

THE COST-BENEFIT ANALYSIS FOR CROP LOAD

Generating profits in difficult conditions is one of the key drivers for sustainability in agriculture. By Dr Kandas Cloete (BFAP) and Natasha Jackson (CRI)

In recent years, some citrus producers have struggled to realise good returns as the industry faced a plethora of challenges. These challenges include, but are not limited to the cost of fertiliser, chemicals, and fuel that rose rapidly because of the invasion of Ukraine, record freight rates and a decline in market prices.



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In this article, we discuss some of the aspects that can affect economic viability. These include some considerations that drive citrus growers' net return, understanding market demand, and the financial implications of the count spread supplied to the packhouse. Combining this information to calculate the cost-benefit analysis of crop load management can hopefully provide producers with a framework for practical implementation.

Considerations to improve citrus growers' net return

With a focus on citrus production, there are many things that are beyond the control of the producer, especially when considering the long value chain from grower to consumer. However, there are a few things producers can control to improve returns. Trees are alive. They require water, nutrients, and sunlight to thrive and produce good-quality fruit. Producers have control over fertiliser application and can implement certain measures that could save on cost and improve yields and fruit quality. Managing the penetration of sunlight into the tree by pruning trees during the winter and summer is an essential production practice. By regularly pruning trees, the rind quality of fruit improves, resulting in a deeper orange colour and stronger rind, and trees can bear more marketable fruit, while also increasing the effectiveness of agricultural chemicals to be used for pest and disease management.

Crop manipulation (physical and chemical) can ensure a more ideal crop load and desired fruit size for the export market. It is

important to determine the optimum fruit load for every orchard, rather than attempting a one-size-fits-all strategy across the farm. This can be accomplished by using historical harvest trends and setting up fruit growth curves for each orchard, measuring fruit growth on a regular basis in each orchard.

The pre-harvest chemical applications to manage citrus pests and diseases should not be applied by using weekly scouting reports rather than according to calendar sprays. This will reduce the cost of unnecessary sprays. One of the most important controllable actions on a farm is irrigation. Accurate irrigation scheduling reduces unnecessary electricity use and ensures better returns per applied unit of water – a finite input. During harvest time, diligent fruit care is imperative. Harvesters should

be trained beforehand on what is expected of them. Removing low-hanging fruit before harvesting starts, is advisable. Also, remove and destroy fruit touching the ground, waste fruit, and sun-burnt fruit. Send over-sized, under-sized and class three fruit to the waste bin. As soon as this fruit is transported from the orchard to the packhouse, it carries an additional cost. Fruit handled by a packhouse and not marketed profitably, will reduce the returns from profitable cartons while trying to make up for the losses incurred.

Once the fruit is transported to a packhouse, the responsibility to care for the fruit shifts. This includes, but is not limited to, packhouse activities when fruit is received, drenching, degreening, tipping, pre-sorting, sorting, packing, palletising,



and the inspection of the final packed product. Therefore, managing the critical control points in the packhouse diligently throughout the entire packing season is vital. Once packed, produce starts its journey to the end consumer, and producers often have little control over the logistical chain and the market. However, by controlling the controllable at farm level, producers can rest assured that produce with internal quality of the highest standard is packed and will better endure the rigorous process of multiple inspections, transport to port, cold storage,

Irrigation is one of the most important controllable actions on a farm.

Table 1. Desired marketable counts for 2022, for class 1

Variety	Desired marketable counts				Market response
Oranges	56	64	72	88	R20 – 40/carton more for desired counts than for bigger/smaller fruit.
Grapefruit	35	40	45	50	Tight marginal returns on desired counts, with negative returns for non-desirable counts.
Soft citrus	1xx	1x	1	2	Smaller fruit generally unmarketable.
Lemons	88	100	113	138	Drop in revenue of up to R15/carton for each increment of smaller fruit counts.

Table 2. Cost-benefit analysis per count for export oranges in 2022

Export count	Export count distribution	Export cartons per ha.	Production cos per carton	Packhouse cost per carton	Transport cost per carton	DIP	Avg. income after cost per carton
36	0%	-	R39,09	R50,06	R15,00	R106,25	R2,10
40	0%	-	R39,36	R51,98	R15,00	R106,25	R(0,09)
48	0%	-	R39,64	R52,17	R15,00	R112,50	R5,68
56	15%	344	R39,97	R52,39	R15,00	R118,75	R11,38
64	15%	344	R40,37	R52,66	R15,00	R125,00	R16,97
72	26%	595	R40,80	R52,95	R15,00	R125,00	R16,25
88	20%	458	R40,80	R52,95	R15,00	R125,00	R16,25
105	24%	550	R42,30	R53,95	R15,00	R100,00	R(11,25)
125	0%	-	R42,96	R54,39	R15,00	R81,25	R(31,10)
	100%	2290	R40,97	R53,06	R15,00	R118,06	R9,03

ocean freight, and destination handling. Citrus is a perishable product and should be handled as such throughout the whole value chain to ensure optimal shelf-life.

Evolving global consumer preferences inform demand and willingness to pay in markets.



Table 3. Cost-benefit analysis per count for export grapefruit in 2022

Export count	Export count distribution	Export cartons per ha.	Production cos per carton	Packhouse cost per carton	Transport cost per carton	DIP	Avg. income after cost per carton
28	0%	-	R33,57	R50,61	R15,00	R89,25	R(9,92)
32	0%	-	R33,82	R52,23	R15,00	R94,50	R(6,55)
35	20%	536	R34,09	R52,45	R15,00	R105,00	R3,46
40	20%	536	R34,40	R52,71	R15,00	R105,00	R2,89
45	25%	670	R34,77	R53,02	R15,00	R99,75	R(3,04)
50	20%	536	R35,18	R53,36	R15,00	R99,75	R(3,78)
55	15%	402	R35,83	R53,91	R15,00	R73,50	R(31,24)
	100%	2680	R34,80	R53,05	R15,00	R97,91	R(4,93)

Market demand and consequent returns for different counts

Evolving global consumer preferences inform demand and willingness to pay in markets. For example, school feeding programmes often prefer smaller fruit to reduce wastage, whereas when paying per unit (rather than weight), consumers may prefer larger fruit.

While some exporters may have lucrative deals on specific counts in specific markets, the general trend on the export circuit is trending towards class 1 fruit marketed in one of four counts per commodity. Table 1 illustrates the

market demand and willingness to pay per count, reiterating the detrimental financial implication of foregoing essential crop load management techniques at farm level under current conditions.

Cost-benefit calculation highlighting the importance of crop load management

Under a realistic, industry-representative set of assumptions, a cost-benefit analysis was conducted per commodity. Assumptions for yields, direct production cost and harvesting cost per hectare, packhouse cost, exports pack-out percentage and count distribution, and Delivered In Port (DIP) returns per count were considered. A principle of varying cost-by-count was incorporated into the harvesting cost at the primary production level and on wages, wax, wrappers, and electricity in the packhouse. The varying of the cost constitutes relaying the average cost per hectare or carton back to an average cost per fruit and then to scale it according to the number of fruits per hectare or carton. The reasoning here is to adequately allocate cost per unit of fruit where applicable. In layman's terms: a worker only has two hands; therefore, it typically takes longer to pick and pack smaller fruit per carton, compared to larger fruit. Since pack

Table 4. Cost-benefit analysis per count for export soft citrus in 2022

Export count	Export count distribution	Export cartons per ha.	Production cos per carton	Packhouse cost per carton	Transport cost per carton	DIP	Avg. income after cost per carton
1xxx	5%	118	R56,35	R82,19	R15,00	R189,00	R35,46
1xx	5%	118	R56,74	R84,81	R15,00	R199,50	R42,95
1x	15%	353	R57,13	R85,11	R15,00	R203,70	R46,46
1	15%	353	R57,94	R85,72	R15,00	R210,00	R51,34
2	20%	471	R58,85	R86,41	R15,00	R210,00	R49,74
3	25%	589	R59,69	R87,05	R15,00	R199,50	R37,76
4	10%	235	R60,64	R87,78	R15,00	R168,00	R4,58
5	5%	118	R61,80	R88,66	R15,00	R147,00	R(18,47)
	100%	2355	R58,76	R86,23	R15,00	R197,51	R37,51

Table 5. Cost-benefit analysis per count for export lemons in 2022

Export count	Export count distribution	Export cartons per ha.	Production cos per carton	Packhouse cost per carton	Transport cost per carton	DIP	Avg. income after cost per carton
75	0%	-	R47,00	R69,08	R15,00	R114,75	R(16,33)
88	0%	-	R47,34	R71,55	R15,00	R128,25	R(5,64)
100	15%	357	R47,68	R71,78	R15,00	R128,25	R(6,21)
113	15%	357	R48,38	R72,26	R15,00	R135,00	R(0,64)
138	20%	475	R49,16	R72,79	R15,00	R135,00	R(1,95)
162	25%	594	R49,89	R73,28	R15,00	R121,50	R(16,68)
189	15%	357	R50,72	R73,84	R15,00	R101,25	R(38,31)
216	10%	238	R51,73	R74,53	R15,00	R87,75	R(53,50)
	100%	2377	R49,49	R73,01	R15,00	R120,83	R(16,68)

lines in the packhouse also run slower to allow for the packing of smaller fruit, the electricity cost was also varied by fruit size. In the net return calculated in this analysis, other farm costs (overheads, interest, etc.) and packhouse costs (cooling, etc.) are not yet deducted.

The results of this baseline analysis highlight that producers are better off applying production practices that prioritise desirable fruit counts. Furthermore, it indicates that slightly bigger fruit rather than slightly smaller fruit appear to generally perform better when moving beyond the

optimal fruit size, i.e., counts that maximises market returns.

Producers, farms, and orchards are all different. Hence, crop load management using a cost-benefit approach is recommended, rather than nit-picking the figures incorporated into the analysis. The figures used are industry-representative as far as possible, but producers should adapt the framework to their own individual scenarios.

Acknowledgement: Data collected by SourceBI

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