The Two-Year Cycle Block Pruning Method
- Our Experience -

March 2021 by Aki Yamagishi

Overview and Background

This article describes our experience using a two-year cycle block pruning method as a very effective method for controlling CBB (Coffee Berry Borer) on our 5 acre farm in North Kona. We also believe it can be an effective control method for CLR (Coffee Leaf Rust).

We changed the pruning method on our 5 acre coffee farm from a three-year cycle block pruning method to a two-year cycle block pruning method three years ago. This made it possible to more easily reduce CBB damage ratio to under 1% and obtain Extra Fancy, Fancy and No.1 certifications. Also, time spent on farming has decreased, allowing us to switch from full-time to part-time farming while increasing overall profit. We believe the two-year cycle block pruning method can be effective for both full-time and part-time farming.

Since the arrival of CBB, the quality of Kona coffee has deteriorated while prices have more than doubled. This move has created a very negative reputation for Kona coffee among consuming countries. Moreover, relaxing the certification standards over the past few years has raised questions among consumers about the integrity of Kona coffee farmers themselves.

In an effort to raise farm reputation, it has become a common strategy in the global specialty coffee industry to obtain high scores in cupping competitions and auctions by submitting carefully selected green beans. But if the majority of the product from that farm is poor in quality and taste, consumers are disappointed. In the long run, consumers lose trust in the farm.

If we want to keep the Kona coffee brand reputation, each of us needs to keep the average quality high and the variability (standard deviation) in quality low in the majority of our farm production and not just for the small batches submitted for competition. Uniformity is essential for brand loyalty and downside surprise jeopardizes it.

What is the Two-Year Cycle Block Pruning Method?

We divide our farm into two sections: a 3 acre section with 1,900 coffee trees and a 2 acre section with 1,300 trees. Every year, we alternate cutting back all of the trees in one of the sections to knee height. Therefore, every tree is cut every other year so that no tree ever has production for more than one season. Previously, we did a three-year cycle block pruning method where one of the two sections was cut back every third year.

With two-year cycle block pruning, during the first year after cut back the trees in that section grow to about 7 feet but there is no harvest in that section for that year. Harvest is in the following year. After harvesting, we strip the remaining cherry and immediately cut back.

The elevation of our farm is 1,600-1,800 feet. Farms located at a higher elevation may find it difficult to fully adopt block pruning.

What CBB Infestation Ratio Do You Need for Extra Fancy Certification?

Over the years, Extra Fancy, Fancy and No. 1 certifications have been key in maintaining Kona coffee's reputation. Since the onset of CBB, many farmers seem to aim to keep the damage ratio in their fields to under 5% using IPM (Integrated Pest Management). However, with 5% insect damage, Extra Fancy, Fancy and No. 1 certifications cannot be obtained. If the grading certification system is to remain an important standard for maintaining Kona Coffee's reputation, setting the target of CBB damage to 5% is too high.

So, what is the CBB ratio allowed to get Extra Fancy? Extra Fancy certification standard allows 8 defective beans in a 300g sample of green beans. If you allow half of the defect count to be made up of insect damaged beans, only 4 beans can have insect damage. Within those 4 beans, a fully damaged bean is counted as 1, but a partial damage is counted as 1/5, so up to 20 partially damaged green beans can be allowed. Since there are about 1,500 beans in a 300g sample, 20 beans are equivalent to 1.3% (= 20/1500).

If the CBB damage ratio in the field is suppressed to 1 to 2% on average for the season and damaged beans (especially fully damaged beans) are removed during wet mill and dry mill processing, the CBB ratio of green beans can be reduced to 1% or less. Thus, you can obtain Extra Fancy. Of course, imperfection in beans are not only insect damage, but also damage such as Moldy, Sour, Poorly developed, Shell, Broken or cut, Aged/Discolored, etc. In order to keep them within 8, it is necessary to keep coffee trees and cherries healthy and harvest only ripe fruit cleanly and carefully.

The Merits of Two-Year Cycle Block Pruning

- CBB damage below 1% with minimum cost and effort
- Strong trees and healthy cherries
- Better green bean quality
- Better coffee taste
- Higher green bean price
- Lower production costs due to less fertilizing and spraying
- Easy harvest with less time and cost
- Improved profitability

Since the onset of CBB in Kona, we have kept CBB damage on our farm to 1% or less every year. We have continuously produced Extra Fancy, Fancy and No. 1 beans even applying the stricter certification standards used before CBB.

Before CBB, our farm used the Beaumont Fukunaga pruning method, where we cut back every 3 rows every year. With the Beaumont Fukunaga method, it was impossible to keep CBB infestation below 1%. We changed to block pruning with a three-year cycle, enabling us to control CBB below 1%. However, keeping CBB below 1% with a three-year cycle required a lot of cost and effort. Therefore, 3 years ago we changed to a two-year cycle. We have found that the two-year cycle has the maximum effect for controlling CBB with minimum effort and cost. In addition, the quality and taste of our coffee have improved. Although production quantity fell, our green bean price rose, production costs fell, and profits improved.

Because two-year cycle block pruning removes all the leaves from half the farm every spring, we believe it can also be effective against CLR.

One of the biggest problems of the three-year cycle was that CBB came out from raisins on the ground of our own third year block. It took time and money to detect and remove CBB infested cherries in the area from spring to summer. With a two-year cycle, CBB does not come out from our field until the latter part of the harvest season. We only need to focus on CBB flying from neighboring farms. Therefore, we can concentrate on trees around the border of our farm.

Our farm is surrounded by coffee farms in three directions, all of which have higher CBB damage than on our farm. On one of the neighboring farms, infestation reaches almost 100% in August. It feels like it reaches 1000%, and 900% flies into our farm in September. Another neighbor also reaches almost 80% in November. In terms of CBB, we have a very harsh environment. Hopefully for most coffee farms, controlling CBB is easier than on our farm.

By switching to a two-year cycle, we created a buffer zone between our farm and one of our neighbors. We focus on only two sides now instead of three.

With the three-year cycle, we used to hire a worker year round to keep CBB below 1%. However, CBB control is easier with a two-year cycle and we no longer need to hire labor on our 5 acre farm.

We now keep 4 to 5 verticals per tree, which produced about 21 pounds of cherry per tree for the 2020-21 season. Before, with the three-year cycle, the trees in the third year were tall and two of us could only pick 400 to 500 pounds of cherry per day. But with the two-year cycle, we can pick 700 to 800 pounds per day because trees are shorter and healthier. Because of this greater efficiency, we do not need to hire pickers, which enabled us to pick more cleanly (hence better taste).

Even for farms that do hire pickers, we believe the two-year cycle block pruning method can keep pickers happy while reducing the number of pickers, which will reduce production cost and ease in scheduling pickers.

With a three-year cycle, our 5 acre farm produced about 40,000 pounds of cherry. With the two-year cycle, our yield dropped to about 25,000 pounds. However, profitability has increased because of lower costs as well as higher price due to better quality and taste.

2021 State Certification Results For Our Farm

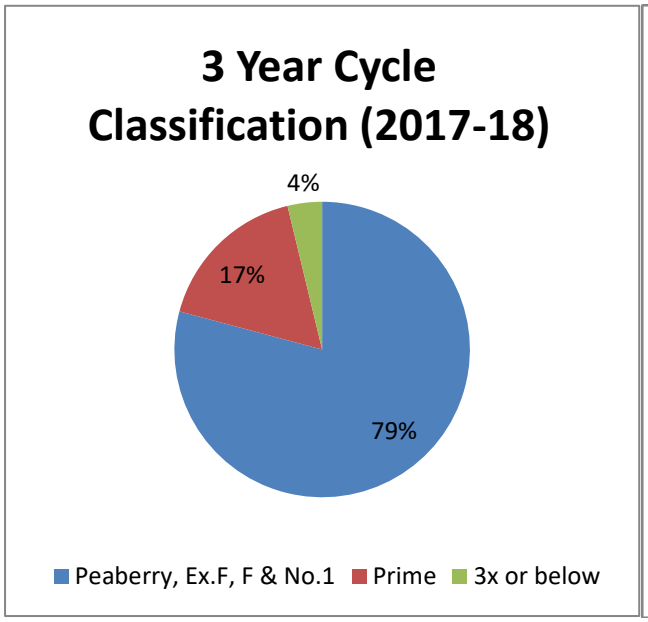
The percentage of insect damage for our certified green bean for the 2020-2021 harvest season is shown in the table below. The numbers were taken from the inspection sheet handed to us by the state inspector after inspection. Our Extra Fancy beans had 0.8 insect damages. This means that there were 4 partially insect damaged beans (1/5 count) in 300 grams (about 1,500 green beans). This is 4/1500 = 0.27%. If CBB ratio on the farm is kept at 1% or less, this level can be easily achieved after removing imperfections in wet mill and dry mill processing. Extra Fancy accepts 8 imperfections, so a 0.8 insect damage count is better than the typical Extra Fancy by a wide margin.

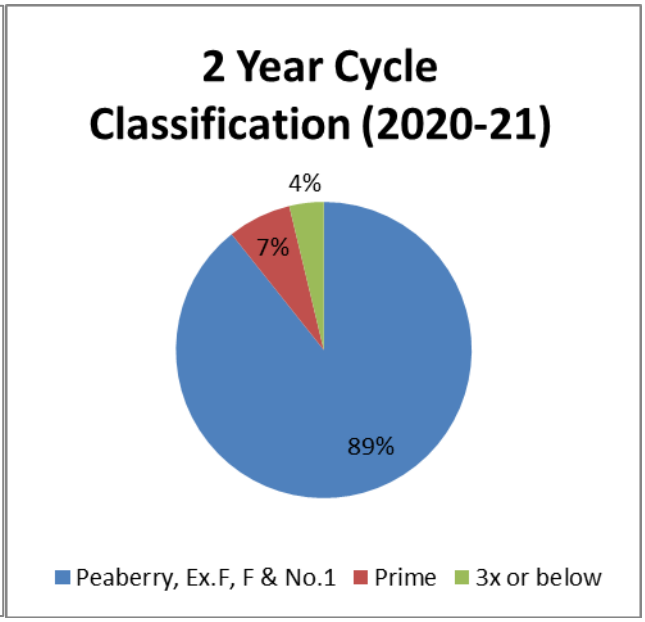
Defect 2020-21	
	Insect damage
Extra Fancy	0.8
Fancy	1.2
No.1	1.0

Inspected by State of Hawaii Dept. of Agriculture (March 1, 2021).
Defects scored as either full imperfections or less than full imperfections, per 300 grams.
Less than full imperfections are scored as 1/5 of a full imperfection.

Production On Our Farm (3 year cycle vs 2 year cycle)

Pruning Method	3 Year cycle		2 Year cycle			
Year	2017-18 3.2acre 2100 trees		2019-20 3acre 1900 trees		2020-21 2acre 1300 trees	
Cherry	36,950	Lbs	22,724	Lbs	26,759	Lbs
Parchment	6,418	Lbs	5,355	Lbs	5,788	Lbs
Green Bean	Lbs	%	Lbs	%	Lbs	%
Peaberry	158	2.5%	144	3.3%	152	3.2%
Extra Fancy (19)	469	7.3%	700	15.9%	840	17.7%
Fancy (18)	2,034	31.7%	1,850	41.9%	1,625	34.2%
No.1 (Size 16/17)	2,019	31.5%	1,151	26.1%	1,406	29.6%
No.1(Size 18/19)	400	6.2%	100	2.3%	225	4.7%
Prime(Size under 16)	318	5.0%	123	2.8%	132	2.8%
Prime(Size Mix)	778	12.1%	243	5.5%	199	4.2%
3X	88	1.4%	53	1.2%	111	2.3%
Off Grade & Rubbish	154	2.4%	52	1.2%	68	1.4%
Total	6,418	100.0%	4,416	100.0%	4,758	100.0%





There are about 3,200 trees on our farm. We harvested from 2,100 trees in 2017-18 under the three-year cycle method. After changing to the two-year cycle, we harvested from 1,900 trees in 2019-20, and 1,300 trees in 2020-21. Cherry production per tree was 18lbs (2017-18), 12lbs (2019-20) and 21lbs (2020-21). 2020-21 (two-year cycle) had higher production per tree than 2017-18 (three-year cycle). This was because of manganese deficiency in 2017-18; however it should be noted that the two-year cycle outweighed in per tree production despite smaller trees. Low productivity in 2019-20 was because of Cercospora (fungus) damage. To be honest, we were surprised that production *per tree* increased using a two-year cycle as we had thought that the third year, taller trees were the biggest contributors to production when we used the three-year cycle.

On the gravity table, we try to sort beans using a stricter than the state certification standard. Despite rigorous selection, Peaberry, Extra Fancy, Fancy, No. 1 still exceeded 89% of total production in both 2019-20 and 2020-21. Prime was 8.3% for 2019-20 and 7.0% for 2020-21. 3X or below were minimal. We do not use any color sorting machine to sort damaged beans.

With the three-year cycle, we had higher Prime ratio. We also spent a lot of time, money and effort to keep the CBB damage in the field below 1%. With the two-year cycle, we produced higher quality coffee with less effort. Also our trees and cherries became healthier, and we were able to pick healthy, mature cherries more easily. As a result, the taste improved and our price increased.

Overall, the two-year cycle produced larger beans, with a higher percentage of Extra Fancy and a lower percentage of Prime (size under 16).

No.1 (Size18/19) might need some explanation. Sizes 18 and 19 were sorted on the gravity table more strictly than the state standard requires so that excluded beans that came down the middle chute still maintained the No. 1 quality.

Damaged beans can be eliminated at the dry mill more effectively by separately processing parchment from the first half of the season (August-October harvest with less damaged beans) and the ones from the second half (November-January with more damaged beans).

Our buyers agree on the price by the quality and taste, not just by grade or size. Our Peaberry, Extra Fancy, Fancy, No. 1 are all sold at the same price - approximately 30% higher than the average price of Extra Fancy in Kona. Prime and No.1 (Size18/19) were sold at lower prices and were used for blended coffee by our buyers.

It is quite possible to have revenue of $150,000 or more from a 5 acre farm under the two-year cycle method as part time farmers. We harvest ourselves with minimal labor costs. Moreover, because of efficient harvesting, the number of working days is about half of the three-year cycle method. We enjoy a better quality of life.

Month By Month Work On Our Farm

We set the target for CBB ratio to 1% or less on average for the whole harvesting season.

Our goal is to start the harvest season (August) with less than 0.1% CBB infestation. Once harvest begins, it becomes more difficult to control CBB because 1) CBB become more active and multiply rapidly and 2) we are busy picking coffee and do not have a lot of time. The CBB ratio in the farm exceeds 0.1% in October, 1% in November, 5% in December, and becomes uncontrollable in January. However, we can average out to 1 to 2% for the whole season. After removing floaters and low density beans in the wet and dry mills, we can further reduce the ratio to below 1%.

The following described what we did in the block that we will harvest for the season. There are no cherries in the cutback block (half of the field), so we do not do much there other than to select 4 to 5 verticals, and occasionally mow and fertilize.

February / March

Every 2-3 weeks, we check all fruit on all branches of all trees and remove CBB infested fruit. This might sound like a lot of work, but it is actually very easy because there are not that many beans yet in February/March. Two of us can do it in half a day to a day. This work is very crucial. If we start

the season with 0.01%, the rest of the season is easy. If you have higher infestation at this point, it requires more intense work later.

Actually one morning in February, our neighbor began to spray Botanigard on his 2 acre farm. We also started picking CBB at the same time that morning. We finished before the neighbor finished spraying. Not only does hand picking infested beans save time and expense, it also removes CBB more effectively. 80% of the CBB in the farm is hidden in the fruit, and 20% is outside the fruit. Botanigard kills only the 20%, while our method removes 80%.

Because there were no cherries in the block during the prior year, no CBB have hibernated and come up from the ground in that block. Any CBB that are around come from neighboring farms. CBB damage from February to March is relatively high. The reason is that the number of cherries in neighboring farms is also few, and each time it rains CBB come out from their ground and fly into our farm in search of beans. The key to the success of the year is to remove CBB after heavy rain during these early months.

April / May

As beans increase in April, we check for CBB every 3 weeks. It takes two of us 2-3 days or more to check all beans. However, neighboring farms have more beans too so fewer CBB fly into our farm. We mark trees that have many CBB with colored ribbons. We try to keep CBB ratio below 0.01% at this point.

Botanigard at this time may not be necessary. But according to our soil and leaf sample tests, our trees are deficient in manganese and copper so we mix Surround WP and Botanigard with our foliar multimineral spray.

June / July / August

After July, the number of beans increases. We check all the trees and attach colored ribbons to heavily infested trees. We focus on trying to eliminate all CBB from the trees with ribbons. We also focus on trees close to neighboring farms. We spend about 40 hours a month (20 hours per person).

With the two-year cycle block pruning, harvesting starts about 1-2 rounds later than our neighbors. We spend more time checking for infestation when our neighboring farms start picking, as harvesting makes more CBB fly into our farm. We try to keep the CBB ratio at 0.1% or less at the start of our harvest season in August.

We spray foliar multimineral (mixed with Surround WP and Botanigard) during the summer.

When we were doing a three-year cycle, we hired a worker, and together we spent more than 200 hours a month checking CBB tree by tree during the summer. After changing to a two-year cycle, we do not need to hire labor any more, which significantly reduced our costs.

September to December

CBB increases rapidly during harvest. Botanigard during this time is effective in subduing CBB. If we did not need to spray minor nutrients earlier in the year, this would be our first application of Botanigard for the season.

By mid-November (when 50% of the harvest is finished), CBB come out from raisins on the ground. CBB are therefore coming from within our own farm as well as from neighboring farms. Beans on

the lower branches, particularly closer to the vertical, can become higher in infestation. We concentrate our CBB checking on these areas and, if become too heavily infested, strip all beans on the lower branches.

Before we start each round of picking, we spend a few days checking all trees and remove all damaged cherries such as CBB infested, raisin, over-ripe, moldy, under-developed, etc. We spend more time for trees with ribbons and trees adjacent to neighbors in an effort to suppress the infestation ratio of those trees to below 1% before we start a new round of picking.

By December, some trees on the border of our farm are more than 10% infested and become uncontrollable, particularly on lower branches. We strip all fruit from these trees. Stripping is relatively easy because 80% of the harvest is done. Every year, we strip more than 10 trees in this way.

When we harvest, we attach a Ziploc bag to our baskets. We put only ripe red fruit in the basket, and put all defective fruit such as CBB infested fruit, moldy fruit, overripe fruit, and undernourished fruit in the Ziploc and discard them. We strongly believe that this is the most important practice among all processes in coffee production. It improves the taste and keeps the green bean price high. As Q graders, our view is that proper picking is far more important to quality and taste than coffee variety, terroir, processing method or fermentation method.

Again, with the two-year cycle, CBB checking in between picking rounds became much easier due to low infestation. Also, we can pick more cherry a day as the trees are healthier and less damaged.

January / February
After a final harvest in early January, we strip all remaining fruit and cut back trees.

For the entire 2020-21 season, we removed about 800 pounds of defective fruit. They are mainly CBB, but also include moldy, overripe, undernourished, unhealthy, or immature green fruit accidentally picked during harvest.

Fungal Control On Our Farm

CLR in Kona will be a big threat going forward, but on our farm, Cercospora has been an issue in the last two years so fungal control has already been necessary.

In 2019-20, Cercospora was spreading in some areas of our farm, but we did not take any action other than giving more fertilizer due to our lack of understanding. It was a rainy season and we harvested in the rain in September with wet gloves touching beans, leaves and everywhere. Next month, we saw an outbreak of Cercospora in the area, which finally made us spray Kocide in October. Kocide did not stop Cercospora from spreading within a tree that was already infested but stopped it from spreading to other areas of the farm. Also we stopped using wet gloves when we picked. The area where the damage had already spread had poor fruiting, and the yield in that area was extremely low. It also affected the taste.

Unlike other coffee growing regions in the world, Kona has rain during the harvest season. Other regions don't need roofs over their drying decks. We have learned the hard way that we need to be careful when harvesting in the rain to avoid the spread of Cercospora. If CLR spreads readily through rain and wet gloves as well, it is even more critical to be careful during harvest. We believe

using two-year cycle block pruning will be effective for mimimizing fungal spread because leaves and fruit are removed from an entire block after each harvest season.

For the 2020-21 season, we sprayed Kocide or Badge in March, May and July. Thanks to this, trees were healthy overall. Yield increased even though the number of trees in 2020-21 was 1,300, compared to 1,900 in 2019-20. The average yield of cherries per tree also increased from 12 pounds to 21 pounds. Increasing the number of verticals from 2 or 3 in 2019-20 to 4 or 5 in 2020-21 also contributed to the increased yield. We are not sure whether 4 or 5 verticals may be too many if you have CLR.

As leaf and soil tests indicated lack of Manganese and Copper, we sprayed foliar Multimineral mixed with Botanigard and Surround from spring to summer. But the fungicide spray was done separately. We do not use Surround WP after July as the residual powder can irritate our eyes during harvest.

The amount of spray and the work load have been reduced. Smaller trees allowed us to spray efficiently and easily in a short time.

2020-21 Spray Schedule

Copper				Nutrition + CBB						
	Badge	Kocide			MMineral	Manganese	Nitrogen	Botanigard	Surround	EM
Mar		x		Mar	x					x
Apr				Apr		x		x	x	x
May	x			May	x		x	x	x	x
Jun				Jun		x	x	x	x	x
Jul		x		Jul	x		x	x		x
Aug				Aug		x	x	xx		x
Sep				Sep						
Oct				Oct						
Nov				Nov						
Dec				Dec						
					MMineral: Metalosate Multimineral					
					Manganese : Metalosate Manganese					
					Surround: Surround WP (Kaolin)					
					EM: Efficient Microorganism					

Fertilizing On Our Farm

The two-year cycle resulted in overall fertilizer savings. However, 2019-20 was fertilized a lot because the trees were weakened by Cercospora.

	2019-20 (3acre)		2020-21(2acre)	
Fertilizer(lbs)	10-5-20	4,050	10-5-20	3,250
	46-0-0	2,140	46-0-0	325
	7-5-5	900		

Summary

Profitability improved with the two-year cycle. We have smaller yield but costs have fallen further. Smaller, healthier trees allowed us to pick ripe cherries cleanly, which improved the quality and taste of our coffee. Therefore, our buyers paid higher prices.

CBB infested beans can be kept to 1% or less. In addition, Extra Fancy, Fancy, No. 1 certification can be easily obtained.

In addition to improving financial profitability, we saved a lot of time. We were able to switch from full time to part time farming. From January to August, we only work on weekends. During the harvest season from September to December, we work about 20 days a month with a little help from one friend. We were able to rest about a week between each of the harvest rounds. The quality of our life improved. Unfortunately, my golf game has not, which is a subject of further investigation.

About Us

North Kona
5 acres with approx. 3,200 coffee trees
Elevation 1600-1800 feet

Retired from Wall Street asset management business in NY and began coffee production in 2008. Quality-oriented production tailored to the Japanese market, which demands high quality and taste. Almost all green beans sold to buyers in Japan who sell our coffee identified with the Yamagishi Coffee name.

In 2019, our coffee was selected as "Mitsukoshi's Three Stars" from Mitsukoshi, Japan's finest department store. Only 8 items were selected for this distinction among all the food products handled by Mitsukoshi that year. It's hard to compare in the US, but it would be like getting a Michelin star.

Although we did not renew our qualification due to Covid-19, until last year we were qualified Q Graders and cupping competition judges.