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# Small Fruit News

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## Special Reports:

### Why Cut-offs May Make Sense for Your Strawberry Operation

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The winter season is always good time to review what's happening with newer varieties and types of strawberries for plasticulture production. For example, in 2010 we tested a newer day-neutral variety with over a dozen growers in several states (with a Tobacco Trust Fund Commission grant), and I am really looking forward to getting some feedback from these trials in 2011. But, when is the last time that anyone has conducted a side-by-side trial of different strawberry plant types in our region? Quite frankly, just about everything we know about the performance of newer plant types like 'cut-offs' is anecdotal. There is nothing wrong with anecdotal information, but one of the things that I have really enjoyed about my work at NC State over the years has been the opportunity to take a "hard look" at a new plasticulture variety (like Albion), or plant type (like a California cut-off) under research station conditions.

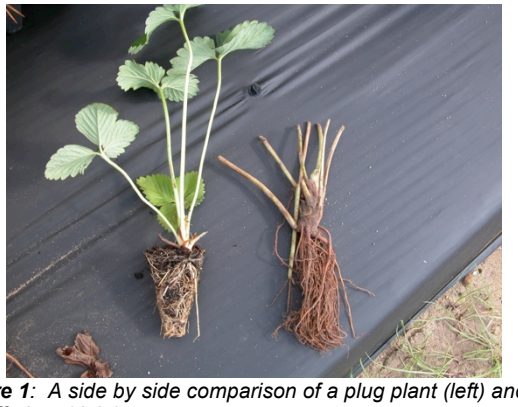


***Figure 1**: A side by side comparison of a plug plant (left) and cut-off plant (right).*

We actually did this in 2009-2010 at Central Crops Research Station in Clayton, NC, and there was no financial support for this study. We did, however, receive free plant material (and shipping) from Lassen Canyon Nursery, Redding, CA. In this brief article I will be sharing some preliminary results from this Chandler plant type trial at Clayton as well as *try* to address a more fundamental concern of all growers – how do you go about optimizing *both* marketable yield and berry size with different plant types and planting dates?

In reality, there are a number of important considerations to take into account in deciding which type of transplant is best for your operation (and market), and it doesn't just come down to measuring plant yield!

Yes, the plant yield of a new variety or plant type is very important, but it is not *all important.* What about berry size and ease of picking? Some growers would rather pick larger berries, and are more than willing to take a modest reduction in total yield per plant. For example, modest-sized Chandler plants with 3-4 branch crowns that are producing an average of 30 large berries with berry weights averaging 18 grams (.63 oz) may yield only 540 grams per plant (1.2 pounds) vs. plants that are producing 60 berries, but weighing only an average of 15 grams (0.52 oz). Yes, the 60 berry plant is more productive with a yield of 900 grams (~2 pounds). But, which Chandler crop will be more *harvestable* and marketable? Ideally, your pickers would pick everything in the field. But, do they? How many times I have heard growers complain over the years about how many berries that U-pick customers leave behind in the field. A way to manage that problem is to grow Chandler plants that do not have more than several crowns per plant!

Profit oriented growers are not fooled by impressive yield numbers alone. Higher yields do not necessarily correlate with higher profits. Smart growers need to know how harvestable and marketable the crop will be if they make a change in the planting date, or perhaps their plant type. For example, if they go with an earlier planting date on Chandler plugs, they may be able to push yields higher, but at what cost to average berry size and getting a good pick of decent berries?

We are not able to market our crops from the research station (though I think the university needs the money pretty badly right now), but what I can tell you is that when our harvest crew hits a research plot of small Chandler berries, we get a lot of moaning and groaning! On one harvest date in the middle of May 2007 (5/17), I did not hear any complaint from the picking crew when they harvested our Chandler cut-off plots, and though I am not terribly proud of the picture I took on the spur of the moment in Figure 2 that compares a box of Chandler fruit on the left that came our of our plug plots vs. the cut-off plots on the right, you can see that there was a clearly visible difference in fruit size.

The 2006-2007 season was my first experience with comparing plugs and cut-off plants. We had a milder fall and winter that season, and we were able to achieve some remarkably high yields with even the 10/24/06 planting date for California cut-off plants of 20,000 lbs/acre, or about 1.14 lbs/plant (Table 1). Interestingly enough, the 10/18/06 planting date for cut-offs produced a yield of 21,300 lbs/acre (compared to a marketable yield of 23,400 lbs/A for Canadian plug plants), and had an average berry size of 17.6 g/berry compared to 15.8 g/berry for the plugs set on 10/11/06.


***Figure 2**: The Chandler plug plant berries (left) averaged only 14 grams in the 2007 season, whereas the Chandler cut-off berries (right) averaged 17.6 grams. (photo by B. Poling, Clayton Central Crops, May 17, 2007).*

**Table 1**. Our first comparison of plugs and cut-off plants for yield and berry size at Clayton Central Crops in 2006-2007

| Plant type | Tip/cutoff source | Plant date | Yield of berries greater than 10 grams (lbs/A) | Average berry size (grams) |
|---|---|---|---|---|
| Plug | Canada | 10/3 | 23,600 | 14.1 |
| Plug | Canada | 10/11 | 23,400 | 15.8 |
| Cut-off | Calif | 10/18 | 21,300 | 17.6 |
| Cut-off | Calif | 10/24 | 20,000 | 17.5 |

In 2009-2010, we did our second trial with cut-off plants at Clayton, and fortunately, we chose some earlier planting dates (9/30, 10/7, 10/14), for what turned out to be one of our coldest falls and winters in more than a decade. In this trial we learned a very important lesson: *cut-offs that are set late in a colder than normal fall/winter will lose you money!*

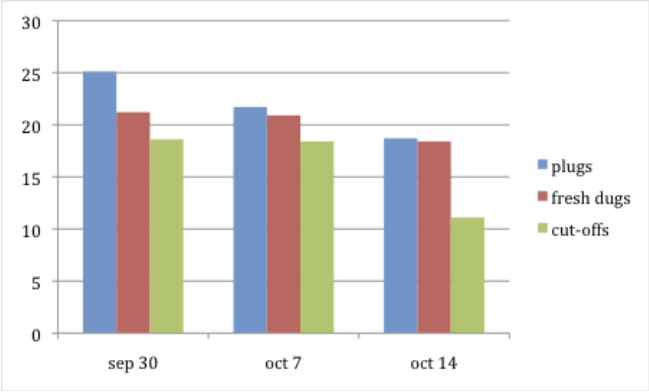



***Figure 3:** Marketable yield comparisons for plugs, fresh dugs and cut-off plants set on 9/30/09, 10/7/09 and 10/14/09, Clayton Central Crops, 2009-2010*

As you can see from the chart (Fig. 3), the cut-offs set on 10/14/09 produced a little over 10,000 lbs/acre. We were able to achieve reasonable cut-off yields of slightly more than 18,000 lbs/acre with plantings on 10/7/09 (and 9/30). But, what an incredible difference a week can make! By delaying the cut-off planting date from 10/7 to 10/14, as we gave up 7,000 lbs/acre in production.

What really concerns me about this current 2010-2011 season, is how very late cut-off plants were shipped from California last fall. I know of a number of producers who did not receive their cut-offs from one northern California nursery until the weekend of October 23-24, 2010. And, we have just experienced one of the coldest Decembers on record! Frankly, it wasn't really

the fault of the Northern California nursery industry for the later shipping dates in fall 2010, as they had major plant shortages out there due to a much colder than normal nursery growing season.

In the spring of 2010, we observed that the October 7, 2009 planting date for the Chandler cut-offs did give us our best berry size (slightly more than 17.5 grams/berry compared to significantly smaller fruit for plug plants). Overall, it would appear that if you are going to try cut-off plants in areas like Clayton, NC (transition piedmont/coastal plain climate), you need to be very cautious about your planting dates! In studying the nursery chilling accumulations for northern California nurseries like Macdoel, it is possible to get as many as 200 hours of chilling (32 F – 45 F) before October 1st.

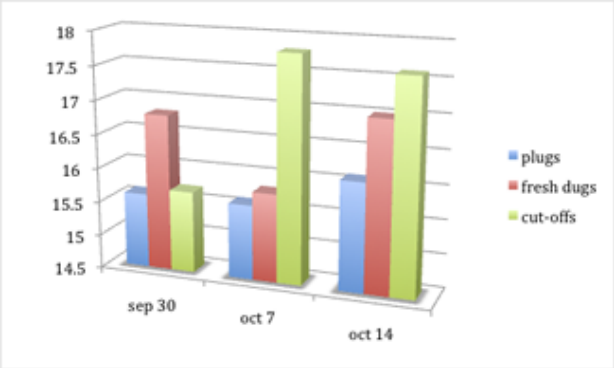



*Figure 4: Average berry size (grams/berry) comparisons for plugs, fresh dugs and cut-off plants set on 9/30/09, 10/7/09 and 10/14/09, Clayton Central Crops, 2009-2010*

Summary. You decide! Our job is to run the research studies and share the results. In our research investigations of cut-offs at Clayton Central Crops in the 2006-2007 and 2009-2010 seasons we have learned that plug plants set in early October at this location can provide the top yield numbers, but we also need to take into account that the average berry size for plugs over the picking season may be unacceptably low for many of today's strawberry operations. A partial solution to this problem with plugs may be to set the plants slightly later, but you must be careful as to how late you push your planting date, especially in a cold year like 2009-2010! And, it was disappointing to see how little improvement we really got in berry size for Chandler plugs with the later planting dates tested in 2009 (Figure 4). Some growers have addressed the smaller berry size issue in Chandler plugs by switching out of plugs entirely and going back to fresh dugs. We did include fresh dugs as a third plant type in our 2009-2010 trial, and it was interesting to see that the fresh dugs did reasonably well in both yield and berry size (Figs. 3 and 4), but what really stood out in this trial was the excellent berry size for cut-off plants set on October 7 (Fig. 4). Combined with the reasonably good yield for cut-off planting date of October 7 (Fig. 3), this would appear to be a very winning combination! And to be safe, it would seem desirable for growers in the Mid-South who wish to experiment with cut-offs, to try to get these plants shipped to their farm by the end of the first week in October in areas with growing climates like Clayton, NC. You can plant cut-offs later in a mild fall/winter season, but in the colder 2009-2010 season, there was little margin for error with this plant type!

*Acknowledgement: The author wishes to sincerely thank Mr. Rocco Schiavone, Research Assistant, Department of Hort. Sci. ,NCSU, for his excellent work in managing these trials at Clayton Central Crops.*

## Growing Gourmet Strawberries Commercially

By Michael J. Wellik

### Introduction

The words "gourmet strawberries" have different meanings to different people. The most common use of these words on the internet is to describe hybrid strawberries covered with chocolate. However, for this article these words will be used to describe specific species and varieties of strawberries that can be grown as a crop for a premium market and sold at a premium price.

European growers are already growing gourmet varieties of a couple of species. These include a hybrid variety named *Fragaria ananassa* 'Mara des Bois' and what are called pineberries. *F. vesca* types, which are known as alpine strawberries or fraises des bois, are grown in Europe on small acreages. In limited areas of Europe a third species, *F. moschata*, is grown that is commonly known as musk strawberries.

'Mara des Bois' is reported to comprise 50% of the acreage in some key European markets. This variety produces medium to large fruit that has excellent aroma and flavor. The alpine types produce small fruit that are highly aromatic and have superb flavor that is known as wild flavor.

The Europeans are also ahead of U.S. growers in another area. Within the last year a grower in the Netherlands introduced what he has called pineberries. The name is the short version of "pineapple strawberries," which are heirloom strawberries dating from the early 1800's that produce a highly aromatic white fruit with the taste of pineapple.

A few growers in the U.S. are creating niche markets with gourmet varieties. This includes the varieties and types mentioned above. There are no more than a handful of growers doing this in the U.S., to my knowledge.
There are several reasons that European growers grow more diverse varieties than U.S. growers. My opinion is that the primary reason is due to the American attitude that big is better. Recently, I discovered a list of research priorities from a large U.S. strawberry association. One of the main priorities was to develop varieties with larger fruit. No mention was made of flavor or aroma. I think this is what separates European from U.S. markets.

For several years I have been building an online retail business where I sell seeds and plants of gourmet strawberries. This business is growing by leaps and bounds. The primary customers are home gardeners who are looking for strawberries with taste. They are not turned off at all by smaller size. They want flavor. And, equally important, many tell me that they want to control how their fruit is grown to reduce or eliminate pesticides that are applied to their fruit. They are looking for healthy fruit with flavor.

It is my opinion that growers who change their attitudes toward large fruited strawberry varieties and start growing varieties with flavor will reap the benefits. Those that also produce fruit using organic or natural methods will enjoy even higher profits.

All of this is likely a new way of thinking for anyone reading this article. I am sure that most are already asking to see the numbers. This article is not going to focus on numbers. However, I believe that gourmet strawberries have the potential to produce significantly more income per acre than growers are receiving now. The numbers for any grower will depend on their location and the varieties and growing methods that are chosen.

The opportunity to grow gourmet strawberries is not limited to large scale commercial strawberry growers. I know of a grower whose production is on a quarter acre. His profit is higher on this area than some commercial growers get for several acres of hybrid strawberry production. If you have the desire and have market opportunities in your area, growing gourmet strawberries may be worth exploring.

**Gourmet Hybrids**
All of the gourmet hybrids currently grown in the U.S. are *F. ananassa* varieties. We will break this category of hybrids into two types. The first type is 'Mara des Bois'. As mentioned, this type is grown extensively in Europe. It has not been widely available in the U.S. until recently.

'Mara' is a day neutral variety that can be grown similarly to currently available hybrid varieties. The smaller fruit size will likely mean that labor cost for harvest will be higher than growers are paying now, but the flavor can increase the market value. Market price will depend on the location and market. I am aware of a grower in the western U.S. who grows this variety and markets to high-end restaurants. This grower is successfully using portable high tunnels to improve quality and marketable yield. More and more growers and researchers are focusing on high tunnel production but this is one of only a handful of growers that I know of that commercially grows the gourmet variety 'Mara des Bois'. He is capitalizing on being in a niche within a niche.

'Mara des Bois' is, in my opinion, a variety that will catch on in the U.S. and will eventually be widely grown. Until it becomes a commodity, growers will be able to demand a premium price. Side by side with current U.S. hybrids it will, again in my opinion, be sought out by consumers due to the excellent taste. The fact that it can be shipped longer distances than some of the other gourmet strawberries will also make it more widely grown.

Another type of gourmet hybrid are the pineberries already mentioned. To date this fruit is available in Europe only and a single large greenhouse grower in the Netherlands is the only grower in Europe. This grower markets all his production through one grocery chain with stores in several European countries. The grower has chosen not to sell plants of his single variety so there are few opportunities for other growers to enter this market. I currently offer three varieties of this type of hybrid strawberry and have been selling one of the varieties to home gardeners in the U.S. for two years (I

cannot ship plants outside the U.S. due to USDA restrictions). A limited number of growers and breeders are interested in commercializing this crop in the U.S. but to my knowledge no growers have a significant area committed to this type at the present time.

My opinion is that for some time there will be interest in growing pineberries by home gardeners, especially those interested in heirloom varieties. Chefs with experience with this type of gourmet strawberry will likely be interested as well if consistent production makes it available. Some plant growth habits and the need for protection will likely limit commercialization. Specialty growers are encouraged to trial these varieties on a limited scale. Growing methods and techniques that I have developed for other gourmet strawberries are adaptable to this type and might make it more attractive for commercialization.

This gourmet type is also known as fraises des bois. These are open pollinated varieties that are not hybrids. The varieties are selections and the oldest have been cultivated in Europe for around 300 years. There are varieties that produce red, white or yellow fruit. Red fruiting varieties are favored in Europe and the Western U.S. European trained chefs seldom are interested in white or yellow fruit. Less traditional chefs will use white and yellow fruit to give their customers a memorable experience with something different.

Several European countries boast acreages of around 50 acres each of fraises des bois production. There are several growers in Europe that export fruit to the U.S. I am aware of several growers in the U.S. that grow no more than an acre of fraises des bois each. More and more U.S. growers are interested in growing this highly specialized crop.

Most of the geographical areas where fraises des bois are currently grown in the U.S. are coastal with mild climates. I am aware of one grower in central Pennsylvania with a half acre of production. I have grown fraises des bois for sale to a high-end restaurant in Philadelphia. My experience was with about ¼-acre of field grown plants. From that experience and from research that I have conducted for a number of years have lead me to a number of observations and conclusions:

- This is a very labor intensive crop due to the size of the fruit.
- Field-grown plants are more difficult to harvest and are more susceptible to weather and pest damage. Harvesting the crop requires “stoop labor” and laborers are difficult to find.
- The alpine type of strawberry has growth habits different from traditional hybrid varieties. Not all methods and techniques currently employed are applicable to commercial production of alpine types.
- Potential sales from small acreages rival returns from whole farms of conventionally grown hybrid strawberries.
- Outside of coast areas with mild climates I recommend growing the crop in a protected environment such as a high tunnel
- Variety trials and experience show that growing multiple varieties produce more consistent production due to the cyclical nature of production of the day neutral plants
- Runnering June-bearing varieties are worth trialing.
- Most literature available both online and printed paint a picture totally different than reality. This is especially true of garden writers in the U.S. Alpine strawberry plants are depicted as cute little ornamentals that are not very productive. My research and experience show this to be false.
- Container production trials have shown clear season extending capabilities of certain types of containers. I have not yet tested combinations of techniques and methods on a commercial scale.
- Growing methods that reduce labor required for production are available. Trials are needed to assess practicality and economics.
- Drip irrigation is an essential component of a production system for alpine strawberries.
- There are multiple markets for fraises des bois fruit. Some believe that the only market is to high end restaurants but this is not the case.
- Strawberry growers tend to have a negative attitude toward fraises des bois largely due to the size of the fruit.
- Fraises des bois production can be incorporated into a hybrid strawberry operation within limits due to pest

considerations.

- Organic and all natural methods can be successfully used for small production areas. Testing is needed on larger areas to determine if these methods will continue to be economical and practical.

**Musk Strawberries**
Musk strawberries are not self-pollinating. A male and a female are needed for production. In practice, I suggest that customers purchase plants of several varieties to optimize pollination.

A University of Maryland researcher is conducting extensive breeding trials with this type of strawberry. His story appeared in Smithsonian magazine several years ago (give reference). I have tried to contact him. To date I don't know the status of his research.

I can confirm that he is on the right track. This strawberry is like nothing you have ever tasted. A couple of years ago I donated a few plants of several types to a chef in Pennsylvania, including musk plants. The day I delivered them I had a half pint of the fruit to offer him. He and his partner had the most interesting looks on their faces I have ever seen. He still says that it is his favorite strawberry.

What is it about musk strawberries that make them a chef's favorite? The aroma is first. The aroma is very strong and penetrating. When you encounter the aroma you don't immediately identify it as a strawberry. And the taste is memorable as well, though some immediately don't like the taste. It is impossible to describe. My best stab at it is to say that these strawberries taste like pineapples, strawberries and raspberries all at once. The musky taste is reminiscent of certain types of wine.

I have never attempted to grow this type and market them commercially. Trials are necessary to determine the commercial potential.

**Other Gourmet Types**
I have been collecting and trialing varieties of several species not already mentioned. This includes a number of European and U.S. heirloom varieties. Some have never been grown commercially. Others fell out of favor due to the soft nature of the fruit making it less desirable to ship large distances. The "buy local" movement currently underway in the U.S. brings into question whether some of these varieties might be grown and sold into local markets. Small and large scale testing is needed to select varieties that have potential to be grown for these local markets. Each will have to be assessed individually in that environment.

**Conclusion**
There is tremendous potential for commercialization of gourmet strawberries. Most of the varieties mentioned likely will not ever be grown on large acreages. Some will be adaptable and accepted in certain local markets. Specialty markets will likely embrace the availability of gourmet strawberries. As production increases, the extremely high price needed to economically market these strawberries will adjust making them more affordable and even more widely available.

The opportunity is now to begin trialing these strawberry types. There is no reason to reinvent the wheel so to speak. I have spent nearly 25 years collecting and growing gourmet strawberries. If you are a commercial grower I would like to work with you to produce these strawberries and bring them to the marketplace. I believe that your customers will appreciate these new products and create new profit centers for your business.

1 Owner, The Strawberry Store, LLC.
Middletown, DE 19709. Online at
www.thestrawberrystore.com.

Click the Link Below to Contact Mike:
mailto:mike@thestrawberrystore.com?subject=Commercialization of Gourmet Strawberries

## Strawberry Genome Sequenced

An international team of scientists led by the University of Florida and Virginia Tech is the first to publish the DNA sequence for the strawberry – a development that should help yield tastier, hardier varieties of the berry and other crops in its family. The consortium sequenced the woodland strawberry *(Fragaria vesca)*, a wild relative of today's cultivated strawberry varieties *(Fragaria × ananassa)*. From a genetic standpoint, the woodland strawberry is similar to the cultivated strawberry but less complex, making it easier for scientists to use in research.

"We've created the strawberry parts list," said researcher Kevin Folta, an associate professor with UF's Institute of Food and Agricultural Sciences. "I you're going to try any advanced research, such as molecular-assisted breeding, a

parts list is really helpful. Now we know the molecular nuts and bolts that make up the strawberry plant."

Having that "parts list" in hand will enable strawberry breeders to bring new varieties to market faster. Having the genome sequence will help strawberry breeders unravel — and improve upon — even a complex trait, such as fruit quality or aroma, or develop cultivars that can be grown with less environmental impact, better nutritional profiles and larger yield, that mature earlier or later than existing varieties, or have higher levels of phytochemicals with health benefits. All of those dividends are probably at least a decade off, however, said researchers.

The strawberry is part of the Rosaceae family of flowering plants that includes important agricultural and ornamental crops, such as apples, peaches, cherries, raspberries, plums, almonds and roses. Plants in the Rosaceae family share many important traits, so unveiling the woodland strawberry's genome should mean quicker breeding advances for those crops, as well.

The research was distinctive in several ways, Folta said. First, it had no central funding source, unlike some similar genome-sequencing projects. Scientists donated time and used parts of smaller grants, to cover costs. Second, the consortium was open access — meaning any scientist who had an interest in the project was allowed to play a role, even those who were not experts in genome sequencing or computational biology, Folta said. And finally, the woodland strawberry is the first plant to have its genome sequenced exclusively by a method called short-read sequencing.

In short-read sequencing, small pieces of DNA are sequenced separately. Those pieces are then strung together using computer software. Folta explained it like this: "If you had the alphabet from A to Z, and someone gave you a piece that was A-B-C, and another piece was C-D-E-F, and another piece that was E-F-G-H, you could align all those using the common letters, and eventually develop the whole alphabet."

Strawberry is an excellent crop for scientists to use in genetic and physiological studies, because it takes so little space to grow and is a quick-turnaround crop, unlike some others in the Rosaceae family, such as peaches or apples.

*To see the University of Florida news release upon which this article is based, go to http://news.ufl.edu/2010/12/26/strawberry/.*

## Mid-South Greenhouse Strawberry Production

By Dennis Deyton and Carl Sams

Can the strawberry production season be extended in the mid-South beyond the normal spring harvest? Prices are higher during the offseason when supply is reduced. Research by others has shown that production on raised plastic-covered soil beds in high tunnels can advance harvest by several weeks. Planting plug plants in a similar system in late summer can produce a fall crop. Growers in Europe, especially in Belgium and the Netherlands, have used "programmed production" such that they use outdoor and greenhouse production to yield strawberries nearly year-round. Reports from Europe indicate that strawberries have been grown in soil beds in protected culture for decades. However, repeated production in a soil in protected culture can eventually result in reduced yields due to increases of soilborne pests and/or accumulated fertilizer salts in the soil. Thus, the grower may need to reduce pathogens through cultural practices such as fumigation or rotation, and reduce fertilize salts through practices such as leaching. An alternative is to produce the crop in containers with a non-soil media.

We, along with several Tennessee vegetable producers, had the opportunity several years ago to visit the Wageningen Research Centre in the Netherlands to learn about greenhouse vegetable and strawberry production. We visited Dutch growers with intensive production of tomatoes, peppers, and strawberries. The grower greenhouse operations we visited were owned and operated by family units with the produce usually sold through auction houses. One grower we visited produced strawberries eleven months of the year through the combination of about 2.5 acres of outdoor production (Fig. 1) and 15 acres of greenhouse production (Fig. 2). The greenhouse production was in high-wall glasshouses with plants grown in coconut coir in pots of approximately 12 inches x 9 inches. Plants were chilled at about 36ºF for 3 weeks before planting. Elevated carbon dioxide was supplied to canopy to increase photosynthesis and yield. The grower

used bumblebees for pollination and predator/parasitoids to control insects and mites. Nutrient solutions were applied through drip tubes. The fruit could be sold as organically produced when using approved nutrients. He stated that the greenhouse yielded about 1 lb/ft$^2$ in the fall and 2.3 lb/ft$^2$ in the winter-spring. As we boarded to return to the USA, we were surprised to see stacks of boxes of strawberries being loaded onto our airplane.

In Tennessee, we are evaluating fall through spring production in less costly polyethylene covered greenhouses. Our research house is a 96 x 30 feet polyethylene covered greenhouse heated with propane and cooled with fans, evaporative cooling pads and shade cloth (fall and spring). We try to transplant plug plants in the first week of September into pots of non-soil media. Tip cuttings and plug plants have been difficult to obtain as as early as we desire, thus we produce our own. After trying various container sizes, single plants are now grown in 6 inch pots in a media of 50% perlite: 50% commercial potting mix. Pot spacing depends on cultivar and environmental factors that influence yield and disease occurrence. Bumblebees have been efficient pollinators for greenhouse strawberries and hives have been effective for up to 6 weeks. Our strawberry production during the first week of January 2011 are shown in Fig. 3. The wooden posts in the picture were established for a previous tomato trial.

We are producing crops with none to minimal pesticide usuage. Powdery mildew is the most common disease on greenhouse strawberries and is relatively easy to control with ventialtion and sulfur sprays. *Botrytis* was a major disease problem in one grower's house but we have been able to control it without pesticides in our house by ventating and using fans for air circulation to control relative humidity; and by controlling plant vigor and canopy density. The twospotted spider mite population has been our most frequent pest problem, but we have very good control with IPM use of the predator mite *Phytoseiulus persimilis.* Two types of aphids were brought into the house one year along with other plant material introduced into the house. They were quickly brought under control with predator insects. Whiteflies became a problem one year and quite damaging to production. Through IPM monitoring and use of the wasps *Encarsia formosa* to parasitizes the larva, we have obtained excellent control. The next year, thrips became the major pest attacking flowers. We have since used the predator mite *Neoseiulus cucumeris and the predatory bug Orius* to provide adequate control. We have produced crops without synthetic pesticides; the use of biologicals is an approach that can reduce synthetic pesticide use. Many growers would change to pesticides if biological no longer provided acceptable control. It appears to be quite possible to produce strawberries in greenhouses organically if approved fertilizer is used. We are unsure of the economics of strawberry production in polyethylene-cover greenhouses but are evaluating that this year.

*Figure 1*

*Figure 2*

*Figure 3*

*Report to the North American Raspberry and Blackberry Association*

## Blackberry Varieties for Tunnel Production in Northern Areas

Eric Hanson (Horticulture),
Rufus Isaacs (Entomology),
and Annemiek Schilder (Plant Pathology),
Michigan State University

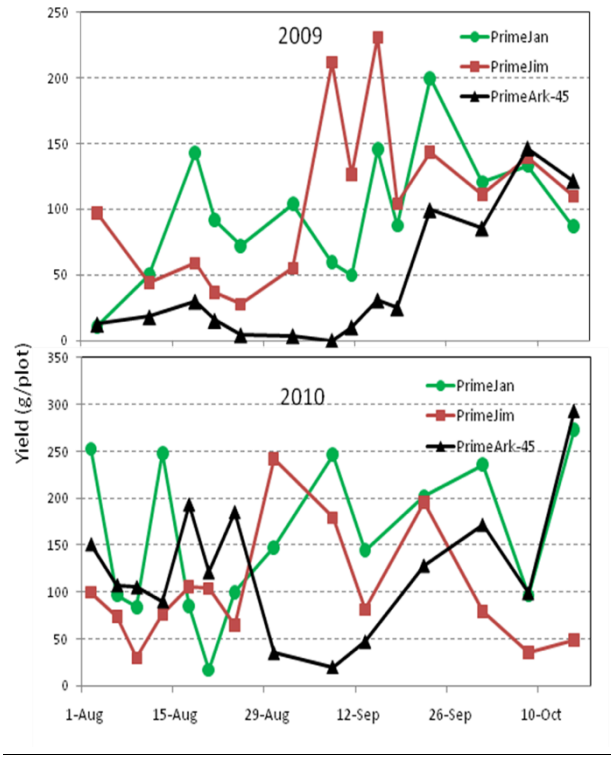
The humid summers and cold winters in the Eastern U.S. make production of bramble fruits challenging. The quality of these fruits is particularly affected by rain and humidity that promote fungal diseases. From 2005 to 2009, we grew summer and fall fruiting raspberry varieties under Haygrove high tunnels at the Southwest Michigan Research and Extension Center (SWMREC) in southwest Michigan and found that tunnels improved yields and berry quality sufficiently to pay back the cost of tunnels in two to three years. Tunnels also reduced Japanese beetle and potato leafhopper numbers and leaf spot and anthracnose infections, while two spotted spider mites were more numerous.

In this project, we studied tunnel production of fall fruiting blackberries (2007 planting of PrimeJan, PrimeJim, four selections from the Arkansas breeding program) and summer fruiting blackberries (Apache, Black Butte, Chester, Kiowa, Ouachita, Triple Crown) planted in 2008.

Primocane-fruiting blackberries have yielded very poorly. Yields in 2009 and 2010 (Table 1) were roughly equivalent to 1,000 to 3,000 lb per acre. As illustrated in the figure below, there has been no period of concentrated production. Berries ripened from early August through mid October. These primocane-fruiting types fruit on the ends of canes and branches. In order to stimulate lateral branching, we have tipped the canes that reach heights of 2-3 feet in June, and left later growing canes alone. At the end of the season in October, up to half of individual canes and lateral branch ends had not yet produced ripe fruit. The disease crown gall is also present in these plants and likely contributes to the yields. We also observed that earlier opening flowers often did not set fruit, and suspect that hot tunnel temperatures in August may inhibit pollination and fruit set. Fruit quality of the primocane-fruiting types has generally been good, though size has been modest.

**Table 1. Primocane fruiting blackberry yields and berry weights under high tunnels, Benton Harbor, MI.**

| | Yield (kg/plot) | | Berry weight (g) | |
|---|---|---|---|---|
| **Variety** | **2009** | **2010** | **2009** | **2010** |
| PrimeJim | 1.3 | 1.5 | 5.3 | 4.7 |
| PrimeJan | 1.4 | 1.2 | 6.2 | 4.2 |
| PrimeArk-45 | 0.7 | 1.3 | 8.7 | 6.5 |
| AR-40 | 0.9 | 1.7 | 7.2 | 4.8 |
| AR-41 | 0.8 | 1.2 | 7.4 | 5.1 |
| AR-46 | 0.8 | 2.2 | 5.8 | 4.3 |

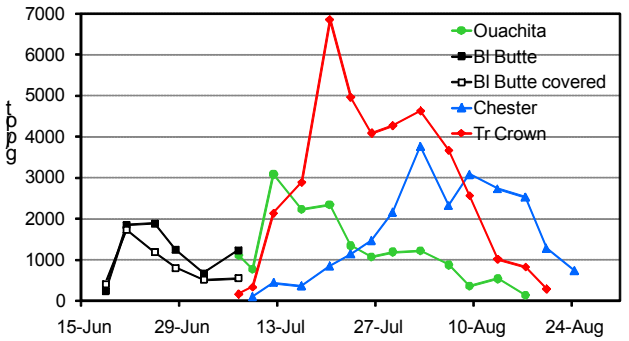



Summer fruiting blackberries were planted in April, 2008. We received poor quality plants of some varieties. Plants of Triple Crown, however, were strong and these plots established well. In 2009, Triple Crown was the only type that yielded significant amounts of fruit (equivalent to about 5,000 lb/acre). All varieties had filled their space in 2010 and yielded well. Triple Crown was again the most productive, followed by Chester and Ouachita. The largest fruited type was Black Butte. Black Butte is a West Coast variety that is very susceptible to cold injury, but because canes trail along the ground rather than grow upright, we included this variety to test whether canes could be protected from cold by covering them with row cover during the winter. We did not learn whether covers protected canes during 2008-09 or 2009-2010 winters because all plants (covered and not) were protected by snow during the coldest parts of the winter.

**Floricane-fruiting blackberry yield and berry weights under high tunnels, Benton Harbor, MI, 2010.**

| Variety | Kg/plot | Lb/acre | g/berry |
|---|---|---|---|
| Bl Butte | 7.1 | 5,100 | 7.8 |
| Bl Butte covered | 5.2 | 3,700 | 9.4 |
| Chester | 22.7 | 16,300 | 4.6 |
| Ouachita | 16.0 | 11,500 | 6.9 |
| Triple Crown | 38.5 | 27,700 | 7.8 |

Floricane-fruiting blackberry yields, Benton Harbor, 2010




## 2011 Georgia Rabbiteye Blueberry Budget

Prepared by: Esendugue Greg Fonsah[1], Gerard Krewer[2], John Ed Smith[3], Danny Stanaland[4]
[1]Extension Ag-Economist, [2]Extension Horticulturist, University of Georgia, Tifton and [3,4]Extension Agents, Bacon County, Georgia.

Click **here** to view 2011 budget.

## 2011 Georgia Southern High bush Blueberry in Soil Budget

Prepared by: Esendugue Greg Fonsah[1], Gerard Krewer[2], John Ed Smith[3], Danny Stanaland[4]
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Click **here** to view 2011 budget.

## Select Max Cleared for Use in Bearing Caneberry and Blueberry

W.E. Mitchem
Extension Associate
NC State Univ., Clemson Univ., and Univ. of Georgia

Select Max herbicide contains the active ingredient clethodim which has been registered for use in non-bearing fruit crops for some time. Through efforts of the IR-4 program a tolerance for clethodim has been established expanding the use of Select Max to include bearing blueberry and caneberry (blackberry and raspberry) plantings.

Select Max effectively controls emerged annual and perennial grasses. The use rate for Select Max is 9 to 16 oz/A per application and total use for a season cannot exceed 64 oz/A. Higher rates should be applied to stressed weeds or weeds approaching the maximum height for control and the addition of a non-ionic surfactant is required for optimum herbicide performance. Select Max has a 14 day pre-harvest interval (PHI) for blueberries and a 7 day PHI for caneberries which is considerably shorter than the PHI for Poast in these crops.

Annual grasses should be treated with Select Max when they are 2 to 6 inches tall. Controlling perennial grasses like bermudagrass and Johnsongrass requires sequential applications of Select Max. Bermudagrass should be treated with an initial application of Select Max at 16 oz/A when runners are 3 to 6 inches long. A second application should be applied when regrowth occurs. Johnsongrass should be treated with Select Max at 16 oz/A when it reaches a height of 12 to 24 inches and a follow up application should be applied when regrowth reaches a height of 6 to 18 inches. Select Max controls other perennial grass weeds like tall fescue, foxtail barley, orchardgrass, and bentgrass.

## Calcium Ammonium Nitrate – A Possible Replacement for Ammonium Nitrate

David Lockwood, University of Tennessee

Ammonium nitrate has long been used in fruit crops fertilization due in part to its high nitrogen content and relatively low cost in comparison to numerous other nitrogen sources. However, in many areas, ammonium nitrate is becoming more difficult, if not impossible, to get. This is due to its potential use as an oxidizing agent in the manufacture of certain types of explosives. New regulations for suppliers including having to fence off storage areas and installing video cameras to monitor activities in these areas have resulted in many suppliers deciding to not stock ammonium nitrate any longer. Calcium ammonium nitrate (CAN) may be used as a replacement for ammonium nitrate as it is almost as high in nitrogen content (27% vs. 34% for ammonium nitrate) and it cannot be used in the manufacture of explosives. The nitrogen component of CAN is comprised of equal amounts of the ammonium and the nitrate forms of nitrogen plus 20% ground limestone. Volatilization of the ammonium component is supposedly negligible, thus avoiding concerns about losses to the atmosphere when broadcast in warmer conditions. CAN has a near-neutral effect on soil pH, making it a good choice for use on crops grown in soils with a pH approaching the low end of the desired range. Since calcium ammonium nitrate contains less nitrogen than ammonium nitrate (27% vs. 34%), an adjustment in the amount of CAN is necessary to give the same amount of actual nitrogen as ammonium nitrate. Multiplying the ammonium nitrate rate by a factor of 1.25 will give the amount of CAN needed to apply to get the same amount of actual nitrogen. While the cost per pound of actual nitrogen for CAN may be higher than for ammonium, it is still less expensive than several other nitrogen fertilizers.

## Inspection recommendations for *C. gloeosporioides* Causal Agent of Strawberry Crown Rot

Mahfuzur Rahman and Frank Louws, Department of Plant Pathology, North Carolina State University, Raleigh, NC 27695

Crown rot is a serious disease in strawberry production regions of the Southeast since infection by *C. gloeosporioides* is favored by warm, moist conditions. The pathogen can kill strawberry plants by aggressively invading the crown tissue. Although crown rot is observed in fields during the winter/spring fruit production season, it is most severe in summer nurseries in the Southeast. In nurseries, initial infections are favored by higher summer temperatures and frequent rains that result in spread of the inoculum among strawberry plants. Observations from the last several fruit cropping seasons revealed the association of crown rot with asymptomatic plants imported from transplant supply nurseries, either as tips or bare root plants. The use of “disease-free transplants” is the most effective method for controlling crown rot in production fields (McInnes and Black 1992). The challenge is that the pathogen may not cause symptoms in the nursery even though it may be widespread. There is a critical need to understand the way this pathogen infects plants, the way it multiplies and spreads on plants without showing symptoms, and to understand how this information can be used to modify the sampling and inspection process to better assess the plant health status. Consistent with many other *Colletotrichum* species, *C. gloeosporioides* has different lifestyles such as epiphytic, endophytic and pathogenic that may vary with tissue types and growth stages. *C. gloeopsorioides* isolates that cause serious crown rot in strawberry have also been isolated from many alternate wild hosts in Florida. Genetic and pathogenic studies with isolates obtained from strawberry and non-cultivated hosts adjacent to strawberry fields indicated that isolates were from the same population and that non-cultivated hosts could serve as potential inoculum sources for Colletotrichum crown rot of strawberry. Some major species of wild hosts are shown in Table 1 (Xiao et al. 2004).

**Table 1.** Noncultivated hosts of *C. gloeosporioides* in Florida (recovered isolates are pathogenic to strawberry)

| | |
|---|---|
| Wild /Muscadine grape | *Vitis /Muscadinia rotundifolia* |
| Virginia Creeper | *Parthenocissus quinquefolia* |
| Wax myrtle | *Myrica cerifera* L. |
| Oak | *Quercus* spp. |
| Caesar weed | *Urena lobata* |
| Brazilian pusley | *Richardia brasiliensi* |
| Air potato | *Dioscorea bulbifera* |

Our study in North Carolina (NC) indicated that Virginia creeper and Muscadine grape are the two major non-cultivated wild hosts of *C. gloeosporioides*. Isolates from these wild hosts are capable of causing crown rot on strawberry. Further studies will be conducted to determine the dispersal distance of inoculum from wild hosts to strawberry nursery plants.

Certification and use of apparently healthy plants from nurseries is a challenge that the entire nursery industry faces. Use of “apparently” disease free plants for fruiting fields in the fall may show crown rot symptom due to washing down of inoculum by overhead sprinkler water, which is normally run after planting for 7-10 days to aid in establishment of bare root plants. Adoption of a comprehensive inspection protocol based on recent results should be able to minimize the risk to fruit producers. Thus, visual inspection should be complemented with samples evaluated for the presence of quiescent infections followed by an adaptive cluster sampling of the positive quadrats. In a recent study, Ojiambo and Scherm (2010) found adaptive cluster sampling is more precise compared to a simple random sampling (SRS). Adaptive cluster sampling occurs preferentially in the neighborhood of quadrats in which the species of interest is detected during the sampling bout. The design is most appropriate when the characteristic of interest is highly aggregated or clustered. In adaptive sampling, the sampler specifies the condition that triggers or initiates adaptive sampling at a sampled unit. If the response value of a sampled unit satisfies the condition for adaptive sampling by being bigger or equal to a pre-determined value, then the unit's neighborhood is added to the sample. However, in the case of quiescent infections, assessment step needs to be included before adding unit’s new neighborhood making the inspection process a relatively lengthy protocol composed of field and laboratory work. We combined stratified random sampling and adaptive cluster sampling together with invitro laboratory assessment for *C. gloeosporioides* quiescent infections in the nursery and obtained superior results compared to SRS when condition for adaptive sampling considered a single positive sample. Inoculum dispersal potential within the field also needs to be considered while adding new neighborhood and deciding quadrat size in adaptive sampling. The following major steps need to be included in the inspection protocol:

1) Visual inspection for symptomatic plants. Any collapsed/wilted plant throughout the nursery should be flagged and confirmed for the presence of *C. gloeosporioides* in affected tissues/ discolored crowns typical to anthracnose crown rot (Fig. 1).

***Figure 1.*** *Plant collapse due to Colletotrichum crown rot (left), typical marbled reddish brown crown symptom (right).*

As crown discoloration and plant collapse can also be caused by *Phytophthora cactorum*, a quick presumptive test for *Phytophthora* can be done in the field in 15 minutes by using commercially available immunostrips from Agdia or Neogen. Both of these kits produce reasonably reliable results if crown tissues are collected from the core avoiding surface contamination. Agdia kits are less expensive compared to Neogen. Instructions for the assay protocol come with the kit. Briefly, ~1 g sample is dispensed in the mesh bag in the buffer, ground with a small hammer to make a fine slurry. The immunostrip is placed inside the pouch wall but outside the mesh vertically with ¼” submerged under the buffer as directed by the arrow on the strip. Appearance of two lines in the middle of the strip will indicate a positive reaction. A

negative reaction would help the field diagnostician conclude *C. gloeosporioides* caused the crown rot. In some cases leaves around the collapsed plant might show some irregular black lesions (Fig. 2).

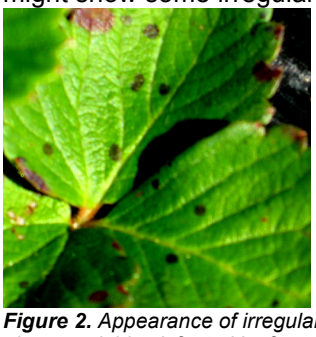

***Figure 2.*** *Appearance of irregular black spots on C. gloeosporioides infected leaf.*

2) Stratified random sampling: If alternate wild hosts are prevalent around the nursery, the likelihood of sub population (stratum) in a nursery are not equally prone to oncoming incoulum from alternate wild host due to the variable distance from the alternate wild source. Stratification needs to consider the sub population in the vicinity of the wild host as a different stratum if alternate wild hosts are present around the nursery. Plants are marked with numbered flags for a follow up adaptive cluster sampling from positive sites. Evaluations of the presence of quiescent infections can be performed through:

a) Paraquat protocol: Surface sterilized foliage are killed by dipping in herbicide gramoxone (Biggs 1995), or by freezing (Mertley et al. 2004) followed by incubating senesced foliage inside a humid chamber. After 7-10 days the killed leaves are scored for pathogen sporulation on the tissue surface. Severity of the quiescent infections can also be scored by assessing the leaf surface area covered by acervular growth. It is important to make slide mounts to confirm the species (*acutatum or gloeosporioides*) based on spore morphology. It is not unlikely for strawberry foliage to be infected quiescently with both species of *Colletotrichum*. The primary disadvantage of these assays is that they rely on the sporulation of the pathogen, which results in a time-consuming assay. Also, sporulation may be inhibited by previously applied fungicides or by the surface disinfestations common to these assays and thus creating a potential for false negatives. An alternate method is a recently developed real-time PCR protocol, which is more sensitive and can be finished in a single day.

b) Real time PCR protocol: Total DNA from leaf tissue samples are extracted with a Qiagen DNeasy Plant mini kit (Valencia, CA 91355). Primer sets (Sense-GCTTGGTGTTGGGGCCC, antisense-GGTTTTACGGCAAGAGTCCCT) together with SYBR Green-I or Evagreen is used to PCR amplify the targets and discriminate the species of *Colletotrichum* (*acutatum* or *gloeosporioides*) by melt curve analysis.

The next step would be to track back the positive plants (●) f rom stratified random sampling in the nursery and initiate an adaptive cluster sampling assuming an equal spread of inoculum around the positive infecti on foci. First quadrat in the adaptive cluster sampling will put the positive plant from SRS (●) at the center of the quadrat and take four new samples from four corners of the quadrat (○). Another four adjacent (neighborhood) quadrats will also be sampled by taking four leaf samples from four corners and one from the center of the quadrat as condition of adaptive sampling was met.

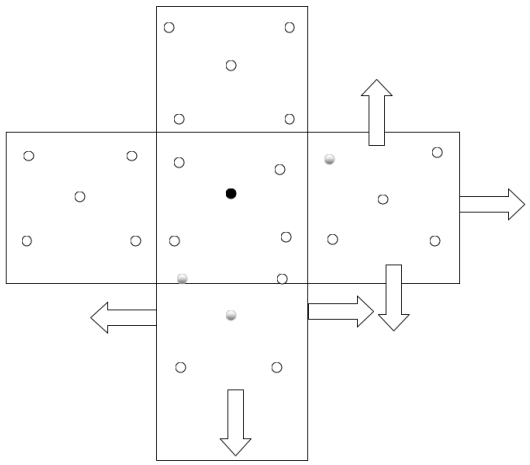

***Figure 3****. A schematic diagram of adaptive cluster sampling for inspecting strawberry nursery to detect anthracnose crown rot.*

Any positive (●) assessment of these samples may trigger further neighborhood s ampling as shown by arrows. However, our field study with plants inoculated with *C. gloeosporioides* showed that severity of quiescent infections outside a 2' radius from the point of inoculation was very low even after 60 days of inoculation. Incidence sharply declined outside a 10' radius from the point of inoculation and daughter plants outside the 10' radius transplanted to a fruiting field did not have any plant mortality or yield reduction. Thus, roguing of nursery plants from

within 10' radius of an infection foci should be very effective in separating quiescently infected plants from healthy planting stocks. However, *C. gloeosporioides* spread potential should be considered by relating it to the date of the probable initial infection of plants in a nursery.

**Summary:**
i) Inspection methods based on visual symptom is not as effective for *C. gloeosporioides* compared to other diseases that readily produce symptoms after infecting host plants.
ii) Effective inspection protocols will have to include a combination of stratified random sampling and adaptive cluster sampling.
iii) Assessment of quiescent infection is essential for samples collected through stratified random sampling and these results can be used as a basis for adaptive cluster sampling.
iv) Collaboration would need to be established between field inspectors and lab programs able to evaluate for quiescent infections.

**References:**
Biggs, A. R. 1995. Detection of latent infections in apple fruit with paraquat. Plant Disease 79: 1062-1067.
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Mertely, J. C., and D. E. Legard. 2004. Detection, isolation, and pathogenicity of Colletotrichum spp. from strawberry petioles. Plant Disease 88: 407-412.
Ojiambo, P. S., and Scherm, H. 2010. Efficiency of adaptive cluster sampling for estimating plant disease incidence. Phytopathology 100:663-670.
Xiao, C. L., Mackenzie, S. J., and Legard, D. E. 2004. Genetic and pathogenic analyses of *Colletotrichum gloeosporioides* from strawberry and noncultivated hosts. Phytopathology 94:446-453.

## Blackberry and Raspberry Seasonal Checklist

Gina Fernandez, Small Fruit Specialist
North Carolina State University

This checklist was originally developed for blackberry growers in North Carolina. Many of the items apply to raspberry production as well. You may have to adjust your work activities either earlier or later depending on your location. For more detailed information, check the Southern Region Integrated Bramble Management Guide and the Southeast Regional Bramble Production Guide at:
http://www.smallfruits.org/SmallFruitsRegGuide/index.htm

*Plant growth and development*
- √ Plants deacclimate quickly
- √ Bud differentiation (additional flowers formed)
- √ Bud break
- √ Flowering
- √ Primocane emergence

*Pruning and trellising*
- √ Finish pruning and make sure all canes are tied to the trellis before budbreak
- √ Rotate shift trellises to horizontal position before budbreak, rotate to upright position immediately after flowering

*Weeds*
- √ Weed growth can be very vigorous at the same time as the bramble crop peaks, don't let weeds get out of control
- √ Weed control is best done earlier in the season before harvest commences.
- √ Hand weed perennial weeds in and around plots

*Insect and disease scouting*
The period of time in the spring when the plant is flowering is the most important season for monitoring and control of insects and diseases. Know what your pests are and how to control them. Check the Southern Regional Bramble integrated Management Guide for recommendations.

Insects to look for this spring and summer
- √ Spotted wing dropsophila
- √ Brown marmorated stink bug
- √ Raspberry crown borer
- √ Rednecked cane borer adults
- √ Raspberry cane borer adults
- √ Thrips
- √ Tarninshed plant bug
- √ Japanese beetle
- √ Raspberry fruit worm
- √ Midge
- √ Raspberry sawfly
- √ Blackberry psyllid
- √ Two spotted spider mites
- √ Aphids
- √ Whiteflies

Diseases

- √ Antracnose
- √ Botrytis (gray mold)
- √ Spur blight
- √ Cane blight
- √ Septoria leaf spot
- √ Leaf and cane rust
- √ Powedery mildew
- √ Viruses

*Water management*

- √ Bramble plants need about 1"-2" water/week, and this is amount is especially critical during harvest.
- √ Consider installing an overhead system for evaporative cooling. Turn on once or twice a day from 10 am to 3 pm for short periods of time (approx. 15 minutes) until mid afternoon

*Nutrient management*

- √ Apply second half of nutrients if doing split application
- √ Take leaf samples after harvest and send to a clinic for nutrient analysis for recommendations for next year

*Marketing and miscellaneous*

- √ Service and clean coolers
- √ Make sure you have enough containers for fruit next season
- √ Prepare advertising and signage for your stand
- √ Contact buyers to finalize orders
- √ Hire pickers
- √ Prepare signage for field orientation, it is easier to tell pickers where to go if rows are numbered

*Attend these meetings*

- ✓ 3rd Annual Virginia Berry Production and Marketing Conference

March 11, 2010 8:45 am – 4:45 pm
http://www.virginiafruit.ento.vt.edu/VSUBerryConf2010

## Quarterly Strawberry Plasticulture Checklist

Gina Fernandez, Small Fruit Specialist
North Carolina State University

**This checklist was originally developed for growers in North Carolina. You will have to adjust your work activities either earlier or later depending on your location. For more detailed information, check the Southern Region Integrated Strawberry Management Guide and the Southeast Regional Strawberry Plasticulture Production Guide at: http://www.smallfruits.org/SmallFruitsRegGuide/index.htm**

Spring (March-May)

- ✓ Send in leaf samples to testing lab every 14 days starting in late February/March
- ✓ Adjust fertility according to the recommendations
- ✓ Scout fields for mites, insects and diseases. Botrytis, anthracnose, powdery mildew, aphids, thrips, mites and clippers will be your primary pest problems at this time
- ✓ Remove old leaves and open plastic where any branch crowns might be growing underneath plastic
- ✓ Get pest problems under control with dormant, pre-bloom, pre-harvest and harvest sprays, customers don't like to see sprayers in the field when they are harvesting
- ✓ Make sure your irrigation systems for frost protection and drip are ready
- ✓ Monitor weather forecasts closely, frost protect as needed, start on a date that is typical for your area, any earlier may result deformed fruit and unnecessary loss of sleep
- ✓ Check your frost alarm to make sure that it is working properly
- ✓ Control weeds or ryegrass in aisles with herbicide if not done so already
- ✓ Apply straw mulch in aisles, if rye grass did not take
- ✓ Place 2 hives of honeybees/acre near your field
- ✓ Schedule picking and sales labor
- ✓ Order portable toilets and emphasize proper sanitation for farm labor and the public

- ✓ Get sales stand ready, tidy up, paint, make new signs, get new baskets…
- ✓ Check and organize supply inventory
- ✓ Clean out and fire-up refrigeration units
- ✓ Have scales checked by proper authorities in your state
- ✓ Harvest each plant 2x week (start early to mid April)
- ✓ Figure out a system to collect customer names etc for your mailing list
- ✓ Keep harvest records even when you are busy


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# 2011 Georgia Rabbiteye Blueberry Budget

Prepared by: Esendugue Greg Fonsah[1], Gerard Krewer[2], John Ed Smith[3], Danny Stanaland[4]
[1]Extension Ag-Economist, [2]Extension Horticulturist, University of Georgia, Tifton and
[3,4]Extension Agents, Bacon County, Georgia.

**Year 1:** First Year Estimated Establishment and Maintenance Cost per Acre of Producing Rabbiteye Blueberries in Georgia, 2011.

| Items | Appl. | Unit | Quantity | Price | $Amt. | Your Cost |
|---|---|---|---|---|---|---|
| **Land prep** | | | | | | |
| Pre-plant Weed Control | | Gal | 2.50 | 36.00 | 90.00 | |
| Stumping, pushing, burning | | Acre | 1.00 | 1000.00 | 1000.00 | |
| Chopping | | Acre | 3.00 | 40.00 | 120.00 | |
| Triple Super Phosphate | | lbs. | 150.00 | 0.32 | 48.00 | |
| Copper sulfate | | Lbs. | 4.00 | 2.00 | 8.00 | |
| Harrowing | | Acre | 3.00 | 30.00 | 90.00 | |
| Bedding | | Acre | 1.00 | 45.00 | 45.00 | |
| Breaking aisles | | Acre | 1.00 | 30.00 | 30.00 | |
| Ditching and drainage | | Acre | 1.00 | 80.00 | 80.00 | |
| Milled Pine Bark | | Tons | 20.00 | 40.00 | 800.00 | |
| **Planting** | | | | | | |
| Plants (5' x 12') | | Acre | 726.00 | 1.65 | 1197.90 | |
| Planting labor (5 people) | | Acre | 15.00 | 9.00 | 135.00 | |
| Trans-planter rental | | Acre | 1.00 | 11.25 | 11.25 | |
| **Fertilizers** | | | | | | |
| Fertigation | 7/yr. | lbs. | 35.00 | 1.87 | 65.45 | |
| **Weed Control** | | | | | **0.00** | |
| Pre-emergence | 2/yr. | Acre | 2.3 | 43.88 | 100.92 | |
| Post-emergence | 2/yr. | Acre | 2.15 | 35.00 | 75.25 | |
| Tractor & sprayer | 4/yr. | Hrs. | 4 | 12.00 | 48.00 | |
| Labor | 4/yr. | Hrs. | 4 | 9.00 | 36.00 | |
| **Insect & Disease Control** | | | | | | |
| Pre-harvest | 2/yr. | Acre | 2 | 50.00 | 100.00 | |
| Post-Harvest | 2/yr. | Acre | 2 | 50.00 | 100.00 | |
| Tractor & sprayer | 4/yr. | Hrs. | 4 | 12.00 | 48.00 | |
| Labor | 4/yr. | Acre | 4.00 | 9.00 | 36.00 | |
| Pruning (hand) | 1/yr. | Hrs. | 3.00 | 9.00 | 27.00 | |
| Irrigation | | Acre | 1.00 | 44.63 | 44.63 | |
| Interest on Operating Costs | | $ | 4336.41 | 0.07 | 303.55 | |
| **Total Operating Costs** | | | | | **$4,639.95** | |
| | | | | | | |
| **Fixed Costs** | | | | | | |
| Tractor & Equipment | | Acre | 1.00 | 695.18 | 695.18 | |
| Overhead & Management | | $ | 4639.95 | 0.15 | 695.99 | |
| Drip Irrigation | | Acre | 1.00 | 215.98 | 215.98 | |
| **Total Fixed Costs** | | | | | **$1,607.14** | |
| **Total Establishment Costs** | | | | | **$6,247.10** | |

**Table 2:** Second Year Estimated and Maintenance Cost per Acre or Producing Rabbiteye Blueberries in Georgia, 2011.

| Operating Costs Items | Appl. | Unit | Quantity | Price | $Amt. | Your Cost |
|---|---|---|---|---|---|---|
| **Fertilizers** | | | | | | |
| Fertigation | 7/yr. | lbs. | 55.00 | 1.87 | 102.85 | |
| **Weed Control** | | | | | **0.00** | |
| Pre-emergence | 2/yr. | Acre | 2 | 50.00 | 100.00 | |
| Post-emergence | 2/yr. | Acre | 2 | 25.00 | 50.00 | |
| Tractor & sprayer | 4/yr. | Hrs. | 4 | 12.00 | 48.00 | |
| Labor | 4/yr. | Hrs. | 4 | 9.00 | 36.00 | |
| **Insect & Disease Control** | | | | | | |
| Pre-harvest | 2/yr. | Acre | 2 | 50.00 | 100.00 | |
| Harvest | 2/yr. | Acre | 2 | 50.00 | 100.00 | |
| Postharvest | 2/yr. | Acre | 2 | 50.00 | 100.00 | |
| Tractor & sprayer | 6/yr. | Hrs. | 6 | 12.00 | 72.00 | |
| Labor | 7/yr. | Hrs. | 6 | 9.00 | 54.00 | |
| Pruning | 1/yr. | Hrs. | 7.00 | 9.00 | 63.00 | |
| Mowing | 3/yr. | Hrs. | 3 | 9.00 | 27.00 | |
| Irrigation | | Acre | 1.00 | 44.63 | 44.63 | |
| Interest on Operating Costs | | $ | 897.48 | 0.07 | 62.82 | |
| **Total Operating Costs** | | | | | **$960.30** | |
| | | | | | | |
| **Harvesting & Marketing Costs** | | | | | | |
| Harvesting | | lbs. | 1500.00 | 0.18 | 270.00 | |
| Custom Packing -Fresh | | Lbs. | 712.50 | 0.62 | 441.75 | |
| Custom Packing - Frozen | | Lbs. | 712.50 | 0.20 | 142.50 | |
| Cooling, Handling & Brokerage | | $ | 1425.00 | 0.15 | 213.75 | |
| **Total Harvesting & Marketing Costs** | | | | | **$1,068.00** | |
| | | | | | | |
| **Fixed Costs** | | | | | | |
| Tractor & Equipment | | Acre | 1.00 | 695.18 | 695.18 | |
| Overhead & Management | | $ | 960.30 | 0.15 | 144.05 | |
| Drip irrigation | | Acre | 1.00 | 215.98 | 215.98 | |
| **Total Fixed Costs** | | | | | **$1,055.20** | |
| | | | | | | |
| **Total Establishment Costs** | | | | | **$3,083.50** | |
| **Less Return From Receipts** | | **$** | **1425.00** | **1.05** | **1496.25** | |
| **Total Establishment Cost after deducting Receipts** | | | | | **$1,587.25** | |

**Table 3:** Third Year Establishment and Maintenance Cost per Acre of Producing Rabbiteye Blueberries in Georgia, 2011.

| Operating Costs Items | Appl. | Unit | Quantity | Price | $Amt. | Your Cost |
|---|---|---|---|---|---|---|
| **Fertilizers** | | | | | | |
| Fertilizer | 7/yr. | lbs. | 56.80 | 1.87 | 106.22 | |
| Labor (hand/mechanical) | Yr. | Hrs. | 1.00 | 9.00 | 9.00 | |
| **Weed Control** | | | | | **0.00** | |
| Pre-emergence | 2/yr. | Acre | 2.00 | 50.00 | 100.00 | |
| Post-emergence | 2/yr. | Acre | 2.00 | 25.00 | 50.00 | |

| | | | | | | |
|---|---|---|---|---|---|---|
| Tractor & sprayer | 4/yr. | Hrs. | 4.00 | 12.00 | 48.00 | |
| Labor | 4/yr. | Hrs. | 4.00 | 9.00 | 36.00 | |
| **Insect & Disease Control** | | | | | 0.00 | |
| Fungicide | 4/yr. | Acre | 4.00 | 52.71 | 210.84 | |
| Insecticide | 3/yr. | Acre | 3.00 | 12.00 | 36.00 | |
| Tractor & sprayer | 7/yr. | Hrs. | 7.00 | 12.00 | 84.00 | |
| Labor | 7/yr. | Hrs. | 7.00 | 9.00 | 63.00 | |
| **Pruning** | 1/yr. | Acre | 1.00 | 75.00 | 75.00 | |
| Mowing | 3/yr. | Hrs. | 3.00 | 9.00 | 27.00 | |
| Pollination | 1/yr. | Acre | 2.00 | 45.00 | 90.00 | |
| Drip Irrigation | Yr. | Acre | 1.00 | 44.63 | 44.63 | |
| Interest on Operating Costs | | $ | 979.69 | 0.07 | 68.58 | |
| **Total Operating Costs** | | | | | **$1,048.27** | |
| | | | | | | |
| **Harvesting & Marketing Costs** | | | | | | |
| Harvesting 2/ | | lbs. | 4500.00 | 0.18 | 810.00 | |
| Custom Packing -Fresh | | Lbs. | 2137.50 | 0.62 | 1325.25 | |
| Custom Packing - Frozen | | Lbs. | 2137.50 | 0.20 | 427.50 | |
| Cooling, Handling & Brokerage | | $ | 4275.00 | 0.15 | 96.19 | |
| **Total Harvesting & Marketing Costs** | | | | | **$2,658.94** | |
| | | | | | | |
| **Fixed Costs** | | | | | | |
| Tractor & Equipment | | Acre | 1.00 | 695.18 | 695.18 | |
| Overhead & Management | | $ | 1048.27 | 0.15 | 157.24 | |
| Drip irrigation | | Acre | 1.00 | 215.98 | 215.98 | |
| **Total Fixed Costs** | | | | | **1068.39** | |
| **Total Establishment Costs** | | | | | **$4,775.59** | |
| **Less Return From Receipts 1/** | | **$** | **4275.00** | **1.05** | **$4,488.75** | |
| **Total Establishment Costs after deducting Receipts** | | | | | **$286.84** | |

**Table 4:** Fourth Year Establishment and Maintenance Cost per Acre of Producing Rabbiteye Blueberries in Georgia, 2011.

| Operating Costs Items | Appl. | Unit | Quantity | Price | $Amt. | Your Cost |
|---|---|---|---|---|---|---|
| **Fertilizers** | | | | | | |
| Fertilizer | 7/yr. | lbs. | 56.80 | 1.87 | 106.22 | |
| Labor | Yr. | Hrs. | 1.00 | 9.00 | 9.00 | |
| **Weed Control** | | | | | | |
| Pre-emergence | 2/yr. | Acre | 2.00 | 50.00 | 100.00 | |
| Post-emergence | 2/yr. | Acre | 2.00 | 25.00 | 50.00 | |
| Tractor & sprayer | 4/yr. | Hrs. | 4.00 | 12.00 | 48.00 | |
| Labor | 4/yr. | Hrs. | 4.00 | 9.00 | 36.00 | |
| **Insect & Disease Control** | | | | | | |
| Fungicide | 4/yr. | Acre | 4.00 | 52.71 | 210.84 | |
| Insecticide | 3/yr. | Acre | 3.00 | 12.00 | 36.00 | |
| Tractor & sprayer | 7/yr. | Hrs. | 7.00 | 12.00 | 84.00 | |
| Labor | 7/yr. | Hrs. | 7.00 | 9.00 | 63.00 | |
| **Pollination** | | | | | | |
| Bee hives | 1/yr. | Acre | 2.00 | 45.00 | 90.00 | |
| Gibberellic Acid | 2/yr. | Ozs. | 48.00 | 1.50 | 72.00 | |
| Tractor & sprayer | 2/yr. | Hrs. | 2.00 | 12.00 | 24.00 | |

| | | | | | | |
|---|---|---|---|---|---|---|
| Labor | 2/yr. | Hrs. | 2.00 | 9.00 | 18.00 | |
| **Pruning** | | | | | | |
| Pruning | 1/yr. | Acre | 1.00 | 75.00 | 75.00 | |
| Mowing | 3/yr. | Hrs. | 3.00 | 9.00 | 27.00 | |
| Labor | 3/yr. | Hrs. | 3.00 | 9.00 | 27.00 | |
| Irrigation | | Acre | 1.00 | 44.63 | 44.63 | |
| Interest on Operating Costs | | $ | 1120.69 | 0.07 | 78.45 | |
| **Total Operating Costs** | | | | | **$1,199.14** | |
| | | | | | | |
| **Harvesting & Marketing Costs** | | | | | | |
| Harvesting (manual) | | lbs. | 7000.00 | 0.18 | 1260.00 | |
| Custom Packing -Fresh | | Lbs. | 3325.00 | 0.62 | 2061.50 | |
| Custom Packing - Frozen | | Lbs. | 3325.00 | 0.20 | 665.00 | |
| Cooling, Handling & Brokerage | | $ | 6650.00 | 0.15 | 149.63 | |
| **Total Harvesting & Marketing Costs** | | | | | **$4,136.13** | |
| | | | | | | |
| **Fixed Costs** | | | | | | |
| Tractor & Equipment | | Acre | 1.00 | 695.18 | 695.18 | |
| Overhead & Management | | $ | 1199.14 | 0.15 | 179.87 | |
| Drip irrigation | | Acre | 1.00 | 215.98 | 215.98 | |
| **Total Fixed Costs** | | | | | **1091.02** | |
| **Total Establishment Costs** | | | | | **$6,426.28** | |
| **Return From Receipts - Fresh** | | | **3325** | **1.5** | **$4,987.50** | |
| **Return From Receipts - Frozen** | | | **3325** | **0.6** | **$1,995.00** | |
| **Less Total Receipt (Fresh & Frozen)** | | | | | **$6,982.50** | |
| **Total Establishment Costs After Deducting Receipt** | | | | | **$-556.22** | |

**Table 5:** Fifth Year - Full Production Cost per Acre of Rabbiteye Blueberries in Georgia, 2011.

| **Items** | **Best** | **Optimistic** | **Median** | **Pessimistic** | **Worst** | **Yours** |
|---|---|---|---|---|---|---|
| Yield (lbs.) | 9000 | 8000 | **7000** | 6000 | 5000 | |
| Fresh Price per lb. | 1.80 | 1.70 | **1.50** | 1.30 | 1.10 | |
| Price per lb. processed | 0.8 | 0.7 | **0.6** | 0.5 | 0.40 | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| **Variable Costs Items** | **Appli-cation** | **Unit** | **Quantity** | **Price** | **$Amt./ Acre** | **Your Cost** |
| **Fertilizers** | | | | | | |
| Fertilizers 1/ | Yr. | Lbs. | 55.8 | 1.87 | 104.35 | |
| **Weed Control (4' Band)** | | | | | 0.00 | |
| Pre-emergence | 2/yr. | Acre | 2.00 | 50.00 | 100.00 | |
| Post-emergence | 3/yr. | Acre | 3.00 | 25.00 | 75.00 | |
| Tractor & sprayer | 5/yr. | Hrs. | 5.00 | 12.00 | 60.00 | |
| Labor | 5/yr. | Hrs. | 5.00 | 9.00 | 45.00 | |
| **Insects & Disease Control** | | | | | 0.00 | |
| Fungicide | 5/yr. | Acre | 5.00 | 52.71 | 263.55 | |
| Insecticide | 4/yr. | Acre | 4.00 | 12.00 | 48.00 | |
| Tractor & sprayer | 9/yr. | Hrs. | 9.00 | 12.00 | 108.00 | |
| Labor | 9/yr. | Hrs. | 9.00 | 9.00 | 81.00 | |
| **Pollination** | | | | | | |
| Bee hives | 1/yr. | Acre | 2.00 | 45.00 | 90.00 | |

| | | | | | | |
|---|---|---|---|---|---|---|
| Gibberelic acid (growth regulator) | 2/yr. | Ozs. | 48.00 | 1.50 | 72.00 | |
| Tractor & sprayer | 2/yr. | Hrs. | 2.00 | 12.00 | 24.00 | |
| **Pruning** | | | | | | |
| Pruning (manual) | 1/yr. | Acre | 1.00 | 75.00 | 75.00 | |
| Drip Irrigation | Yr. | Acre | 1.00 | 44.63 | 44.63 | |
| Interest on Operating Costs | | $ | 1190.53 | 0.07 | 83.34 | |
| **Total Variable Costs** | | | | | **$1,273.86** | |
| | | | | | | |
| **Harvesting & Marketing Costs** | | | | | | |
| Custom Harvesting | | Lbs. | 7000 | 0.18 | 1260.00 | |
| Custom packing - Fresh | | Lbs. | 3325 | 0.62 | 2061.50 | |
| Custom packing - Frozen | | Lbs. | 3325 | 0.2 | 99.75 | |
| Cooling, Handling & Brokerage | | Lbs. | 6650 | 0.15 | 997.50 | |
| **Total Harvesting & Marketing Costs ($)** | | | | | **$4,418.75** | |
| **Total Variable Costs ($)** | | | | | **$5,692.61** | |
| | | | | | | |
| **Fixed Costs** | | | | | | |
| Tractor & Equipment | | Acre | 1 | 695.18 | 695.18 | |
| Overhead & Management | | $ | 1273.86 | 0.15 | 191.08 | |
| Drip irrigation | | Acre | 1 | 215.98 | 215.98 | |
| Recaptured Costs | | Acre | 1 | 735.27 | 735.27 | |
| **Total Fixed Costs** | | | | | **$1,837.50** | |
| **Total budgeted cost per acre** | | | | | **$7,530.11** | |

**Table 5: Net Returns Over Total Costs of Producing Rabbiteye Blueberries in Georgia, 2011.**

| Net return levels (TOP ROW); | | | | | | |
|---|---|---|---|---|---|---|
| The chances of obtaining this level or more (MIDDLE ROW); and | | | | | | |
| The chances of obtaining this level or less (BOTTOM ROW). | | | | | | |
| | **Best** | **Optimistic** | **Expected** | **Pessimistic** | | **Worst** |
| | | | | | | |
| Returns ($) | 6,910 | 6,078 | **2,970** | 3,549 | 2,684 | 1,818 |
| Chances (%) | 6% | 16% | 80% | 0.70 | 0.84 | 1 |
| Chances (%) | | | 20% | 30% | 16% | 7% |
| | | | | | | |
| **Chances For Profit =** | **99%** | | **Base Budgeted Net Revenue =** | | | **2,970** |


## Acknowledgement

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**Back**

**2011 Georgia Southern High bush Blueberry in Soil Budget**

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Year 1: First Year Estimated Establishment and Maintenance Cost per Acre of Southern Highbush blueberry in Soil in Georgia, 2011

| Items | Appl. | Unit | Quantity | Price | $Amt. | Your Cost |
|---|---|---|---|---|---|---|
| Land preparation | | | | | | |
| Pre-plant Weed Control | | Gal | 2.50 | 36.00 | 90.00 | |
| Stumping, pushing, burning 2/ | | Acre | 1.00 | 1000.00 | 1000.00 | |
| Chopping | | Acre | 3.00 | 40.00 | 120.00 | |
| Triple Super Phosphate | | lbs. | 150.00 | 0.13 | 19.50 | |
| Copper sulfate | | Lbs. | 4.00 | 2.00 | 8.00 | |
| Harrowing | | Acre | 3.00 | 30.00 | 90.00 | |
| Bedding | | Acre | 1.00 | 45.00 | 45.00 | |
| Breaking aisles | | Acre | 1.00 | 30.00 | 30.00 | |
| Ditching and drainage | | Acre | 1.00 | 80.00 | 80.00 | |
| Milled Pine Bark | | Ton | 20.00 | 40.00 | 800.00 | |
| Planting | | | | | | |
| Plants (4' x 10') | | | 1089.00 | 2.25 | 2450.25 | |
| Planting labor | | | 1742.00 | 0.25 | 435.50 | |
| Fertilizers 1/ | | | | | | |
| Fertilizer (liquid) | | Gal | 64.00 | 1.86 | 119.04 | |
| Weed Control | | | | | 0.00 | |
| Pre-emergence | 2/yr. | Acre | 2.00 | 58.00 | 116.00 | |
| Post-emergence | 2/yr. | Acre | 2.00 | 43.50 | 87.00 | |
| Tractor & sprayer | 4/yr. | Hrs. | 4.00 | 12.00 | 48.00 | |
| Labor | 4/yr. | Hrs. | 4.00 | 9.00 | 36.00 | |
| Insect & Disease Control | | | | | 0.00 | |
| Fungicide | 4/yr. | Acre | 4.00 | 26.43 | 105.71 | |
| Insecticide | 2/yr. | Acre | 2.00 | 12.00 | 24.00 | |
| Tractor & sprayer | 6/yr. | Acre | 6.00 | 12.00 | 72.00 | |
| Labor | 6/yr. | Acre | 6.00 | 9.00 | 54.00 | |
| Pruning | 1/yr. | Hrs. | 3.00 | 9.00 | 27.00 | |
| Irrigation | | Acre | 1.00 | 276.87 | 276.87 | |
| Interest on Operation Costs | | $ | 6133.87 | 0.07 | 429.37 | |
| Total Operating Cost | | | | | $6,563.24 | |
| | | | | | | |

| | | | | | | |
|---|---|---|---|---|---|---|
| Fixed Costs | | | | | | |
| Tractor & Equipment | | Acre | 1.00 | 795.22 | 795.22 | |
| Overhead & Management | | $ | 6563.24 | 0.15 | 984.49 | |
| Irrigation | | Acre | 1.00 | 1327.65 | 1327.65 | |
| Total Fixed Costs | | | | | $3,107.36 | |
| Total Establishment Costs | | | | | $9,670.60 | |

**Table 2:** Second Year Estimated and Maintenance Cost per Acre for Georgia Southern Highbush Blueberry in Soil, 2011.

| Operating Costs Items | Appl. | Unit | Quant. | Price | $Amt. | Your Cost |
|---|---|---|---|---|---|---|
| Fertilizers | | | | | | |
| Fertilizer (Liquid) | Yr. | Gal | 85.00 | 1.86 | 158.10 | |
| Weed Control | | | | | | |
| Pre-emergence | 2/yr. | Acre | 2.00 | 58.00 | 116.00 | |
| Post-emergence | 2/yr. | Acre | 2.00 | 43.50 | 87.00 | |
| Labor | 4/yr. | Acre | 4.00 | 9.00 | 36.00 | |
| Insect & Disease Control | | | | | | |
| Fungicide | 8/yr. | Acre | 8.00 | 46.13 | 369.00 | |
| Insecticide | 4/yr. | Acre | 4.00 | 12.00 | 48.00 | |
| Tractor & sprayer | 12/yr. | Acre | 12.00 | 12.00 | 144.00 | |
| Labor | 12/yr. | Acre | 12.00 | 9.00 | 108.00 | |
| Pruning | 1/yr. | Acre | 1089.00 | 0.22 | 239.58 | |
| Irrigation | Yr. | Acre | 1.00 | 276.87 | 276.87 | |
| Interest on Operation Costs | | $ | 1582.55 | 0.07 | 110.78 | |
| Total Operation Cost | | | | | $1,693.33 | |
| | | | | | | |
| Harvesting & Marketing Costs | | | | | | |
| Harvesting | | lbs. | 1700.00 | 0.72 | 1224.00 | |
| Custom Packing | | Lbs. | 1615.00 | 0.94 | 1518.10 | |
| Cooling, Handling & Brokerage | | Lbs. | 1615.00 | 0.15 | 242.25 | |
| Total Harvesting & Marketing Costs | | | | | $2,984.35 | |
| | | | | | | |
| Fixed Costs | | | | | | |
| Tractor and Equipment | | Acre | 1.00 | 795.22 | 795.22 | |
| Overhead & Management | | $ | 1693.33 | 0.15 | 254.00 | |
| Irrigation | | Acre | 1.00 | 1327.65 | 1327.65 | |
| Total Fixed Costs (TFC) | | | | | $2,376.87 | |
| Total Establishment Cost per Acre (TC) | | | | | $7,054.55 | |
| Less Returns From Receipts | | $ | 1615.00 | 3.00 | $4,845.00 | |

| | | | | | | |
|---|---|---|---|---|---|---|
| Total Establishment Cost After Deducting Receipts | | | | | $2,209.55 | |

**Table 3:** Third Year Estimated and Maintenance Cost per Acre for Georgia Southern High bush Blueberry in Soil, 2011.

| Operating Costs Items | Appl. | Unit | Quantity | Price | $Amt. | Your Cost |
|---|---|---|---|---|---|---|
| Fertilizers | | | | | | |
| Fertilizer 1/ | Yr. | Gal | 85.00 | 1.86 | 158.10 | |
| Weed Control | | | | | | |
| Pre-emergence | 2/yr. | Acre | 2.00 | 58.00 | 116.00 | |
| Post-emergence | 2/yr. | Acre | 2.00 | 18.00 | 36.00 | |
| Labor | 4/yr. | Acre | 4.00 | 9.00 | 36.00 | |
| Insect & Disease Control | | | | | | |
| Fungicide | 8/yr. | Acre | 8.00 | 46.13 | 369.00 | |
| Insecticide | 4/yr. | Acre | 4.00 | 7.00 | 28.00 | |
| Tractor & sprayer | 12/yr. | Acre | 12.00 | 12.00 | 144.00 | |
| Labor | 12/yr. | Acre | 12.00 | 9.00 | 108.00 | |
| Pruning | 1/yr. | Hrs. | 4.00 | 9.00 | 36.00 | |
| Irrigation | | Acre | 1.00 | 276.87 | 276.87 | |
| Interest on Operation Costs | | $ | 1307.97 | 0.07 | 91.56 | |
| Total Operations Costs | | | | | $1,399.53 | |
| | | | | | | |
| Harvesting & Marketing Costs | | | | | | |
| Harvesting | | lbs. | 4000.00 | 0.72 | 2880.00 | |
| Custom Packing | | Lbs. | 3800.00 | 0.94 | 3572.00 | |
| Cooling, Handling & Brokerage | | Lbs. | 3800.00 | 0.15 | 570.00 | |
| Total Harvesting & Marketing Costs | | | | | $7,022.00 | |
| Total Operating, Harvesting and Marketing costs | | | | | $8,421.53 | |
| | | | | | | |
| Fixed Costs | | | | | | |
| Tractor and equipment | | Acre | 1.00 | 795.22 | 795.22 | |
| Overhead & Management | | $ | 1399.53 | 0.15 | 209.93 | |
| Irrigation | | Acre | 1.00 | 1327.65 | 1327.65 | |
| Total Fixed Costs | | $ | | | $2,332.80 | |
| Total Establishment Cost per Acre | | $ | | | $1,0754.33 | |
| Total Receipt Per Acre | | $ | 3800 | 3.00 | $11,400 | |
| Total Establishment Cost After Deducting Receipt | | $ | | | $-645.67 | |

**Table 4:** Fourth Year – Full Production Georgia Southern Highbush Blueberry in Soil Budget, 2011.

| | Best | Opt | Median | Pess. | Worst | Yours |
|---|---|---|---|---|---|---|
| *Yield (lbs.) | 9000 | 8000 | 7000 | 6000 | 5000 | |
| *Price per lb. | 3.50 | 3.25 | 3.00 | 2.75 | 2.50 | |
| | | | | | | |
| Variable Costs Items | Applic-ation | Unit | Quantity | Price | $Amt./ Acre | Your Cost |
| Fertilizers | | | | | | |
| Fertilizer (Fertigation) | Yr. | Gal | 85.00 | 1.86 | 158.10 | |
| Weed Control (4' Band) | | | | | 0.00 | |
| Pre-emergence | 2/yr. | Acre | 2.00 | 50.00 | 100.00 | |
| Post-emergence | 2/yr. | Acre | 2.00 | 20.00 | 40.00 | |
| Tractor & sprayer | 4/yr. | Hrs. | 4.00 | 12.00 | 48.00 | |
| Labor | 4/yr. | Hrs. | 4.00 | 9.00 | 36.00 | |
| Insect & Disease Control | | | | | 0.00 | |
| Insecticides | 3/yr. | Acre | 3.00 | 7.00 | 21.00 | |
| Fungicides | 8/yr. | Acre | 8.00 | 46.13 | 369.00 | |
| Tractor & sprayer | 11/yr. | Hrs. | 11.00 | 12.00 | 132.00 | |
| Labor | 11/yr. | Acre | 11.00 | 9.00 | 99.00 | |
| Pruning | | | | | | |
| Pruning (manual) | 1/yr. | Plants | 1089.00 | 0.22 | 239.58 | |
| Mechanical topping | 1/yr. | Acre | 1.00 | 75.00 | 75.00 | |
| Irrigation | | Acre | 1.00 | 276.87 | 276.87 | |
| Interest on Operation Costs | | $ | 1594.55 | 0.07 | 111.62 | |
| Total Pre-Variable Costs | | $ | | | 1706.17 | |
| | | | | | | |
| Harvesting & Marketing Costs | | | | | | |
| Harvesting | | lbs. | 7000.00 | 0.72 | 5040.00 | |
| Custom Packing | | Lbs. | 6650.00 | 0.94 | 6251.00 | |
| Cooling, Handling & Brokerage | | Lbs. | 6650.00 | 0.15 | 997.50 | |
| Total Harvesting & Marketing Costs | | $ | | | 12288.50 | |
| Total Variable, Harvesting & Marketing Costs | | | | | 13994.67 | |
| | | | | | | |
| Fixed Costs | | | | | | |

| | | | | | | |
|---|---|---|---|---|---|---|
| Tractor & Equipment | | Acre | 1.00 | 795.22 | 795.22 | |
| Overhead & Management | | $ | 1706.17 | 0.15 | 255.93 | |
| Irrigation | | Acre | 1.00 | 1327.65 | 1327.65 | |
| Recaptured Establishment Costs | | Acre | 1.00 | 1039.38 | 1039.38 | |
| Total Fixed Costs | | $ | | | 3,418.18 | |
| Total budgeted cost per acre | | $ | | | 17,412.84 | |

**Table 5:** Net Returns Over Total Costs of Producing Southern High Bush Blueberry in Soil in Georgia, 2011.

| Net return levels (TOP ROW); | | | | | | |
|---|---|---|---|---|---|---|
| The chances of obtaining this level or more (MIDDLE ROW); and | | | | | | |
| The chances of obtaining this level or less (BOTTOM ROW). | | | | | | |
| | | | | | | |
| Items | Best | Optimistic | | Expected | Pessimistic | Worst |
| | | | | | | |
| Returns ($) | 9,187 | 8,113 | 7,040 | 2,537 | 4,892 | 3,819 | 2,745 |
| Chances (%) | 7% | 16% | 31% | 94% | 0.69 | 0.84 | 1 |
| Chances (%) | 93% | 84% | 69% | 6% | 31% | 16% | 7% |
| | | | | | | |
| Chances for Profit = | | 99% | Base Budgeted Net Revenue = | | | $3,587 |

**Acknowledgement**

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**Back**