Wild-harvesting fynbos flowers: a viable business?

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ABSTRACT

The economic viability of businesses involved in fynbos flower wild-harvesting is assessed. Wild-harvesters form part of a fynbos conservation model whereby private landowners are paid by harvest teams for access to their land. This provides an economic incentive for landowners to retain natural fynbos over other land-use options. Any breakdown in this model is concerning as private landowners are integral to conservation efforts in the Cape Floral Kingdom—a threatened biodiversity hotspot. Wild-flower harvesting is also a source of employment in impoverished communities. Using data from the Flower Valley harvest team between 2009 to 2015, it is found that harvesters face stagnant prices for all species except for Brunia laevis—a valuable species which has surged in popularity leading to a number of harmful environmental practices. As a result, industry bodies are calling for its ban. It is shown that should a ban occur, these harvest teams will become unprofitable at current market prices.

I. Introduction

The Cape Floristic Region is a biodiversity hotspot[1] home to over nine-thousand plant species, with almost 70 percent 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 flower harvesting—has pioneered a conservation model whereby private landowners are paid by harvesters for access to pick flowers. This creates an economic incentive for landowners to maintain the natural vegetation rather than convert the land to other-income generating activities—notably, farming or grazing. At the same time, Flower Valley promotes the Sustainable Harvesting Program training wild-harvesters to follow ecologically sound protocols.

The fynbos cut-flower industry obtains plant material from two sources: farmed

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

focal flowers, usually of the *Proteaceae* family, and wild-harvested “greens” or “fillers”—often used as fillers in bouquets accompanying the more valuable focal flower (Conradie & Knoesen, 2009). Traditionally, independent harvest teams receive an order from a packshed. The harvesters then pick on private land paying landowners in return. Upon arrival at the packshed, the fillers are prepared for export or sale on the domestic market. However, industry changes are seeing firms undertake more than one activity within the supply chain (Bek & O’Grady, 2018). For example, some packsheds are in-sourcing their wild-harvest teams; certain protea farmers are operating on-site packsheds; and there are even packsheds retaining their own veld as a source of wild-harvested fillers reducing the need for private landowners (Bek & O’Grady, 2018).

The implications of this on the wild-harvesting sector are not fully known. However, recent trends are concerning: 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, talks of a moratorium on *Brunia laevis’s* use are concerning. It is important to understand how this might affect Flower Valley’s conservation model as well as harvesters’ livelihoods. This paper therefore investigates the viability of independent wild-harvesting teams with and without the inclusion of *Brunia laevis*. Using data from Flower Valley’s[3] harvesting team between 2009 and 2015, trends in species utilisation and prices are investigated. From this, a model is constructed assessing the viability of wild-harvest teams in a post-brunia industry.

II. An overview of the cutflower 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. At the same time, the first commercial exports of flowers to Europe began with a group based in Elim sending dried flowers to Germany (Cowling & 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 (Alsopp et al., 2015; Davis, 1990).

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

[3]Flower Valley includes an NGO promoting sustainability in fynbos flower harvesting; but it is also located on a flower farm in Gansbaai, and until 2015 owned their own harvesting team.

Until the 1960's, flower selling was an informal activity undertaken by disadvantaged communities—particularly the Coloured community (Davis, 1990:3; Boehi, 2010:20). Sourcing stock from the wild meant minimal costs were incurred, but inconsistency in quality and supply, as well as the long journey, made international exports unfeasible for anything but certain dry varieties (Huysamer, Johnson & Hoffman, 2018). With the rise of cheap airfreight in the 1960's, 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, 1989; Huysamer, Johnson & Hoffman, 2018). The abundance of wild plants coupled with a lack of domesticated species meant the industry remained reliant on wild-harvesting; an arrangement only recently undone by the increasingly stringent quality requirements imposed by European markets (Davis, 1990). Quality concerns were addressed through the development of cultivars—chosen for their looks, productivity, bloom time, and resistance to disease—beginning the sector's move towards large-scale cultivation (Huysamer, Johnson & Hoffman, 2018). Even with intense commercial production undertaken today, the industry still relies on wild-harvesting for a supply of cheap fillers (Bek & O'Grady, 2018).

2.2. Wild-harvest teams within the supply chain

Industry maturation has seen the consolidation of firms into fewer, albeit larger operations. This is detailed in a 2018 research report by Bek and O'Grady investigating the scale and structure of the fynbos cut-flower sector. They interviewed eighty industry stakeholders between 2016 and 2018. The study shows an increasingly formal wild-harvesting sector, as the industry moves away from the *bakkie brigade*—a collection of independent, informal businesses frequently using casualized labour (Heydenrych, 1999). Traditionally, the *bakkie brigaders* fufilled an order received from a packshed by picking on private land. Upon delivery at the packshed, the material was prepared for use as a straight or combined in a mixed fynbos bouquet accompanying a cultivated focal flower (usually a protea). The packshed then sold the flowers to an export agent or to a retailer for sale on the local market. In this industry set-up, there are five independent actors: landowner, wild-harvester, protea farmer, packshed, and export agent/domestic seller.

In recent years, large firms have emerged involved in more than one activity within the supply chain. Bek and O'Grady suggest this is typical of the agri-sector with the move facilitating an increasingly "professional" business model characterised by improved quality and efficiency. This might then explain the move by some large firms towards in-sourcing their harvesting team—Bek and O'Grady quote an interviewee extolling the greater control this allows a firm over their stock from the time of harvest to arrival at the packshed. Nevertheless, independent wild-harvesting teams continue to be used to some extent by all packshed-operating firms (Bek & O'Grady, 2018). This may be during peak times when the in-house team is insufficient; or, if a firm requires a species not available on the land accessible to their own harvesting team.

2.3. Green marketing

The overall fynbos cutflower 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 at projecting a "green" brand (Bek & O'Grady, 2018). This creates an economic incentive for suppliers to follow sustainable practices, both in terms of the environment and labour, in order to access these lucrative markets. For example, Marks & Spencers required Fynsa, an export packshed, to undergo an audit of its labour conditions in 2009 before engaging in a commercial relationship (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). *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.

2.4. Sustainable livelihoods

Sustainability, as used in a business context, usually implies firms adhering to both sufficient environmental and labour standards during production[4]. Bek et al. (2016) find the introduction of the Sustainable Harvesting Program has resulted in higher wages for wild-flower harvesters compared to other agricultural opportunities in the area. This is partly a result of growth in the dry-sector[5] reducing the seasonality of the sector. However, the extent to which this applies more to formal firms than to the *bakkie brigaders* is unclear (Bek & O'Grady, 2018). These businesses tend not to keep detailed records, and with piece-rate payments per stem harvested the industry norm, it is difficult to determine whether minimum wage is being met. As a payment scheme, piece-rate payments also potentially encourage unsustainable harvesting: rewarding maximal extraction in as short a time possible. This is especially a problem when packsheds fail to provide adequate notice to harvesters for upcoming orders; in such a situation, harvesting sustainably, which mandates leaving a certain number of flowers head, might not be feasible as the harvest team has not had adequate time to source appropriate parcels of land (Bek & O'Grady, 2018). Nevertheless, fynbos flower harvesting remains an important source of employment for people in these communities.

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[4]Sustainability has many different definitions in many different contexts (Brown et al., 1987).
[5]The fynbos flower industry is split into a dry and fresh sector.

Figure 1. : *Brunia laevis*

Note: This species has become popular in Asia where it is admired for its unusual appearance.

III. Demand side trends

The overall fynbos cut-flower industry has experienced strong growth in recent years; this follows a lull induced by the 2008 recession. Between 2008 and 2011, industry exports declined before a burgeoning export market has seen greens increase by forty percent between 2011 and 2015 (SAPPEX, 2011; Cape Flora, 2015). It is important to note that greens, as used in that statistic, include non-indigenous species too. This is a reflection of the need to align conservation efforts within realistic market expectations. Fortunately, there is increasing demand for fynbos flowers domestically—perhaps a result of improving quality within the industry. The sector has also grown internationally through the establishment of markets in new countries, and most importantly, as a result of trade deals with overseas supermarket retailers (Bek and O'Grady, 2018). As previously mentioned, sustainably harvested flowers form part of these retailers' efforts at promoting themselves as environmentally conscious.

The structure of the wild-harvesting sector has also changed in recent years:

Figure 2. : Fynbos bouquet with a protea focal flower

Note: This bouquet consists of a focal flower—the large pink protea flower in the middle of the image—and wild-harvested fillers comprising the bulk of the bouquet. On the left of the central protea is a dainty, pink erica species; and above the erica, with many, small white heads, is a member of the metalasia genus—another commonly wild-harvested species.

there is a shift away from wild-harvesting of both valuable focal flowers and relatively cheap fillers to only harvesting the latter; real prices have stagnated; and *Brunia laevis* has become increasingly important to the harvest team. These trends are found using data from Flower Valley's harvesting team for the period 2009 to 2015. They indicate a worrying pattern in the harvest team increasingly dependent on *Brunia laevis* to compensate for stagnant prices of other species. It should be noted, however, that calculations in this paper are based on a single harvest team's data and do not necessarily apply to the sector as a whole. Nonetheless, Bek and O'Grady (2018) describe similar trends[6].

3.1. From focal to filler

The majority of species currently wild-harvested are fillers; a change from a past which included focal flowers. Coetzee and Middelmann (1997) partly predicted this when they argued that veld-harvesting will need to be phased out owing to its unsatisfactory quality and consistency. Instead, wild-harvesting has been

[6]Bek and O'Grady had access to the same dataset as this paper; but they also had access to additional information through interviews with industry stakeholders.

realigned in its role as a source of fillers only—a vital role for the industry. Their abundance and low price allow for much of the value of a bouquet to be captured by the intensely cultivated focal flower; while still providing the bulk of the volume (Conradie & Treurnicht, 2010). This is important as bouquet products are central to the lucrative trade deals between South African firms and British supermarket retailers (Bek & O'Grady, 2018).

The decline of wild-harvested focal flowers is in-part a consequence of the superior product offered through cultivation; yet, another reason is the development of cultivars. Bred for their desirable characteristics, cultivars may benefit from longer blooms, enhanced appearance, disease immunity, and adjusted flowering times. For these reasons, cultivars are preferred to their wild cousins. Besides quality issues reducing the quantity of wild-harvested focal flowers, growing market demand is being sufficiently met by farmers meaning there is little need to source focal flowers from the wild. Protea cultivation is undertaken by some farmers as an aside to their main agricultural activity. The returns per hectare are relatively high, and fynbos does not require soil augmentation—growing naturally in nutrient poor lands (AgriBook, n.d.). Conradie (2010) finds protea cultivation offers a gross margin return per hectare in excess of three-hundred times that of wildflower harvesting. It follows then that the Flower Valley harvest team does not systematically pick any focal flower besides *Protea compacta*—possibly for use in the dry sector, anyway, rather than for use as a focal flower.

3.2. Price trends

With harvest teams increasingly condemned to picking fillers; and fillers being relatively low-value items per unit of effort; it is concerning that filler prices stagnate or decline. Real prices per stem marginally increase for orders quoted in stems, and decreased for orders quoted in kilograms[7]. As shown by the fitted line in figure three, the average monthly price for all fresh stems only slightly increases between 2009 and 2015; the price of fillers and leucadendrons slightly decrease, while protea prices fluctuate, but become increasingly sparse reflecting decreasing harvest occurrences. In contrast, *Brunia laevis*, the only species to increase in price, moves from costing just above R1 to almost R2. One prominent group missing from this graph is the *Leucospermum* genus. This is a result of their negligible use by the Flower Valley team; likely a consequence of the rise of cultivars and their lack of use as fillers or appropriateness for the dry sector. Trends are similar within the dry sector: stagnant prices for orders quoted in stems and decreasing prices for those quoted in kilograms. During this same time frame, focal flower prices have increased—likely to compensate for increasing input costs such as electricity, equipment, and fuel.

[7]Kilogram orders are only used in the dry sector; but the dry sector also quotes in stems.

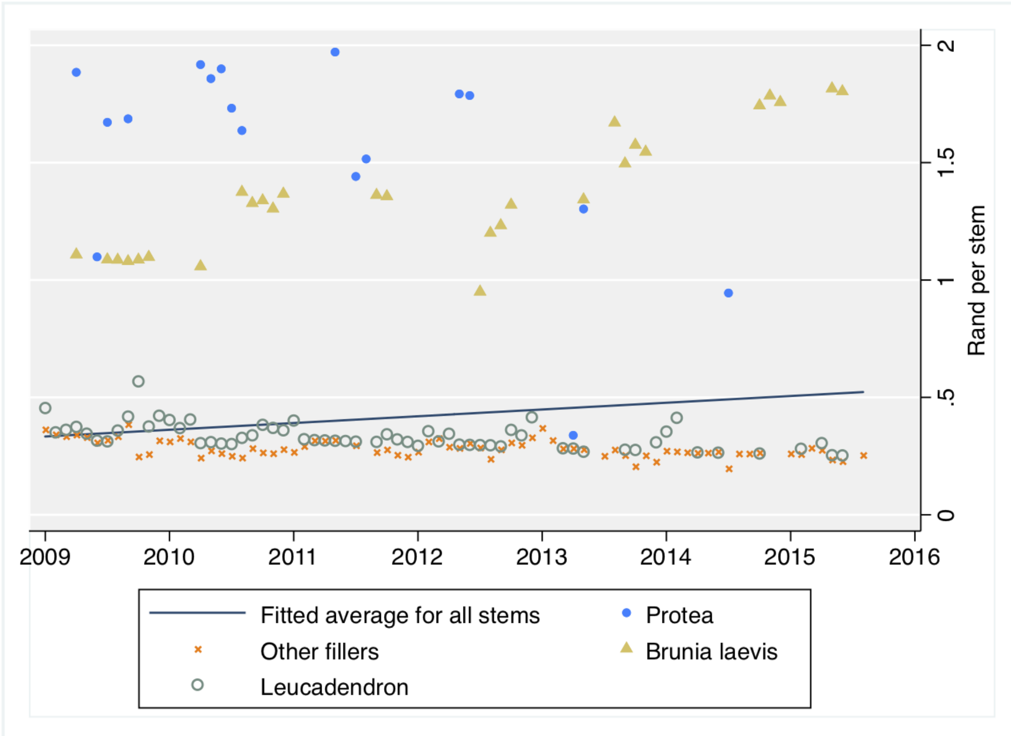

Figure 3. : Average real prices per stem for fresh orders

Note: This data reflects the real prices paid to Flower Valley's harvest team by various packsheds for fresh orders. The base year is set to 2015. Besides for *Brunia laevis*, price trends are flat or declining.

3.3. The rise of Brunia laevis

As noted above, *Brunia laevis* increases in price by almost 100% between 2009 and 2015[8]. During this time, *Brunia laevis* exports increase from 1.5 million stems in 2012 to over 3.5 million stems in 2015 (Cape Flora, 2015). Figure 4 shows how *Brunia laevis* accounts for a progressively larger share of the team's revenue. Between 2009 and 2011, it contributed less than ten percent to the team's revenue; by 2014, its contribution is over thirty percent. Bek and O'Grady (2018) suggest *Brunia laevis's* surge in popularity is a result of increased demand from Asian markets. Currently, *Brunia laevis* is listed as least concern on the Red List compiled by the South African National Biodiversity Institute (SANBI)[9]; however, its localised range on the mid-slopes of mountains between Caledon and Bredasdorp,

[8]Bek and O'Grady (2018) state a 600% increase; however, the dataset used in calculating this was found to contain an error.

[9]The SANBI Red List provides the conservation status of indigenous flora. Least concern indicates a species not sufficiently threatened to warrant a higher classification.

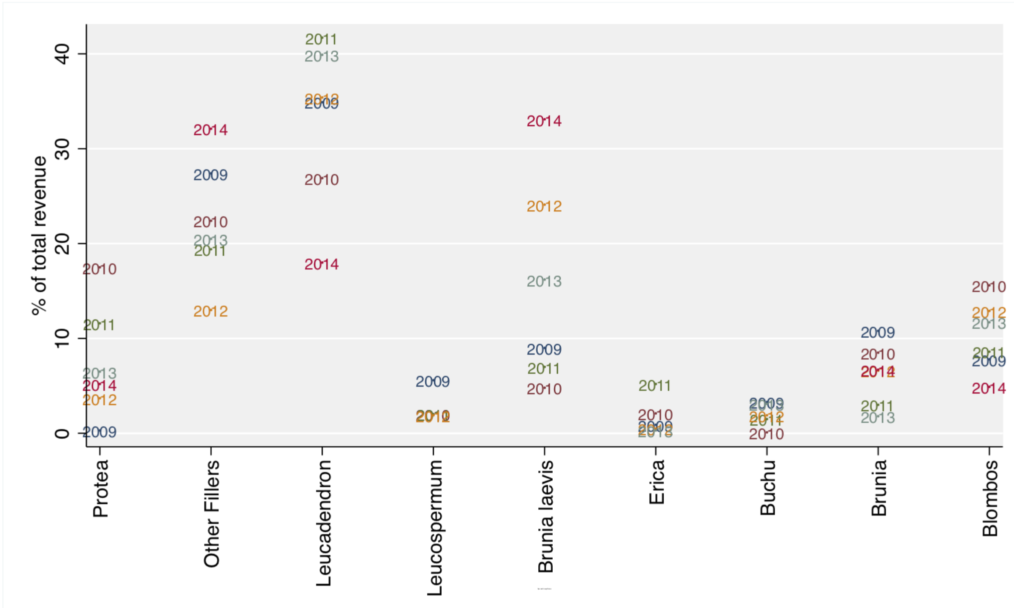

Figure 4. : Contribution to total revenue by different groups of species

Note: The graph shows how much each cluster contributes to that year's total revenue. For example, in 2009, *Brunia laevis* contributes just under 10% of the team's total revenue; in 2014, this is above 30%. Data is taken from the Flower Valley harvesting team.

and long period until harvest, make it unsuitable for cultivation (Flower Valley, 2017). Therefore, the wild population is the only supply of stock. As previously mentioned, its limited supply and high value have induced environmentally worrying practices including over-harvesting and illegal poaching syndicates.

3.4. Conclusion

These industry developments are concerning. Not only have wild-harvest teams lost orders for valuable focal flowers, but stagnant filler prices mean fillers are unlikely to adequately compensate for this loss. This depends on whether there is scope for the lost focal flower orders to be replaced by increased fillers orders—should the harvest team have spare working days. It is even possible that income received for certain fillers is less than the unit cost of harvesting them, and *Brunia laevis* is cross-subsidising the losses. If *Brunia leavis* is banned, as urged by certain industry bodies, wild-harvest teams may not be viable enterprises at current market prices. The next section models this viability for scenarios with and without *Brunia laevis*.

IV. 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 (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. 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*, compiled by the Department of Agriculture, Forestry and Fisheries, 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 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.

Unlike the usual structure of the industry, Flower Valley's harvesters are paid a set salary at the minimum wage level of R120.32 in 2015. There are ten workers in the team but this is 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, McEwan, and Hughes (2012) report 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 minimum wage of R120.32 a day. Table one summarises this information.

Table 1—: Cost structure for the harvesting team

Item	Cost	Total (R)
Transport	R 5000 per month	60 000
Twine	R400 per month	4 800
Labour	10 workers*	312 832
Seasonal labour	25 workers (Dec)	30 080
Seasonal labour	10 workers (Jan-Mar)	72 192
Team manager	R8 000 a month	96 000
Landowner payments	30% of the price	30% of revenue
Total costs		575 904 + 30% revenue

Note: *Labour costs are calculated as 10 workers earning R120.32 daily for five days a week for 52 weeks.

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). 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, 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 two 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.

4.3. 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 all of *Brunia laevis's* 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. 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 2, 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, totalling R79 139. The results of this are recorded in column two of table 3 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 3 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 3 under the heading *new price*.

7. Finally, the percentage change needed from each cluster's average price can be calculated by comparing table 3's average price column and new price column (column four and five, respectively).

4.4. Results

Industry prices for wild-harvested species will need to rise if wild-harvest teams are to remain viable without *Brunia laevis*. Table 3 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. Upon first noticing stagnating prices, Conradie et al. (2010) suggested that increased harvesting days might offset any ill-effects. However, at that stage, the harvest team had idle time. Currently, there appears little scope left for any increases in workload: internal payment documents in 2014 did not show days without orders; and worker contracts state that daily payment is dependent on the availability of orders to fulfil—so it is not a case of workers simply being paid to sit around. If filler prices do not increase, another suggestion

Table 2—: Different fillers' contributions to total fresh stems harvested and total fresh revenue for the period 2013 to 2014

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

Note: *Brunia laevis* has been separated from the *Brunia* cluster. 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.

is for wild-harvest teams to focus on high-value fillers species only. However, there is a dearth of valuable alternatives with *Brunia laevis* one of two plants costing over R1. This also ignores that harvesters respond to packshed requests, which itself is a response to consumer trends. Realistically, prices in the industry will have to rise, otherwise businesses which solely perform wild harvesting will likely cease to exist in the future.

Table 3—: 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
Blombos	100 533	315 894	0.29	0.36	24
Other	309 197	765 636	0.24	0.34	42

Note: 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.

V. 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.

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.

If the above is true, independent harvest teams will be priced out of the market. That this has not happened yet is possibly a result of *Brunia laevis* masking the ill-effects of low market prices. As price-takers, independent harvest 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 nature 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 (Blokker, Bek, & Bins, 2015; McEwans, Hughes, & Bek, 2014; Conradie & Knoesen, 2010).

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 feasible negotiations for higher prices. 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*

Flower Valley's conservation model is likely negatively impacted by the above industry changes. Packshed owned harvesting teams may be the cause of low prices paid to landowners; with less money, landowners have a weaker incentive to not convert their land for other uses. If the use of broadcast-sowing by packsheds or farmers is driving down market prices, then third-party landowners become increasingly obsolete in the flower industry—undermining a fundamental component of Flower Valley's conservation model. This may be partially offset, ecologically, if broadcast-sowing results in less veld disturbed by harvesting; but this assumes this veld remains pristine fynbos; instead, broadcast sowing often occurs on previously pristine fynbos. Broadcast sowing is also ecologically detrimental, through reducing plant diversity, if undertaken on naturally occurring fynbos; this means it would be undesirable, from a conservation perspective, for landowners to copy such strategies to increase their own productivity (Joubert, Esler & Privett, 2009). Flower Valley will need to re-assess their role in a changing industry to best ensure their conservation priorities.

5.4. *Harvester livelihoods*

The effect on harvesters 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 the *bakkie brigaders*, to be compliant with minimum wage. It is also possible that broadcast sowing is more labour intensive than wild-harvesting creating further employment in the industry. 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 is a potential foothold into the industry.

VI. Conclusion

Independent wild-harvesting teams are threatened by a changing industry structure in which only fillers, and not the valuable focal flower, are being wild-harvested. Further concern is that the prices for these fillers remain stagnant in real terms. This is possibly a result of the emergence of large firms, involved in many nodes of the supply chain, 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 its use go ahead, independent wild-harvesting teams will not be viable at current market prices.

Flower Valley's market-led conservation model is potentially threatened by these industry developments. The low prices paid to harvesters in-turn results in low prices paid to landowners. This weakens the economic incentive for landowners to conserve fynbos; and the use of broadcast sowing potentially makes 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.

VII. References

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