Wash thoroughly the plants especially the roots to get rid of soil particles.
- Prune old leaves and shorten root length to approximately 9-10 cm.
- Classify the cleaned planting materials according to the following:
  - Large: Tall and those whose crowns are plump. This is expected to produce fruits the earliest.
  - Medium: Shorter and fruiting is delayed for a month compared with the large planting materials.
  - Small: These will be planted in separate beds without any mulch and are purposely called 'waiting beds'. These serve as a ready source of new planting material to replace the dead plants from the large and medium plants.
- Spray fungicide at the rate of 1-2 gram/liter to clean and ready planting materials before planting.

© The Strawberry Farm / Facebook

Soil Management

In selecting a site, consider wind, drainage, slope, and sun exposure. A gradual slope is preferable to minimize soil runoff.

Soil Requirement

Strawberries can be grown on a variety of soils, but good drainage is essential. The best soil is medium loam, slightly acidic. Chalk or limestone soils are less satisfactory for growing but can be improved by application of dung or composted material. Sandy soils which would normally dry out in summer will ensure plant growth if sufficient humus is present to retain soil moisture. Soils that have good moisture holding capacity are the most suitable.

As earlier stated, certain varieties of strawberries can grow better on light or heavy soils. While this is so, the application of organic matter is highly recommended. Soil texture, to a large extent, is a major consideration in strawberry production, which is also under the control of the cultivator. Plants are likely to die in waterlogged soils (clay) and in fine sandy silt soils. Wet soil inhibits plant growth and may lead to damage by red-stele root rot disease.

Section of an infected strawberry root (left) showing discoloration from red stele disease. Healthy root on right. © The Ohio State University / Ohioline

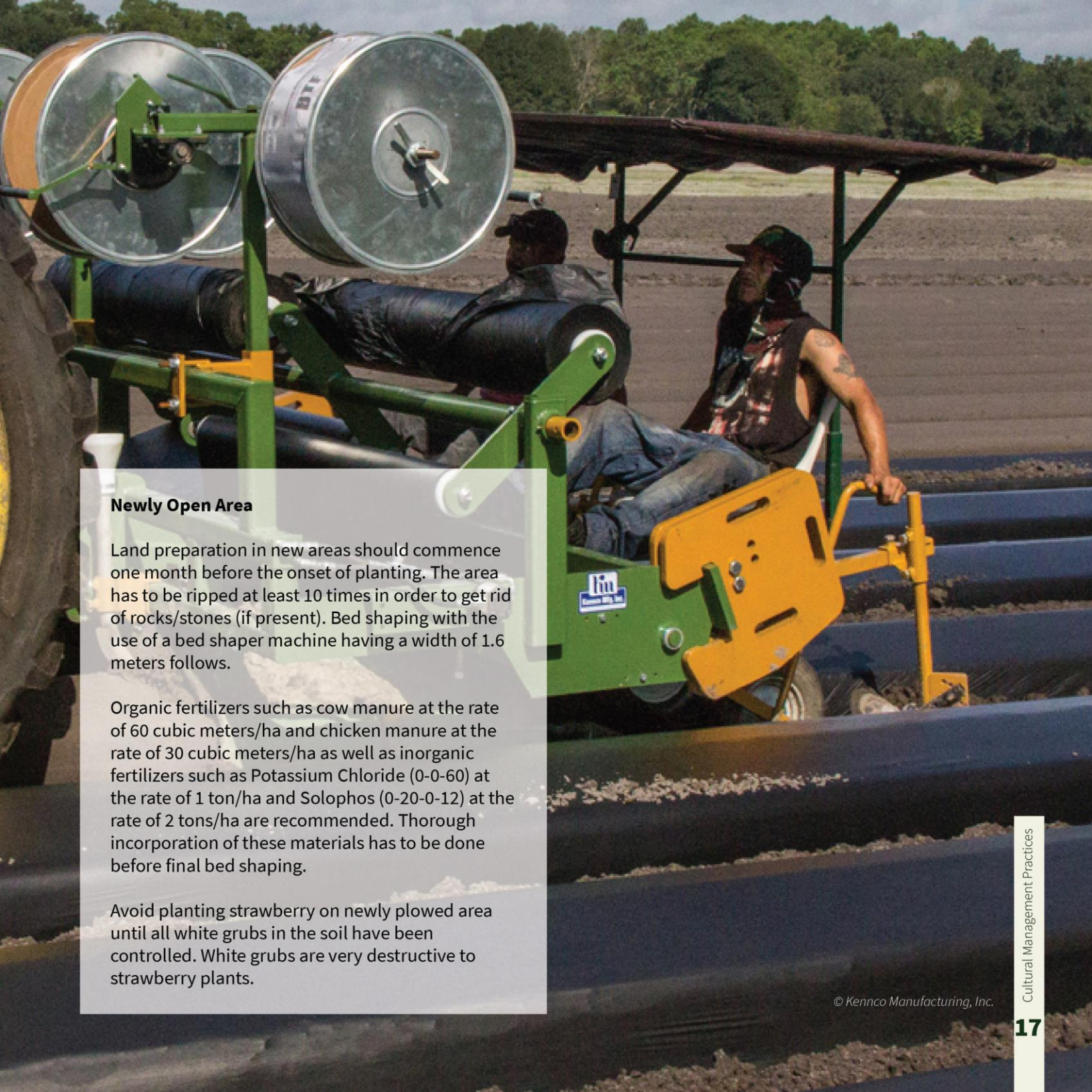
Strawberry root system affected by red stele. © The Ohio State University / Ohioline

Strawberries grow best in well-prepared soil that is high in organic matter. If culture of the previous crop includes systematic seedbed preparation, cultivation and either turning under green manure or adding stable manure, only harrowing then bed shaping is needed to prepare the soil for planting.

Land preparation starts with the construction of beds with a width of 1.60 meters. This is done one month before the on-set of planting. Organic fertilizers such as cow manure and chicken manure at the rate of 30 cubic meter/ha and 15 cubic meter/ha respectively is recommended.

On the other hand, inorganic fertilizers such as Potassium Chloride (0-0-60) at the rate of 1 ton/ha and Solophos (0-20-0-12) at the rate of 2 tons/ha are recommended. These should be thoroughly incorporated with the soil before the final bed construction. Broadcast Brassicol (a fumigant) at the rate of 25 kgs/ha after Solophos is applied. If cultivation in the previous year or two years before has not included these practices, special preparation will be needed for best results.

Under most conditions, to obtain good drainage, strawberries are grown on raised beds or ridges with measurement of 2 to 3 inches high. It can be made higher if drainage is very poor. Pulverized the soil thoroughly just before setting the strawberry plants.



Newly Open Area

Land preparation in new areas should commence one month before the onset of planting. The area has to be ripped at least 10 times in order to get rid of rocks/stones (if present). Bed shaping with the use of a bed shaper machine having a width of 1.6 meters follows.

Organic fertilizers such as cow manure at the rate of 60 cubic meters/ha and chicken manure at the rate of 30 cubic meters/ha as well as inorganic fertilizers such as Potassium Chloride (0-0-60) at the rate of 1 ton/ha and Solophos (0-20-0-12) at the rate of 2 tons/ha are recommended. Thorough incorporation of these materials has to be done before final bed shaping.

Avoid planting strawberry on newly plowed area until all white grubs in the soil have been controlled. White grubs are very destructive to strawberry plants.

Planting Season

Nursery. The growing period of runners takes about 7 months. Mother plants are planted in February to early March in order to produce substantial number of runners as planting materials for commercial berry production to commence in early September.
For off-season runner production, mother plants are planted at the early part of August in order to produce substantial quantity of runners for off-season berry production that starts in June.

© SunnysideLOCAL Produce and Nursery

© Department of Primary Industries and Rural Development, Government of Western Australia

Commercial. The growing period for berry production takes 7 months. Planting starts mid-August to early September in order to acclimatize the plants and to initiate early fruiting.

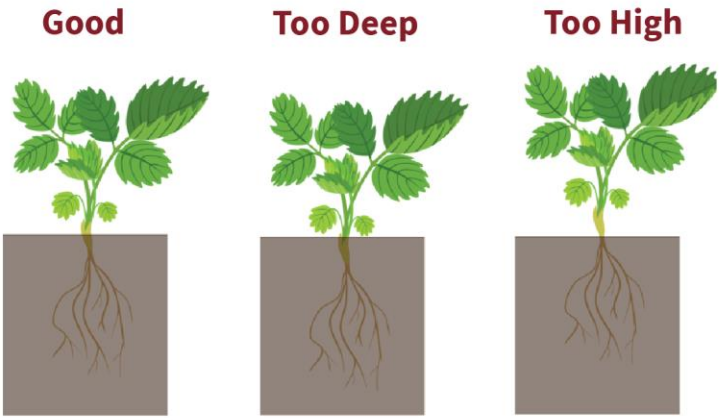
For off-season commercial production, planting starts mid-March and harvesting in the month of June.

Methods of Planting

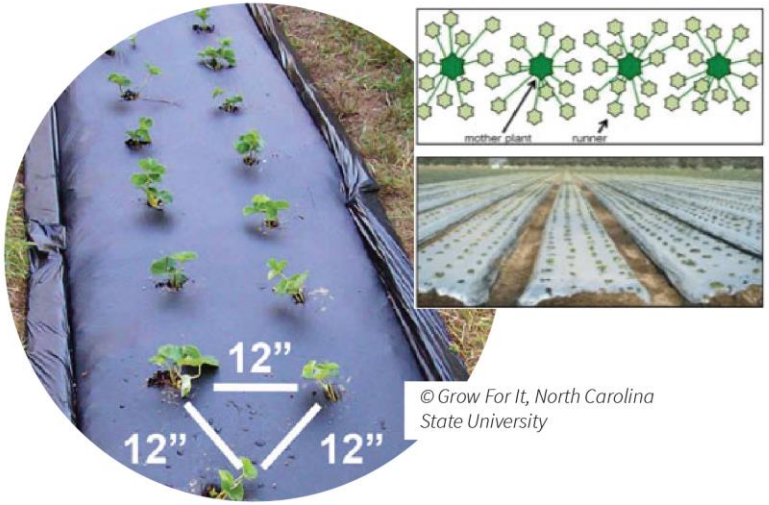
Whether the plants are placed in the beds by hand or by machine, it is important to:

- Keep the plants moist,
- Plant at correct depth making sure that the roots are set straight, and
- Press the soil firmly around the base of the plant.

Place the plants at correct depth with the crown just below the ground level. Plants set too deep are likely to smother and die. Compact the soil around the roots of the plants by pressing the soil. When planting by hand, ensure that planting materials are continuously moist.



© Gardening in the Desert



© Grow For It, North Carolina State University

Planting Distance

Nursery. Planting of mother plant is done one row in a bed with a distance of 75 to 100 cm between hills.

Commercial. Bore holes on plastic mulch with four plants in a bed having a distance of 25 cm by 25 cm in a zigzag formation (quin cunx).

Runner Production (Nursery)

Weed Control. To control weeds prior to runner emergence, herbicide such as Ponstar at the rate of 3.5 liter/ha or Herbadox at the rate of 6 liter/ha with Gramoxone (sticker) at the rate of 1 liter/ha or other herbicides is recommended. Mother plants needs to be protected with 'defenders' before herbicide spraying. If runners are already produced, hand weeding is practiced. During weeding, the removal of flower throughout the season can be simultaneously done.

Removing of Flowers. Newly set strawberries should aim for vigorous runner production rather than flowering or fruiting. Remove stems with flowers as soon as they appear. This strengthens the plants and also increases the number of runners.

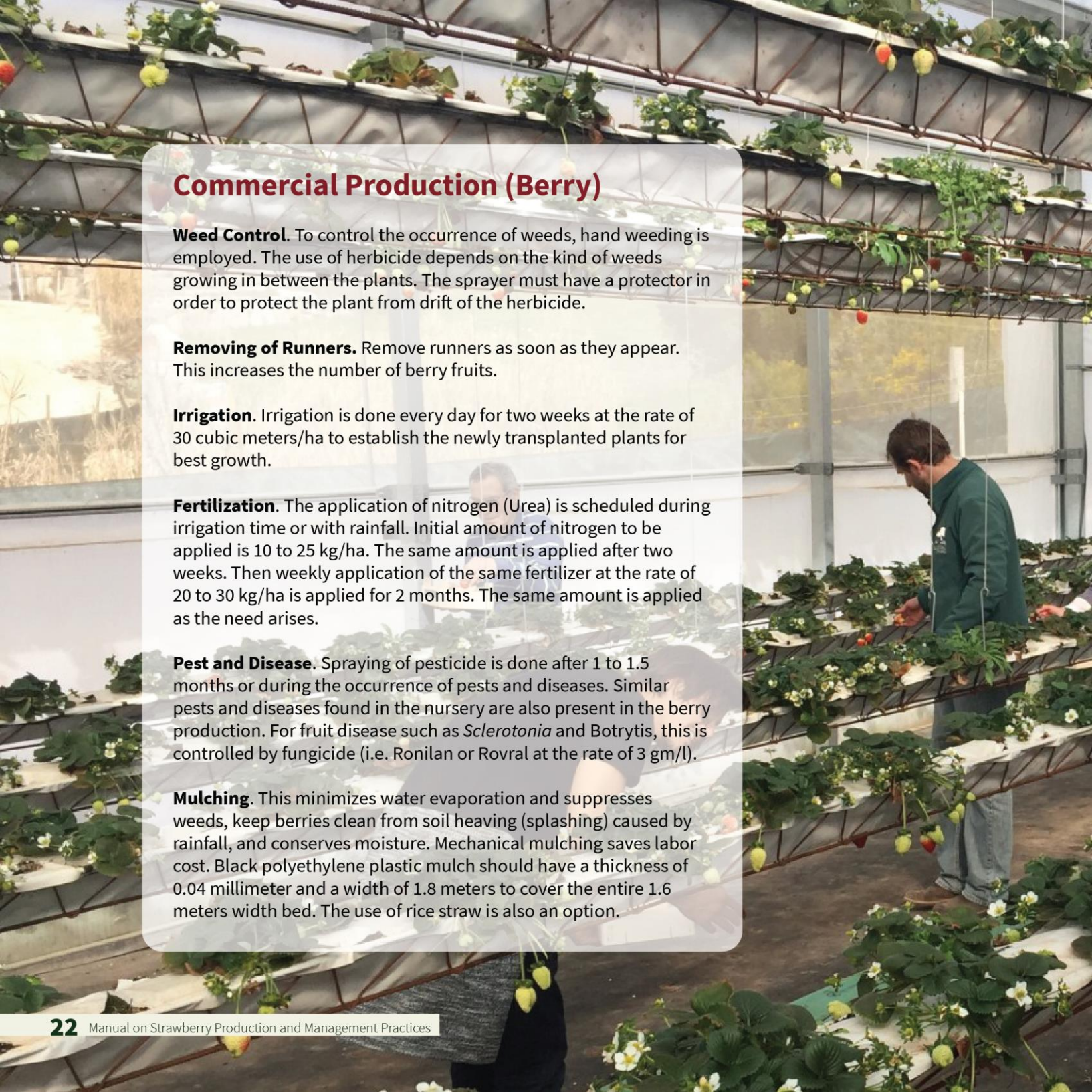
Mulching. Mulch around mother plants to suppress weeds, keep mother plants from soil heaving (splashing) caused by rainfall, and conserves moisture.

Irrigation. Irrigation with the use of sprinkler is done for 10 to 14 days for about 15 to 30 minutes/day. This is to ensure acclimatization for faster recovery. Further irrigation is dependent on soil type and the occurrence of rainfall. A rule of thumb is to closely observe the soil and the plant to provide the required irrigation.

Fertilization. This starts the moment runners are produced. The application of nitrogen (Urea) is simultaneously done during irrigation or with rainfall. Initial amount of nitrogen used is at the rate of 10 to 25 kg/ha. The same amount is applied after two weeks. Then weekly application of the same fertilizer at the rate of 20 to 30 kg/ha is applied for 2 months. The same amount is applied every 2 weeks for two months. However, if in the last two months runners tend to be lanky, nitrogen application is stopped.

Pest and Disease. Possible outbreak of pests is controlled by pesticide application. Based on observations in the nursery, outbreak of pests such as beetles, aphids, Spedoptera (prodenia), and semi-loopers are controlled by insecticide (i.e. Lannate or Thiodan at the rate of 3 ml/l). For cutworms, Basudin or Sapsan (granule form) is used. To control mites; Spide, Peropal, or Plictran at the rate of 3 gm/l is recommended.

Disease incidence and severity can be minimized by locating strawberry fields on well-drained soil, planting annually with certified resistant transplants, fumigating the soil before planting, and using raised beds to provide optimum drainage. The use of systemic fungicides may be helpful. Avoid excessive or insufficient amounts of irrigation water. Diseases such as *Lemolaria*, *Marsonia*, and *Phytoptora fragariae* are sprayed with fungicide (i.e. Benlate at the rate of 1 to 2 gm/l or Daconil at the rate of 3 to 5 gm/l). Other chemical alternatives include Curzate using the same rate of 3 to 5 gm/l.



Commercial Production (Berry)

Weed Control. To control the occurrence of weeds, hand weeding is employed. The use of herbicide depends on the kind of weeds growing in between the plants. The sprayer must have a protector in order to protect the plant from drift of the herbicide.

Removing of Runners. Remove runners as soon as they appear. This increases the number of berry fruits.

Irrigation. Irrigation is done every day for two weeks at the rate of 30 cubic meters/ha to establish the newly transplanted plants for best growth.

Fertilization. The application of nitrogen (Urea) is scheduled during irrigation time or with rainfall. Initial amount of nitrogen to be applied is 10 to 25 kg/ha. The same amount is applied after two weeks. Then weekly application of the same fertilizer at the rate of 20 to 30 kg/ha is applied for 2 months. The same amount is applied as the need arises.

Pest and Disease. Spraying of pesticide is done after 1 to 1.5 months or during the occurrence of pests and diseases. Similar pests and diseases found in the nursery are also present in the berry production. For fruit disease such as *Sclerotonia* and Botrytis, this is controlled by fungicide (i.e. Ronilan or Rovral at the rate of 3 gm/l).

Mulching. This minimizes water evaporation and suppresses weeds, keep berries clean from soil heaving (splashing) caused by rainfall, and conserves moisture. Mechanical mulching saves labor cost. Black polyethylene plastic mulch should have a thickness of 0.04 millimeter and a width of 1.8 meters to cover the entire 1.6 meters width bed. The use of rice straw is also an option.

Installation of Irrigation System

Installation of irrigation system varies in nursery and commercial areas. The entire line of special equipment includes a fertilizer tank, filter tank or screen tank, pressure gauge, timer, and air valve. The laterals are polyethylene pipes with different types of couplings and fittings.

Nursery. Sprinkler installed in the nursery is dependent on the diameter of water it can cover. Sprinkler with a discharge diameter of 24 meters is installed at a distance of 12 meters by 12 meters. Maintain 1.5 to 3 atmospheric pressure.

Commercial Area. Drip irrigation system is highly recommended. Two laterals per bed with a length of 80 meters and a diameter of 12 mm or 16 mm are installed. Each lateral has drippers with distance of 0.25 m or 0.50 m. Maintain 1.5 to 3 atmospheric pressure to ensure even distribution of water.

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Harvesting

Berries are harvested when they are almost red (75%) or full red. Fruits are manually picked by pinching the stalk upward and are directly placed in a Styrofoam container with three compartments to facilitate sorting. The container measures 50 cm (width) by 35 cm (length) with 6 cm depth. Frequency of harvesting is done every day or every other day. But generally, this is dependent on the ability of the plants to produce fruits.

Sorting and Packing

From the field, berries are brought in the packinghouse for grading and classifying. Classification based on size is as follows: extra-large (25-50 gm); large (20-24 gm); medium (15-19 gm); small (10-14 gm); little small (5-9 gm); reject (berries damaged by pests and diseases); and over-ripe (extreme maturity that exhibits softness and water exudates).

After thorough classification, the fruits are packed in punnets. The total weight of punnet with fruits should be 250 gm. Punnets are finally packed in boxes with a capacity of either 1 or 2 kg.

Storing and Shipping

Strawberry is classified as highly perishable goods with a storage life span of only one week. Temperature requirement for storage is 0°C to 3°C to prolong shelf life. Transporting/shipping to long distance requires a cooling van following the above temperature.

© Food Logistics

Manpower, Material, and Equipment Requirement

First Year Operation Requirement

A. Estimated cost of production of 0.4 ha nursery for 1 ha commercial area:

Note: cost of operation and inputs is computed as per present value

	Mandays	Amount
1. Labor cost		
• Land preparation (clearing, harrowing, fertilizing, rotavating, and bed shaping	3	
• Five farm workers utilized for 240 days with the following activities: planting and cultural practices (irrigation, fertilization, spraying and hand weeding)	1,200	
2. Cost of Materials		
• Fertilizers		
a. Urea (4 bags)		
b. Muriate of potash (5 bags)		
c. Chicken manure (11 cubic meters)		
• Pesticides and stickers a. Lannate (2 l)		
b. Benlate (2 kg)		
c. Daconil (2 kg)		
d. Furadan 10g (10 kg)		
e. Surfactant (Tenac sticker @ 1 l/ha)		
• Diesel (15 l/ha)		
• Oil (1 l/ha)		
3. Fixed cost		
• Repair and maintenance		
4. Others		
• Planting materials (mother plants @ 2,500 plants/0.4 ha)		

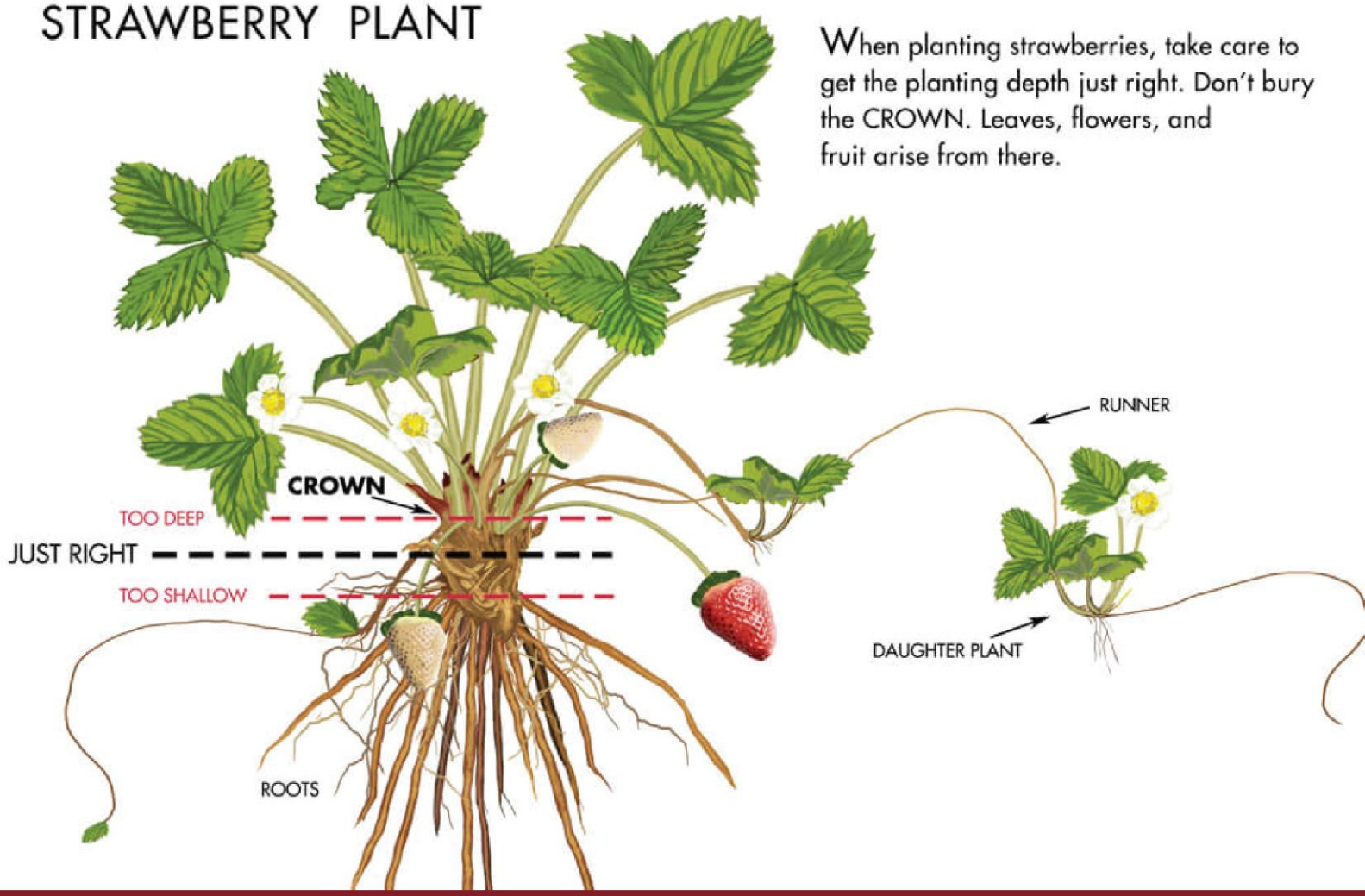
B. Estimate cost of production of 1 hectare berry production (commercial)

Note: cost of operation and inputs is computed as per present value

	Mandays	Amount
1. Labor cost		
• Land preparation (clearing, harrowing, fertilizing, rotavating, and bed shaping	7	
• Twenty farm workers utilized for 240 days with the following activities:	4,800	
a. Planting and cultural practices (irrigation, fertilization, spraying and hand weeding)		
b. Harvesting (hauling, sorting and packing)		
c. Marketing (transportation)		
2. Cost of Materials		
• Fertilizers		
a. 14-14-14 (10 bags)		
b. Urea (10 bags)		
c. Muriate of potash (40 bags)		
d. Potassium chloride (20 bags)		
e. Chicken manure (24 cubic meters)		
• Pesticides and stickers a. Lannate (50 l)		
b. Benlate (10 kg)		
c. Daconil (10 kg)		
d. Furadan 10g (50 kg)		
• Surfactant (Tenac sticker @ 5 l/ha)		
• Mulching (i.e. rice straw @ 3,000 bundles)		
• Diesel (70 l)		
• Oil (3 l)		
3. Tools and equipment		
• 2 units knapsack sprayer		

	Mandays	Amount
• 1/2 cm diameter hose (300 meters) • Rainbird sprinkler (100 pcs) • 2 cm diameter polyethylene pipe (300 meters) • 1/2 cm polyethylene pipe (1,000 meters) 4. Fixed cost • Repair and maintenance 5. Others • Harvesting trays (500 pcs) • Punnets (10,000 pcs) • Plastic cover sheet (30,000 pcs) • 1 kilo capacity box (2,500 pcs) • 2 kilo capacity box (1,200 pcs)		

C. Expected yield per hectare (15-20 tons)



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