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Wild-harvesting fynbos flowers: Still a viable business?

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Abstract

The economic viability of businesses involved in fynbos flower wild-harvesting is assessed. The model promoted by Flower Valley Conservation Trust assumes that payment for picking rights creates an incentive for landholders to conserve untransformed fynbos vegetation, and that this arrangement creates opportunities for small business development in an area where work is scarce. Any breakdown in this model is concerning, as the most threatened fynbos land is privately owned and wildflower harvesting is a source of employment in impoverished communities. Using data from the Flower Valley harvest team between 2008 and 2015, it is found that harvesters face stagnant and falling real prices for all wildflower species except for Brunia laevis*—a valuable species which has surged in popularity—leading to several potentially harmful environmental practices. As a result, industry bodies are calling for a harvesting ban on this species. It is shown that should a ban occur, these harvest teams will become unprofitable at current market prices, which could compromise the sustainable wild harvesting of other fynbos species used in floristry.*

1 Introduction

The Cape Floristic Region is a biodiversity hotspot[1] that is home to over nine thousand plant species, with almost 70% of these endemic (Manning, 2018). The region also contains a high concentration of threatened plant species, making it a conservation priority (Cowling & Heijnis, 2001). Threats include changing land-use patterns as the veld is transformed for agriculture and urban expansion, the spread of alien invasive species, and, to a lesser extent, wild-flower harvesting which removes future seeds essential for the continuation of a plant's lineage (Privett et al., 2014). To counter this, Flower Valley Conservation Trust—an NGO promoting responsible fynbos wildflower harvesting—has pioneered a conservation model whereby private landowners are paid by harvesters for access to pick wildflowers, and the picking teams are trained to utilise the resource sustainably. The aim is to create an economic incentive for conservation.

[1] An area that is both home to an exceptional concentration of endemic species and experiencing exceptional habitat loss (Myers et al., 2000).

The fynbos cut-flower industry makes bouquets out of focal flowers (like *Proteas*, *Brunia* and *Leucadendrons* such as *Safari Sunset*) and wild-harvested fillers (*Metalasia*, *Erica*, *Stavia*, *Phylica*, etc.). The most popular fillers are the species with the best stem length and longest vase life. New species are added all the time. This phenomenon is industry wide (Conradie & Knoesen, 2010) and focal flowers are ten times more expensive than fillers (Conradie et al., 2009). The supply chain is dominated by export agents who in most cases run their own packsheds, protea farms and picking teams (Bek & O'Grady, 2018). This industry has been in transition since the government's plant breeding programmes began to release the first cultivars in the 1980s. Further changes came about in the late 1990s with the rise of landscape-scale conservation and the importance of redistributive justice for previously disadvantaged black South Africans. Currently we have had almost a decade of small enterprise development on the wild harvesting side, whose performance is being evaluated in this study.

Recent trends in the wild-harvesting sector are not fully known but are of concern. Bek and O'Grady (2018) report that wild-harvest prices[2] have barely risen between 2006 and 2015, the exception being *Brunia laevis*, which has surged in value resulting in poaching syndicates and over-harvesting. A possibility is that *Brunia laevis* is offsetting the stagnant prices of other species. If so, a possible moratorium on *Brunia laevis* use is worrying as it might affect the viability of the sustainable harvesting programme championed by Flower Valley Conservation Trust. This paper investigates the viability of independent wild-harvesting teams with and without the inclusion of *Brunia laevis*. Price trends are recalculated and a model is constructed to assess the viability of wild-harvest teams in a post-*brunia* industry.

2 The fynbos cut-flower industry

2.1 Historical background

Flower selling in the Western Cape began at the end of the nineteenth century with traders selling along Adderley street in central Cape Town—a location still used by descendants of those original families (Rabe, 2010). Known as *blomdraers*, perhaps as a result of transporting and selling their flowers from baskets, sellers harvested stock from the wild around the Peninsula and Boland areas. From the beginning there was a second stream of landowners involved in building an export market for dried fynbos flowers in Germany (Cowling &

[2] Their analysis does not state whether this is calculated using real or nominal prices.

Richardson, 1995). Even then, the potential environmental harm of picking flowers from the wild had resulted in the introduction of the Flower Protection Bill of 1905 and the Wild Flower Protection Ordinance of 1937 (Davis, 1990; Alsopp et al., 2014).

Until the 1960s, flower selling was an informal activity mainly undertaken by disadvantaged communities—particularly the Coloured community (Davis, 1990; Boehi, 2010:20). Anyone with access to suitable fynbos land could be a part of the industry and the values involved were so small that landowners often did not charge for picking rights to their land. Sourcing stock from the wild meant that minimal costs were incurred, but inconsistency in quality and supply, as well as the long journey to overseas markets, made exports unfeasible for anything but certain dry varieties (Huysamer et al., 2018). With the rise of cheap airfreight in the 1960s, a formal industry emerged, spearheaded by the Middelman family, exporting proteas to Europe, which by then had acquired an appreciation for fynbos's exotic aesthetic (Davis, 1990; Coetzee & Middelman, 1997; Huysamer et al., 2018).

The most important product attributes in floristry namely long, straight stems and a long vase life, are not available in the wild. Variety is equally important as flowers go in an out of fashion. For airfreight, product weight is a consideration too, especially in proteas which grow on large, woody shrubs. The wild varieties favoured by the emerging fynbos flower industry were P. *compacta* P. *cynaroides*, P. *barbigera*, P. *repens* and P. *nerifolia*, *as well as* some showy *Leucadendron* species and to a lesser extent *Leucospermum* species (pincushions) which are more fragile flowers. In the local fresh market, these focal elements were traditionally, and still are, presented in bunches that also contained filler species like *Stavia*, *Phylica*, *Metalasia* and *Brunia* as well as a variety of smaller-scale *Leucadendrons*. The price difference between focal flowers and fillers is ten-fold for Flower Valley (Conradie et al., 2009) and the distinction between focal flowers and fillers is still used industry-wide (Conradie & Knoesen, 2010).

As the market grew, opportunistic wildflower harvesting developed into an important sideline on farms in the Standford – Gansbaai – Napier area where agriculture is quite marginal. The first protea "farms" raised the valuable fraction of their native vegetation by broadcast sowing of wild-harvested seeds in lightly disturbed landscapes (Treurnicht, 2010). Government plant breeders began to select and domesticate the most promising varieties in the 1980s. When these came to market production shifted from broadcast showing to formal orchards, and since then the superior quality product grown in orchards almost completely displaced wild-harvested focal flowers whose post-harvest physiology and productivity was poor compared to the cultivated varieties (Huysamer et al, 2018).

Figure 1 Brunia laevis and a bouquet with a mix of focal flowers (proteas) and fillers (Phylica, Metalasia, Erica)

The increased importance of cultivation was predicted by Coetzee and Middelmann (1997) who explained that the inferior quality of wild-harvested material will not be able to compete with orchard-produced flowers that can be committed to the cold chain within an hour of being picked. Financially cultivation makes sense too. Returns per hectare are high and fynbos does not require soil augmentation as it grows naturally in nutrient poor lands (Conradie et al., 2009; Department of Agriculture, Forestry and Fisheries, 2014). Protea cultivation offers a gross margin return per hectare in excess of three-hundred times that of wildflower harvesting (Conradie et al., 2009).

2.2 Wild-harvest teams within the supply chain

A survey of members of the Protea Producers of South Africa in 2009 revealed that 92% of South Africa's fynbos flowers were exported and that 86% of production came through vertically integrated firms that produce, pack and export their own produce (Conradie & Knoesen, 2010). However, the switch to cultivated focal flowers reduced the number of players in the lucrative export market. Small independent landowners were either restricted to a seasonal local market, went out of business or became affiliated with one or more large farmer-exporters. The co-existed with independent picking teams. Exporters dictate price and volume of the filler species that continue to be wild harvested because they are monopoly buyers in a market with many competing suppliers. The opportunity cost of their labour determine filler prices as exporters will only outsource wild-harvesting when their own lands are exhausted or if their staff is fully occupied, and even then, casual labour could be had at a minimal wage due to high unemployment in the area.

If there is excess demand the exporter's packhouse will contact one or more of their regular suppliers to issue an order. In the case of independent picking teams, a temporary workforce will be assembled and landowners will be contacted to secure picking rights. The team then goes out into the field armed with secateurs, some twine and a *bakkie* for transport. The plant material is picked and bundled for transport to the team's base, where stems are stripped, sorted and counted. The packshed then takes delivery of counted bundles of cleaned product at a pre-determined price per stem. Any excess and inferior material are discarded.

2.3 Green marketing and sustainable livelihoods

The fynbos cut-flower industry has enjoyed sustained growth since 2010. This is in-part owing to lucrative deals with overseas supermarket retailers, especially in

the United Kingdom, where "sustainably harvested" fynbos bouquets form part of retailers' attempts to project a "green" brand (Bek & O'Grady, 2018). The green marketing trend creates an economic incentive for suppliers to follow sustainable practices, both in terms of the environment and labour, in order to access lucrative overseas markets. Like most European supermarkets, Marks & Spencers issued a contract for fynbos bouquets on condition that Fynsa, an export packshed affiliated to Flower Valley, underwent a labour audit in 2009 (Bek et al., 2016). With access to overseas markets predicated on ethical standards, the South African cut-flower sector takes seriously any actions which threaten their reputation. An example of this is the growing calls by industry bodies, such as Cape Flora SA, to ban or limit the use of *Brunia laevis* (silver brunia) to prevent environmental degredation. *Brunia laevis* has surged in popularity, and, being a high value wild-harvested species, induced a number of environmentally worrying practices including over-harvesting and illegal poaching syndicates.

Bek et al. (2016) claimed that the introduction of the Sustainable Harvesting Program has resulted in higher wages for independent picking teams than other agricultural workers in the area. This is partly a result of growth in the dry-sector reducing the seasonality of the wildflower harvest. However, the extent to which this applies more to formal firms than to independent picking teams is unclear. These businesses tend not to keep detailed records, and, with piece-rate payments per stem harvested being the industry norm, it is difficult to determine whether the minimum wage is being met. As a payment scheme, piece-rate payments potentially encourage unsustainable harvesting because it incentivises maximal extraction in as short a time possible. The problem is worse when packsheds fail to give adequate notice of orders as it prevents picking teams from sourcing appropriate parcels of land (Bek & O'Grady, 2018).

3 Market demand

Except for the 2008 global recession, the fynbos cut-flower industry has experienced strong growth in recent years. A burgeoning export market saw greens increase by 40% between 2011 and 2015 (Kotze, 2012; Cape Flora SA, 2015). Domestic demand has also increased, perhaps a result of improving quality within the industry and the number of export destinations continue to grow (Bek & O'Grady, 2018). It is an open question if this growth is filtering down to independent picking teams. As the only wild-harvested focal flower left in the portfolio of the Flower Valley picking team, *Brunia laevis* has become increasingly important to them. The possibility that Brunia might be cross-subsidising the harvesting of fillers is a worry.

3.1 Price trends

With harvest teams increasingly condemned to picking fillers, and with fillers being relatively low-value items per unit of effort, a stagnating or declining price trend for this type of product could jeopardise the Flower Valley sustainable harvesting business model. See Table 1 for the average real prices realised by the Flower Valley picking team between 2008 and 2015. The row labelled GR is the annual growth rates in category prices[3].

Table 1 Weighted average real prices per stem for fresh orders filled by the Flower Valley harvest team (2015 = 100)

	Leucadendron	***Leucaspermum***	**Protea**	***Brunia***	**Fillers**
2008	0.42	0.92	0.92	0.92	0.35
2009	0.40	0.99	1.21	1.09	0.32
2010	0.37	0.41	1.82	1.33	0.28
2011	0.32	1.20	1.53	1.36	0.28
2012	0.32	0.40	1.79	1.22	0.30
2013	0.30		1.24	1.57	0.26
2014	0.37		0.94	1.76	0.26
2015	0.26	0.30		1.81	0.25
GR	-5.40%	-16.50%	0.50%	8.90%	-4.30%

Proteas, the fynbos industry's traditional focal flowers, bring more than R1 per stem (in constant 2015 prices), while fillers are worth a third as much. Wild harvested proteas, of which *Protea compacta* is by far the most important, are less lucrative than cultivated *P. compacta* hybrids (prices not shown), but more valuable than wild harvested *Leucaspermum cordifolium* because proteas have a longer shelf life than pincushions that can be used as alternative focal flowers when proteas are scarce or out of season. Protea prices remained stable over the period covered in Table 1, while pincushion prices declined sharply. In the filler category *Leucadendron* species consistently outperform the *Stavia*, *Metalasia*, *Berzelia*, *Erica* and *Phylica* species that are commonly picked. *Brunia laevis* is an interesting case because its shape is more like *Metalasia* or *Berzelia* and yet in scale and shelf life it is more like proteas. However, prices fell in both categories, by 5.4% per year for *Leucadendrons* and 4.3% per year for other fillers. *Brunia laevis* was the only wild harvested product whose prices rose substantially between 2008 and 2015. The annual increase was 8.9% for the Flower Valley picking team.

[3] Growth rates were calculated by regression in natural logarithm of price on the year.

3.2 The importance of *Brunia laevis*

The changing composition of Flower Valley's picking team's product portfolio is illustrated in Figure 2. The 2010 season was exceptionally lucrative for the team and during the period from 2008 – 2013 it was in full operation. In this period the team was employed by the NGO who also ran the Fynsa packshed from its farm near Gansbaai. Close vertical integration and good overseas connections resulted in many orders and high prices for the picking team. In this period its real turnover averaged just under R1 million per year, and *Brunia laevis* contributed 10-30% of turnover. The rest of the industry began to object the unfair advantage that Fynsa had due to is affiliation with the Flower Valley NGO. The NGO first moved Fynsa's operations off the farm to a more neutral location in Stanford and eventually sold the packshed. This move was disastrous for Flower Valley's picking team who was no longer the preferred supplied of Fynsa. The team's real revenues declined by 66% between 2013 and 2015 and in this period, the contribution of *Brunia laevis* became more important.

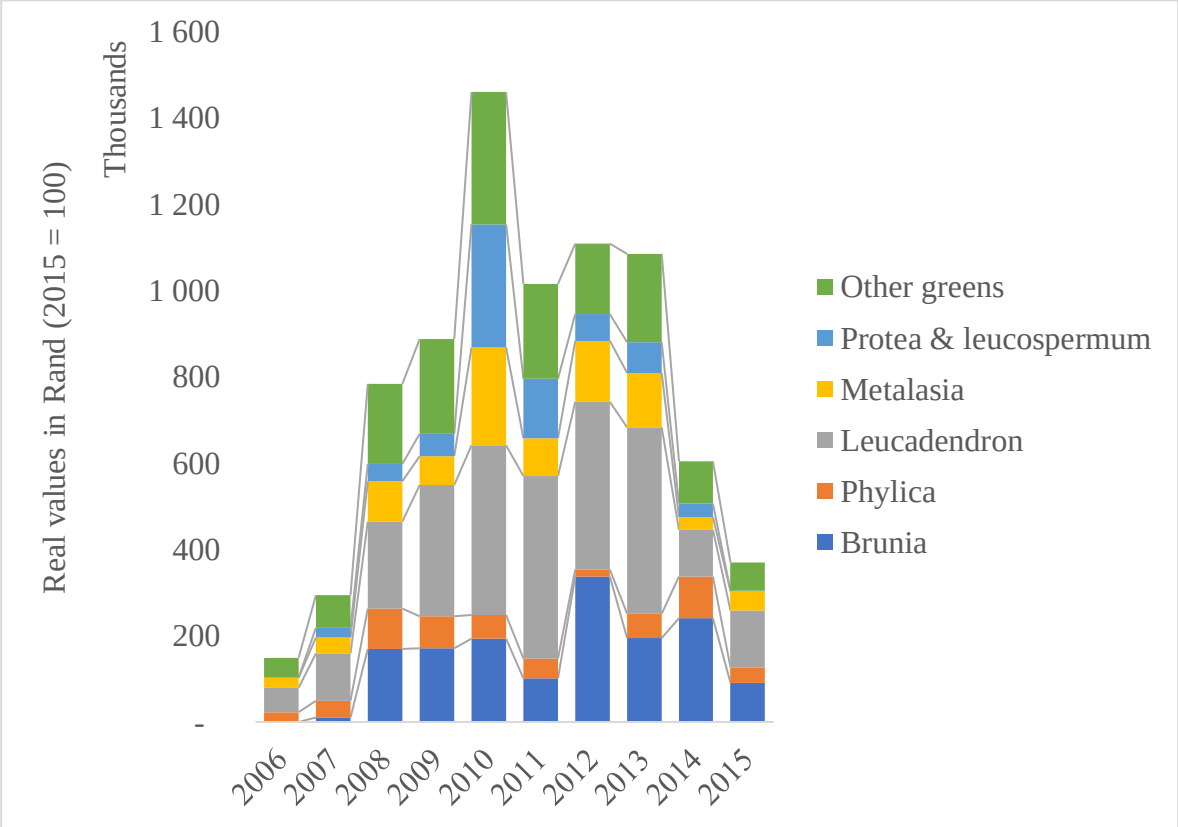

Figure 2 Contribution to total revenue by different groups of species

There is no evidence that the Flower Valley team has been overharvesting *Brunia laevis*, which is listed as "of least concern" in the Red Data Book, but the species' localised range on the mid-slopes of mountains between Caledon and Bredasdorp, and its long period until harvesting maturity, make it unsuitable for cultivation (Flower Valley, 2017). Therefore, the wild population is the only supply of stock, making the species vulnerable to over-harvesting and illegal poaching syndicates. *Brunia laevis* exports increased from 1.5 million stems in 2012 to over 3.5 million stems in 2015 (Cape Flora, 2015).

4 Modelling harvest team profitability

This section assesses the viability of an independent wild-harvesting business. Two models are constructed: the first, based on that used by Conradie et al. (2009), calculates the number of stems needed for a harvest team to break-even given current market prices and input costs. The second model is a reversal of the first: instead of finding quantities' given prices, the necessary prices needed are calculated given a certain quantity of stems. From this, the prices needed for a harvest team to be profitable without *Brunia laevis* are calculated.

4.1 Costs

Costs include vehicle, labour, minimal equipment, and paying landowners (Table 2). Calculating vehicle expenses is difficult as the distance to site and the distance travelled within the site must be estimated. Using the 2014/15 guide to machinery cost (Department of Agriculture, Forestry and Fisheries, 2015), a diesel single cab four-wheel bakkie is estimated to cost R6.38 per kilometre. To calculate kilometres travelled per month, the difference is taken between vehicle diesel expenses per month, obtained from an internal Flower Valley document, and how far the bakkie travelled to various locations to harvest during that month. By noting how different monthly travel distances correspond to different budgeted amounts, it is possible to obtain an estimate of the distance travelled within sites. Total distance is found to average 800km (rounded off to the nearest hundred). Then, vehicles expenses amount to R5104 per month (later rounded to R5000 for ease of calculation). Equipment costs, which consists of twine, is estimated at R400 a month using the same internal budget document. Landowner costs consist of the share of income harvesters must pay landowners in exchange for access to their land. This is usually a third of the income paid to harvesters by packsheds.

Table 2 Cost structure for the harvesting team

Item	Unit cost	Total (R)
Transport	R5 000 monthly	60 000
Twine	R400 monthly	4 800
Labour (10 workers)	R120.32 daily*	312 832
Seasonal labour (December; 25 workers)	R120.32 daily**	30 080
Seasonal labour (Jan-Mar; 10 workers)	R120.32 daily*	72 192
Team manager	R8 000 monthly	96 000
Landowner payments	30% of price	30% of revenue
Total		R575 904 + 30% revenue

*Labour costs are calculated as number of workers earning R120.32 daily for five days a week.
**As above, but the amount is halved as workers perform other tasks in addition to harvesting.

Unlike the usual structure of the industry, Flower Valley's harvesters were paid a set salary at the minimum wage level of R120.32 in 2015. There were ten workers in the team, but this was augmented with seasonal labour during peak times. Internal contracts for seasonal labourers show that this usually occurs during the first half of December and then again from January till the end of March. Bek et al. (2012) reported that fifty seasonal workers are used during the December period and twenty workers for the other period. However, these workers often perform a variety of tasks besides harvesting (such as cleaning flowers), and for this reason, only half the number will be counted as harvesters in this model. Whether or not this is a reasonable assumption depends on the product sold by the harvesting team to the packshed. If the product is cleaned bunches, then cleaning labour should be included with picking labour. It is even possible that cleaning gives a picking team a quality advantage in a highly competitive picking market. These workers also earn the minimum wage of R120.32 a day. Table 2 summarises this information.

4.2 Profitability

In calculating the break-even number of stems, we use average price, represented by P, and total quantity represented by Q. Then P multiplied by Q gives total revenue. Costs must be subtracted, which amounts to PQ - (R575 904 + 0.3PQ), where 0.3PQ represents the costs paid to landowners for access to their land; the cost is usually a third of that paid by packsheds to the harvest team. To work out the break-even point, the average of the 2013 and 2014 average stem price is used, namely R0.39. This results in 2 109 538 stems needed to break even for the year. At this average stem price, the team will have been profitable for the years 2010 to 2013 given the same input costs. However, this method is unsatisfactory in that

using the average price implies all stems are worth equal amounts. As table three shows, this is not the case with *Brunia laevis* only accounting for 5.72% of the total stems harvested, but still contributing a quarter of the total revenue generated. The next section instead partitions the average into clusters to mitigate this issue.

Table 3 Different fillers' contributions to total fresh stems harvested and total fresh revenue for the period 2013 to 2014

Cluster	**% Total Stems**	**Average Price**	**% Total Revenue**	**% Adjusted Revenue**
Protea species	4.61	0.55	6.0	8.03
Leucadendron species	27.15	0.45	28.2	37.73
Brunia laevis	5.72	1.66	25.25	-
Erica species	0.27	0.28	0.15	0.2
Buchu species	2.91	0.28	1.6	2.14
Brunia other	4.98	0.27	3.8	5.08
Metalasia	12.81	0.29	8.6	11.51
Other fillers	41.55	0.24	26.45	35.28

Brunia laevis has been separated from the Brunia cluster to illustrate the financial implications of a ban on *Brunia laevis* harvesting. Adjusted revenue is calculated by taking the revenue contributed by *Brunia laevis*, and distributing this to all the other clusters in proportion to each cluster's contribution of total stems.

4.3 Results with and without *Brunia laevis*

This section assesses the viability of wild-harvesting teams without *Brunia laevis*. To do so, the following must be noted: we cannot simply take the *Brunia laevis* stems and distribute them across the other clusters, as different clusters have different average stem prices. Instead, each cluster's quantity of stems is adjusted in proportion to the cluster's contribution to total revenue (this is in Table 3). The end result shows how much each cluster's price will need to change, relative to the cluster's current average price, to ensure a harvest team breaks even without *Brunia laevis*. This method works as follows:

1. The break-even revenue amount is calculated. This is the break-even quantity in the preceding section multiplied by the 2013/14 average stem price: 2 109 538 × 0.39 = R822 719.82.
2. An entrepreneurial profit of 20% of break-even revenue is added to total revenue. This is the assumed minimum profit a wild-harvest entrepreneur

will require to enter the industry. Total revenue is now R987 263.78 and will be called *break-even revenue*.

3. Then, each cluster's contribution to total revenue, as shown in the fourth column of table 3, is re-adjusted as though we removed *Brunia laevis's* revenue share. As an example, proteas originally comprise 6% of total revenue. If we take 6% over 74.75% (74.75% obtained from 100% minus *Brunia laevis's* 25.25% share of total revenue), we obtain 8.03%. This is termed *adjusted revenue share*.
4. Then, the break-even revenue amount is distributed to each cluster in proportion to each cluster's adjusted revenue share. So, the Protea cluster will receive 8.03% of R987 263.78, totaling R79 139. The results of this are recorded in column two of table 4 under *revenue needed*.
5. At this stage, we have each cluster's original share of revenue with *Brunia laevis* included, the cluster's adjusted share of revenue without *Brunia laevis*, and each cluster's so-called needed revenue. We need to find each cluster's new stem quantity—this is their average stem quantity for 2013/14 plus the additional stem quantity taken from *Brunia laevis*. This is calculated as the average 2013/14 stem quantity multiplied by the adjusted revenue share over the old revenue share. The results are recorded in column three of table 4 under *new stem quantity*.
6. We have now calculated each cluster's needed revenue, and their new quantity. From this, we can work backwards to find each cluster's required price, as shown in column five of table 4 under the heading *new price*.
7. Finally, the percentage change needed from each cluster's average price can be calculated by comparing table 4's average price column and new price column (column four and five, respectively).

Table 4 Calculating price changes needed to compensate for Brunia laevis

Cluster	**Revenue Needed (R)**	**New Stem Quantity**	**Average Price (R)**	**New Price (R)**	**Price Change (%)**
Protea	70 139	113 686	0.55	0.70	27
Leucadendron	329 655	669 154	0.45	0.56	24
Brunia laevis	-	-	-	-	-
Erica	1 753	6 615	0.28	0.30	7
Buchu	18 704	71 706	0.28	0.29	5
Brunia	44 422	122 854	0.27	0.41	51
Metalasia	100 533	315 894	0.29	0.36	24
Other	309 197	765 636	0.24	0.34	42

Column one shows each cluster's revenue target. Column two is the new number of stems distributed to each cluster in replacing *Brunia laevis* orders. With revenue and quantity calculated, it is possible to find the required price per stem. Then, this price and the current market price can be compared. The last column indicates the percentage change in price needed for each species after adjusting for the removal of *Brunia laevis* by increasing other species' harvest quantities.

Industry prices for wild-harvested species will need to rise if independent picking teams are to remain viable without *Brunia laevis*. Table 4 shows that the two biggest contributors to revenue, *Leucadendron* and other, which account for nearly 70% of revenue when *Brunia laevis* is excluded, need price increases of 24% and 42%, respectively. Conradie et al. (2009) suggested that increased harvesting days might offset any ill-effects. However, at that stage, the team had idle time. Currently, there appears little scope left for an increase in workload as accounts for 2014 shows orders for every working day. Wages would rise if productivity could be increased. The best way to do so would be broadcast sowing on easily accessible land, as the early protea farmers have done. However, Treurnicht (2010) showed that this disturbs the vegetation assemblage, which is not ideal from a conservation perspective (Joubert et al., 2009). The alternative is to avoid the most remote and steep picking sites and to concentrate on the flat lands, but there is also inconsistent with conservation aims. While mountain populations of fynbos are still relatively intact due to few threats, most low-land fynbos populations have been lost to agriculture or urban development which makes it quite important not to overharvest the little lowland fynbos that remains. The third possibility is for prices to rise. The third possibility is for prices to rise, but as explained, filler prices are capped by the opportunity cost of labour of farmer-exporters.

5 Discussion

The above section shows how important *Brunia laevis* is to the Flower Valley harvest team. Understanding the causes leading to such a situation is important in determining the possible effects on Flower Valley's conservation model, and on harvester livelihoods, should a ban be enacted.

5.1 Wage-setting mechanism

It is possible that a changing industry structure has altered the wage-setting mechanism resulting in sustained low prices paid to wild-harvesters for their

produce. Most wild-harvesters are paid through piece-rate agreements per stem harvested (Bek & O'Grady, 2018). In this case, after deducting expenses, any income left over is effectively a harvest team's wage. If packsheds offer harvesters too low a price, the team's net income will be too low, and traditional economic theory suggests no-one will be willing to supply the service; packsheds will have to increase their offer to induce someone to supply the service. However, with the emergence of large firms, active in multiple nodes within the supply chain, it is possible that the price setting mechanism has changed. If those harvesters working for large firms are compensated through set wages, rather than through piece-rates, it does not matter that the market prices offered by other packsheds to independent harvesters is too low—their wage is already fixed. With firm-employed harvesters willing to harvest at implied low stem prices, because it does not affect their own set wage, there is less pressure for the market equilibrium wage to rise.

The other contributing factor to low piece rates in the fynbos industry is the high rate of unemployment in South Africa which lowers the reservation wage to the very low level of social insurance for working age adults. This is normally counteracted by statutory minimum wages in low-paid occupations such as domestic work, taxi driving and agriculture, but since wild-harvesting is not formally part of agriculture, there is no minimum wage in this sector.

Reasons for large firms in-sourcing harvesters—offering set wages instead of piece-rate agreements—may include harvesters being required to undertake general duties besides harvesting, for example, helping with protea cultivation, or cleaning flowers in the packshed. It would not be sensible to use a piece-rate payment if their duties are flexible in this way. A more compelling explanation is that the firm enjoys sufficient efficiency gains through in-sourcing to offset the additional costs. In-sourced harvesters can be trained to a firm's own specifications, and firms can now interact directly with landowners. Large firms may be able to negotiate lower prices from landowners in return for larger purchase volumes. Costs saved through this arrangement may allow the firm to offer better prices for their final product; in a sector as competitive as with cut-flowers, other firms will adapt too—further entrenching the lower market equilibrium wage.

The implication is that independent picking teams will be priced out of the market. In 2019 the Flower Valley team, which has been fully independent since 2016, is back at work from a short sabbatical. The team leader felt that the revenues on offer does not justify the wages she owes to the rest of her team, which is exactly the conclusion of the analysis presented here. So far, the popularity of *Brunia laevis* has been masking the ill-effects of low market prices. As price-takers, independent picking teams have little power in price negotiations with packsheds

(Bek & O'Grady, 2018). For this reason, the income afforded through picking *Brunia laevis* may have postponed any real need to negotiate higher prices for other species. Successful bargaining efforts will likely need support across many different harvesting teams; and given the secretive and highly competitive nature of the wild harvesting side of the industry, as well as the profitability gained through *Brunia laevis*, it is unlikely harvest teams will be willing to co-ordinate such efforts unless there is a dire need to do so (Conradie & Knoesen, 2010; McEwan et al., 2014; Blokker et al., 2015).

5.2 Broadcast sowing

From the above, a solution to low prices might be for joint co-operatives between landowners and wild-harvest teams; together, their enhanced market power might make negotiations for higher prices feasible. However, the rise of broadcast sowing reduces the effectiveness of this plan. The use of broadcast sowing, and the resulting enhanced productivity, allows firms to acquire their needed fillers from smaller areas of land (Treurnicht, 2010). This makes it possible for a piece of small veld, owned by a farmer or packshed, to be sufficient for the provision of fillers—with independent landowners sought only when needed. At some point, should a landowner-harvester co-operative raise prices, it may become cost-effective for large firms to simply supply their own fillers through broadcast sowing their own veld. Again, this weakens the prospects of independent harvest team viability in the long-run.

5.3 Implications for Flower Valley's business model

Flower Valley's conservation model is made unviable by developments in the industry. Packshed owned picking teams may be the cause of low prices paid to landowners; with less money, landowners have a weaker incentive to protect wild fynbos populations. If the use of broadcast-sowing by packsheds or farmers is driving market prices down, then third-party landowners become increasingly obsolete in the flower industry—undermining a fundamental component of Flower Valley's conservation model as retaining pristine fynbos landscapes on their farms no longer has any financial value, but then Conradie et al. (2009) argued that the revenues from harvesting fynbos where so low anyhow that it could not really deter other developments. The likelihood of landholders subscribing to the Agulhas Biodiversity Initiative's plan for landscape-scale conservation was found to be a function of farm size, their financial dependence on the land and education (Conradie et al., 2013). Where land is plentiful and

opportunity cost is low, conservation is likely and where farms are small and other farming activities are viable, conservation is unlikely.

5.4 Harvester livelihoods

The analysis presented here has shown that no amount of awareness can overturn these economic realities, and by continuing to promote the naïve "economic case for fynbos conservation", Flower Valley Conservation Trust runs the risk of already marginal communities more vulnerable. The effect on picking teams is unclear. It is possible that independent harvest teams will cease to exist and those employees will instead be absorbed into larger firms. This may be a good thing as these large firms are more likely, compared to small independents, to be compliant with the statutory minimum wage for agriculture. Yet, the loss of independent harvesting teams may be a lost entrepreneurial opportunity for Coloured and Black workers hoping to enter a White-dominated industry. With low capital requirements, wild-harvesting gives a potential foothold into the industry. Unfortunately, it does not seem to be financially viable at current prices.

Minimum wage regulation is a possibility but will be quite difficult to administer unless the status of picking teams is changed from that of independent contractors to permanent employees of farmer-exporters. Doing so, will undermine the social sustainability aim of the Flower Valley vision of a landscape that provides a sustainable future for all.

6 Conclusion

Independent wild-harvesting teams are threatened by a changing industry structure in which only fillers, and not valuable focal flowers, are being wild-harvested. Their prices remained stagnant in real terms which could lead to overharvesting of valuable species as independent harvesting teams scramble to maintain their revenues. This is possibly a result of the emergence of large vertically firms, allowing for greater market power over wild-harvesters. This, coupled with the secretive, competitive nature of the industry, make successful negotiations for higher prices unlikely. Harvesters' only reprieve, *Brunia laevis*, the only species to have experienced a price increase in recent years, is possibly offsetting the ill-effects of other species' low prices. If calls to ban the use of *Brunia laevis* go ahead, independent wild-harvesting teams will not be viable at current market prices.

The low prices paid to harvesters in turn result in low prices paid to landowners. This weakens the economic incentive for landowners to conserve fynbos; and the use of broadcast sowing potentially makes non-exporting landowners obsolete in the industry. For wild-harvesters, it is possible that they will be absorbed into these large firms, rather than become unemployed, should independent wild-harvesting teams become priced out of the market.

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