

# Two to Five Acres of Berries Can Sweeten Your Income

By Gene Galletta, Arlen Draper, and Richard Funt

Some 15 to 30 acres of intensively cultivated land is usually thought of as the necessary farm size to make labor-saving equipment pay for itself. However, several of the berry crops (namely strawberries, blueberries, blackberries and raspberries) offer a unique opportunity for a small or average sized family (of four) to make a good supplemental income on two to five bearing acres.

Other berry crops such as cranberries, gooseberries, currants, or elderberries, demand very specialized culture (cranberries), or have limited usage (elderberries) or limited popularity (gooseberries and currants) to make their culture profitable on a small scale.

Berry crops need a lot of labor, but a family can usually manage all but the harvesting on a small acreage. Berry culture requires considerable knowledge of the crops and their care, and a large initial investment per acre. However, berries offer a high return per dollar invested because of a generally low supply and high demand in many regions of the United States.

The advent of direct farm to consumer marketing (U-Pick or Pick-Your-Own) reduces harvest labor cost and provides the consumer with high quality fruit. Future demand for berry crops promises to be high because of their appeal as sources of dietary enrichment and their varied uses.

## Strawberries

The garden strawberry (*Fragaria x ananassa*) is a perennial herbaceous plant in the Rose family. The strawberry plant has a short thickened stem (called a crown) which has a growing

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point at the upper end of the crown and forms roots at the crown's base. The leaves are borne along the crown on long petioles (leafstalks) arranged in spiral fashion around the crown.

At the juncture of each petiole and the crown, a bud is borne which may grow into one of three structures according to the environmental stimuli the plant receives:

- A runner or specialized elongated stem, which normally forms daughter plantlets at every other node, if the temperatures are warm and the daylength long
- A branch crown or new stem under the same temperature and daylength conditions under which runners are formed (some strawberries are runnerless forms and produce many or multiple branch crowns)
- Flower stalks (scapes) bearing 1 to 15 flowers, usually under short days and low temperatures ("June Bearers"). However, some strawberries flower under long days ("everbearers")

The strawberry fruit is the ripened receptacle bearing many small "seeds" (achenes). The seeds form following pollination of female parts of the flower, which are collectively arranged on the fleshy receptacle (modified stem).

Strawberry plant roots are usually confined to the upper 6 to 12 inches of soil. As such they are subject to soil moisture fluctuations and severe weed competition.

Strawberry roots are vulnerable to nematode attack and several root-rotting fungi, notably red stele (*Phytophthora*), *Verticillium*, and *Rhizoctonia*. Frequently soil is chemically fumigated to kill these pests and many weed seeds before planting. Several newer strawberry cultivars are resistant to some of these soil fungi.

Strawberry plants grow on a wide variety of soils and tolerate wide ranges in soil acidity and composition. Generally the lighter soils (sandy) are chosen for early maturity. Strawberry soils should be reasonably high in organic matter and well-drained. Strawberry roots will not tolerate poorly drained soils.

Control of weeds by mechanical and/or chemical means is essential to successful strawberry culture.

One acre inch of water per week during the growing season is considered optimum, as is a slightly acid soil reaction (pH 5.5 to 6.0).

Strawberries grow in almost any climate, but it is critical to select cultivars adapted to your region and tolerant to its pests. Varieties developed at a certain latitude are generally adapted to within 3 to 5 degrees of the same latitude at the

same elevation. A 1,000-foot increase in elevation reduces the mean temperature 3° F. A variety is adapted to a region if it grows and produces well in response to the region's prevailing environment and pests.

Climatic factors which influence strawberry adaptation are low winter temperatures (remember that strawberries are frequently covered by snow or straw in areas with cold winters), high summer temperatures, amount of winter chilling, length of growing season and days.

Important strawberry pests are viruses, nematodes, mites, and fungi and insects that attack the root, leaf, crown or fruit. Most insect pests and many of the fungal pests can be controlled with chemical sprays.

Water must be added to supplement natural rainfall and to protect flowers and green fruit against spring frosts in many locations.

## Blueberries

Cultivated blueberries (*Vaccinium* species) are woody perennial bushes of the Heath family. The commonly grown types are tall multiple-caned (stemmed) plants with shallow and fibrous matted root systems.

It takes 3 to 4 years for the plant to grow to mature size (they are usually pruned to 5 to 10 feet in height and 3 to 8 feet in width and depth). The single leaves are arranged in spiral fashion along new shoots which grow from each stout cane. There may be several flushes of new growth each season.

The buds between each leaf and the stem become one of two types: *leaf buds* which will expand into a leafy shoot in the following season; or *flower buds* which will bear a cluster of 2 to 12 flowers the following spring. Each flower, if pollinated, will develop into a fleshy, many-seeded berry. A mature bush bears literally thousands of blueberry fruits.

Blueberries generally grow well on moist, but reasonably well-drained, acid soils with a high organic matter content. Mineral soils can often be modified for blueberry culture by adding organic matter and/or soil acidifiers. Certain types of blueberries may be grown on acid mineral soils without soil amendments.

Blueberry roots are very fine, usually grow in the upper foot of soil, and are easily damaged by excessive fertilizer salts and standing water. Hence blueberry plants are frequently planted in low-lying, quite acid, sandy areas (optimum pH 4.5) on raised beds. Special attention must be given to weed and water control in blueberry fields.

Cultivated blueberries cannot usually be grown successfully where winter temperatures are lower than  $-20^{\circ}$  F, where the growing season is less than 160 days, and where there is less than 1,000 hours of temperatures under  $45^{\circ}$  during winter. Rabbiteye and southern species hybrid blueberries require lower amounts of winter chilling, and succeed in the Gulf Coast and Southern U.S. areas.

Specific cultivars are adapted to different regions. (See article by Galletta and Draper in the 1977 Yearbook of Agriculture, p. 279-283, for suitable varieties and cultural practices).

Principal blueberry pests are the stunt and red ring spot viruses, two fungal stem cankers, a fungal root rot, a number of leaf and stem fungi, a bud mite, several fruit-rotting fungi and worms, and a number of chewing, sucking, and tying insects. These are controlled by resistant varieties and chemical pesticides.

## **Bramble Plants**

Blackberries and raspberries (bramble plants) are woody, multiple-stemmed, usually thorny plants in the genus *Rubus* of the Rose family. Roots live for many years in brambles, but the stems usually live for only two seasons (biennial), vegetating in the first year and bearing fruit in the spring of the second season. Exceptions to this growth habit are certain raspberry varieties (everbearers) which fruit in the fall on first-year canes, and in the next spring on the same canes.

The canes may be either erect, semi-trailing or trailing (the latter two need to be trellised), depending on the particular species of *Rubus* involved. The stout canes grow and branch, forming laterals during the first growing season. During the next season buds on the laterals grow and produce short shoots which bear both leaves and flowers.

Like the strawberry, the female pistils are aggregated around a raised receptacle (or stem axis called the torus in blackberries) in each flower. However, each pistil ovary develops into a fleshy drupelet bearing a single, hard, internal seed upon pollination. The drupelets adhere together, separating from the receptacle in raspberries, and including the central stem axis, when harvested, in blackberries.

Raspberries and blackberries will tolerate almost any soil type as long as it is well-drained to a depth of 3 to 4 feet. Both crops grow well on soils having good organic matter content and water-holding capacity and a slightly acid soil reaction (pH 5.5 to 6.8). Soil grubs and certain weeds should be controlled before planting.

Some bramble plants spread so the row width must be controlled in subsequent years.

Raspberries are particularly hardy in areas with cold winters, withstanding temperatures of  $-35^{\circ}$  F for red and  $-25^{\circ}$  for black (and purple) fruited types. However, raspberries are frequently injured in milder areas having fluctuating winter temperatures.

Blackberries may be injured at  $-15^{\circ}$  F, while thornless blackberries, boysenberries and youngberries may be injured by  $0^{\circ}$  temperatures.

Generally, raspberries are not too successful south of USDA minimum temperature zone 6 ( $-10^{\circ}$  to  $0^{\circ}$  F) nor are blackberries north of that zone. (See USDA Farmers Bulletin 2160, p. 8, 1975 revision, for map of plant hardiness zones. A map also is carried inside the front cover of the 1972 Yearbook of Agriculture).

Raspberries are especially sensitive to soil nematodes, viruses, and a number of insect and fungus troubles. Blackberries are troubled by the bacterial diseases crown and cane gall, the fungus diseases anthracnose, leaf and cane spot, orange rust, double blossom and a considerable array of insects. Resistant varieties and pesticides are the usual means of control.

## **Berry Culture**

To successfully grow strawberries, blueberries, and brambles, you need to understand some general principles. All these crops grow on acid to alkaline soils, pH 5.5 to above 7.0, except blueberries which require an acid soil in the range of pH 4.0 to 5.5. These crops grow best on well-drained soils that have a good supply of water. For top yields they should be irrigated in dry periods, and in strawberries spring-frost control by irrigation is desirable in most areas.

They should all be fertilized with a complete fertilizer, such as 10-10-10, at the rate of 50 to 75 pounds of actual nitrogen per acre varied to the soil's fertility. This recommendation is for established mature plants.

Young and new transplants can be easily damaged by fertilizer. Apply lower rates initially and increase the rates up to the full amount on mature plants of blueberries and brambles. Rabbiteye blueberries probably should not be fertilized the first year.

Distribute fertilizer over the entire root zone just before times of greatest growth and fruiting.

Prune the woody crops to remove dead and injured canes and to balance and distribute the fruit load. Most brambles

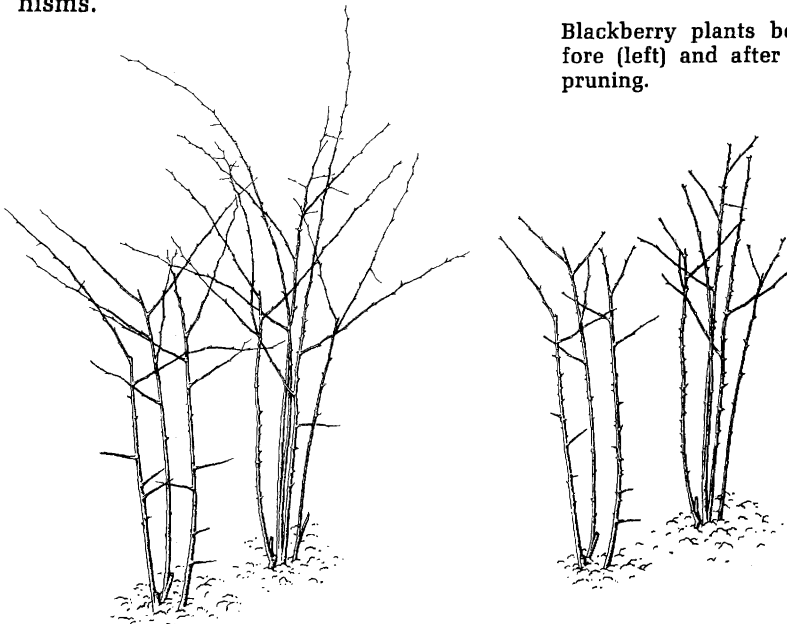
fruit the second year on canes produced the previous season. Fall-fruiting red raspberries can be cut back in late winter and will fruit the following fall on new canes.

Training small fruits depends upon the plant's growth habit. Trailing blackberries and red raspberries are tied to a wire trellis for support; erect blackberries and black raspberries need not be.

Erect blackberries are planted by covering pencil-size root pieces with soil and permitting suckers to form a hedgerow, no wider than 24 inches. Red raspberries also sucker freely and row width must be narrowed. Trailing and semi-erect types (such as the thornless varieties Smoothstem, Thornfree, Black Satin, and Dirksen Thornless) and black raspberries sucker very little and are propagated from cane tips that root in contact with the soil.

Planting density varies with the particular kind of berry. With black raspberries, blueberries, trailing and semi-erect blackberries, and strawberries grown in hill culture, the number of plants set is the same as the desired number to be fruited. Red raspberries, erect blackberries and strawberries grown in the matted row are set with fewer than the desired number of plants and allowed to multiply.

Weeds, insects, and diseases must be controlled by a combination of cultural practices and pesticides. Soil fumigation before planting is expensive but pays well in controlling most weeds, soil insects and nematodes, and some disease organisms.



Blackberry plants before (left) and after pruning.

## Planting and Planning Guide for Strawberries, Blueberries and Brambles

Type	Planting distances		Planting stock	Years from planting to economic return	No. of bearing years	Average mature yield (lbs)
	Between rows (ft)	In the rows (ft)				
<b>Strawberries</b>						
matted rows	3.5-4	1.5-2	1-yr runners (virus free)	1	2-3	1/row foot
hill	4-5	0.5-1	1-yr runners (virus free)	1	2-3	1.5/plant
<b>Blueberries</b>						
Highbush	8-10	4-5	2-yr plants	3	25+	6-8/plant
Rabbiteye	10-12	6-8	2-yr plants	4	30+	12-15/plant
<b>Brambles</b>						
<b>Blackberries</b>						
Erect	8-12	2-6	root pieces	3	10-12	1.5/row foot
Trailing	8-12	6-8	rooted cane tips	2	5-10	9/plant
<b>Raspberries</b>						
Red	8-10	2-4	1-yr suckers (virus free)	3	10-12	1.5/row foot
Black	8-10	3-4	rooted cane tips (virus free)	3	3-4	1.5/plant

Fruits of these crops develop from flowers pollinated usually by local bee and insect populations. It is a sound practice to grow at least two rabbiteye blueberry cultivars in each ripening season for cross pollination. The other small fruits are self fruitful, but can benefit from cross pollination by more uniform fruit maturation and increased berry size.

A straw mulch for winter protection is beneficial for strawberries in certain areas, and plastic mulch is used in some areas for moisture conservation and fruit protection. Blueberries and bables also benefit from mulching, particularly on soils not optimally suited for these crops. Incorporating peat moss in the planting hole improves establishment and growth.

### Economic Aspects

Small fruit production involves a high initial investment for plants and machinery. Estimates of the total cost per acre during the first year for strawberries, raspberries, thornless blackberries and blueberries were \$1,100, \$900, \$3,200 and \$3,400 respectively using 1975 and 1978 input prices.

Strawberries begin to produce heavily in the year after planting while brambles and blueberries start producing heavily in the third to fifth year. However, returns per acre and per dollar invested over several years can be the highest. Thus you need to regard such enterprises as a long term commitment. In

**Costs, labor and rates of return per dollar invested per acre over the life of the crop for several small fruit enterprises in Maryland. (Based on 1975 input prices for all except blueberry which is on 1978 input prices)**

Crops (years grown)	Cost Per Acre		Labor/A/Yr Bearing year(s) hours	Rate of Return	
	First year	Total life		Hired Harvested %	Consumer Harvested %
Strawberry (4)	\$1,100	\$ 6,700	143	52	65
Thornless blackberry (12)	3,200	32,000	183	39	57
Blueberry (12)	3,400	52,400	180	30	41
Raspberry					
Red (12)	900	14,600	116	25	26
Black (12)	900	12,200	116	13	16

planning for this commitment there are a number of considerations.

Labor requirements vary for each month of the year. The jobs, number of hours and time of year will vary with species, geographic region, plant density and yield.

Hand harvest labor may represent 60 to 80 percent of total costs over the life of the crop. Generally 8 to 12 persons per acre per day are required to harvest the ripe fruit.

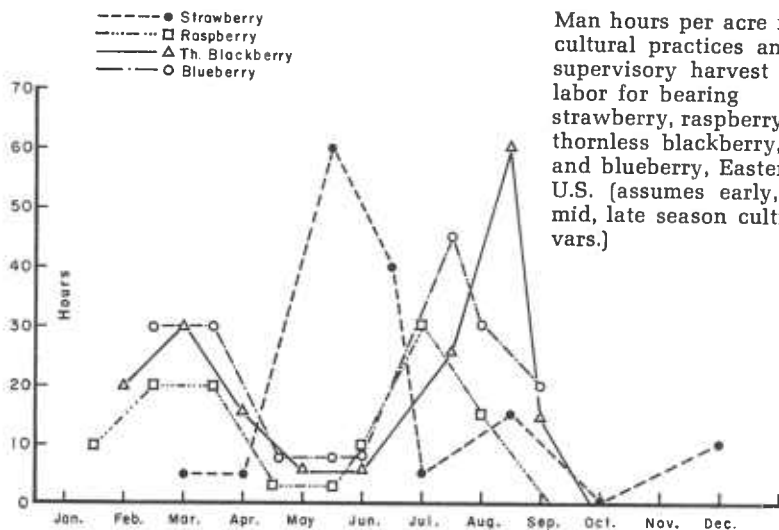
Pick-your-own harvesting, where consumers pick the fruit, provides an excellent means of reducing harvest labor costs, selling a perishable crop quickly, and receiving payment immediately. Pick-your-own harvesting is most advantageous within 25 to 50 miles of a large metropolitan area.

Virus-free, disease-resistant, hardy plants are worth the cost because healthy, vigorous plants provide the highest yields. Trellis materials should be of good and lasting quality. Select chemicals on local Extension recommendations. Take advantage of soil and tissue testing services provided by some state agencies.

Equipment purchases can be most challenging in matching price and specific uses. For example, a tractor and sprayer are two indispensable implements. A small high-volume sprayer costs less than a low-volume sprayer. However, the high-volume sprayer will require more water and labor per application. The low-volume sprayer will require a larger tractor than the high-volume sprayer. Hence, if time is the limiting factor (as in weekend farming), you may need the more expensive equipment.

Tractors must be matched to the PTO horsepower required by implements. Emphasize these points to a dealer when you





Man hours per acre for cultural practices and supervisory harvest labor for bearing strawberry, raspberry, thornless blackberry, and blueberry, Eastern U.S. (assumes early, mid, late season cultivars.)

purchase equipment. A reputable dealer can furnish parts and repairs in a short period of time.

Renting, loaning or doing custom work for other growers is a way to reduce the total cost of operating equipment. However, many operations are timely and vital to success, and waiting more than a few days for a sprayer can lead to a crop failure.

## Selecting a Crop

First, consider the amount of labor available within the family. Remember that teenagers will not be able to assist during school hours. Weather conditions and shorter days re-



Picking strawberries is easier with a carrier that holds several baskets.

strict working time in winter. Berry crops require a large amount of hand labor. If labor is limited, note which crops have high labor requirements during the same period of the year, and choose just one of them.

Next consider only a small acreage to start. This will reduce the financial risk as well as provide an opportunity to learn

### Suggested Berry Crops and Regions of Adaptation

Hardiness Zone*	Approx. Range of ave. minimum temperature (°F)	Suggested Berry Crops	
10	30 to 40	Strawberries	(Winter producing varieties developed in Calif., Fla.)
9	20 to 30	Strawberries	(Early Spring vars. developed in Fla., La., Calif.)
		Blueberries	(Short Chilling Rabbiteye in upper half, low chilling highbush throughout zone)
		Blackberries	(low chilling trailing types)
8	10 to 20	Strawberries	(Mid Spring vars. developed in N. C., Ore., Wash.)
		Blueberries	(Rabbiteye vars., canker-resistant highbush in Carolinas and Va., and Northern highbush in Pacific Coast States)
		Blackberries	(Erect and trailing, but different varieties are adapted to eastern and western U.S.)
		Raspberries	(Certain reds and blacks in cooler areas of zone)
7	0 to 10	Strawberries	(Late Spring vars. developed in Md., Ark., N.J., Wash., Ore.)
		Blueberries	(Highbush types)
		Blackberries	(Thorny and thornless erect and trailing types)
		Raspberries	(Reds and blacks in cooler areas of zone)
6	-10 to 0	Strawberries	(Late Spring vars. developed in Md., N.J., N.Y., Ill., Ark., Canada)
		Blueberries	(Highbush)
		Blackberries	(Erect types and some thornless vars. if protected)
		Raspberries	(Reds and blacks developed from Minn. to the East and in British Col.)
5	-20 to -10	Strawberries	(Late Spring vars. developed in N.Y., Mich., Wisc., Minn., Canada)
		Blueberries	(Highbush in warmer areas)
		Blackberries	(Hardest erect types)
		Raspberries	(Most of the hardy red and black fruited types)
4	-30 to -20	Strawberries	(Early Summer vars. devel. in Minn., Wyo., Alaska)
		Raspberries	(Hardest reds)

\* See inside front cover of 1972 Yearbook for map of hardiness zones.

the biological, technological and economic requirements before expanding. Plan ahead for expansion, rotation and location of crops, particularly if you have a pick-your-own operation.

The initial cost of land, plants and equipment will generally require borrowed capital if personal assets are limited. You should anticipate a rate of return greater than the interest rate you pay the bank.

If you have limited cash and labor to invest, then a pick-your-own operation having strawberries, and/or red and black raspberries, would be a logical choice. If cash is not limited, then choose strawberries, raspberries and thornless blackberries. If ample cash and labor are available, you might grow strawberries, raspberries, thornless blackberries and blueberries.

Since the species of berries are adapted to different regions, and varieties within a type of berry are adapted to smaller areas within a region, consult your local Extension service or agricultural experiment station for particular berry variety recommendations.

In land use planning, set aside sufficient additional acreage for new plantings as present fruiting areas decline in vigor and productivity. The marketing season may be profitably extended in most areas if compatible vegetable, floral, nursery, and tree fruit crops are grown near the berry plantings.

### **Further Reading:**

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