A survey of the cultivation and wild harvesting of fynbos flowers in South Africa

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Abstract:

A survey of protea production reveals that the industry consists of a dominant cultivation sector paired with a smaller wild harvesting component. Marketability of the product depends on a steady supply of focal flowers, a third of which is still harvested from the wild. The cultivation sector of the industry use intensive production methods and show strong signs of expansion in the short run. For example, one in four hectares of fynbos orchards are currently not yet in production. Most producers (86%) have their own packing facilities and more than 90% of the product is exported with the balance split between the florist industry, local supermarkets, the street trade and sales directly to the public. In general producers of wild flowers are conservation conscious. Wild harvesting in particular is done in accordance with best practice sustainability guidelines. This together with good labour practices might ensure preferred market access in European supermarkets.

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Introduction

The Fynbos biome yields a large range of products including rooibos tea (*Aspalathus linearis*), honey bush tea (*Cyclopia* spp), aloe bitters (*Aloe ferox*) and thatch reed (*Thamnochortus insignis, Thamnochortus erectus*), but its most famous product is probably the many species of wild flowers harvested. The main commercial types are Proteacea (*Protea, Leucospermum, Leucadendron*) but *Brunia, Phylica and Erica* species are also utilised selectively. Locally in the Overberg this industry is known as the "flower" or "protea" industry, terms used interchangeably in what follows below. According to Cowling & Richardson (1995) the fresh flower industry utilised 36 fresh flower species and 60 foliage species in 1992. It produced 2000 tons for export and earned foreign exchange to the value of R75 million in the equivalent of 2007 Rand. The huge variety of fynbos flower products is due to the high biodiversity of the Fynbos biome. It comprises of 8600 plant species of which 5682 are endemic (Cowling & Richardson, 1995). Within the region there is more diversity in the southwest (Cape Peninsula, Kogelberg) than in the north and east, but we know that the Agulhas and Riversdale coastal plains are local centres of endemism (Cowling, 1990; Rebelo et al., 1991). Producers who rely on wild harvesting will thus be concentrated in these areas while cultivation can occur anywhere in the province or the country, or even the world. South Africa probably still is the largest producer of proteas in the world but experiences growing competition from Australia, New Zeeland, Israel, Zimbabwe and the USA (California and Hawaii).

The Western Cape has three of the world's biodiversity hotspots, namely the Fynbos biome, the Succulent Karoo biome and the recently identified Thicket biome (Mittermeier, 2005). Myers et al. (1990) explain that to mitigate the effects of climate change international conservation efforts ought to be focused on areas high in biodiversity, so that we conserve the largest number of species in the smallest areas. The conservation community is particularly interested in transition zones as these are the places where adaptation is most likely. Fynbos is not exceptional in terms of alpha diversity, which just counts the number of species in an area. It is exceptional because it is very high in beta and gamma diversity (Cowling, 1990). Referring to Cody (1975, 1983) Cowling (1990) defines beta diversity as the species turnover along an environmental gradient and gamma diversity as the turnover among similar but geographically distinct habitats.

Due to its origins and context there is an international conservation spotlight on the local protea industry. Other fynbos-based industries have attracted bad publicity as long as fifteen years ago when, for example, it was shown that thatch reed harvesting destroys biodiversity (Ball, 1991). Climate change is predicted to destroy more than half of the Fynbos biome and most of the Succulent Karoo biome (Kiker, 2000 in Turpie, 2003). These predictions intensify the world's concern over the effects of wild harvesting on biodiversity in fynbos. Ecosystems managed for a particular product or service, rarely is managed to maximise biodiversity (Westman, 1990; Conradie et al., forthcoming). We know that the protea industry modifies ecosystems, for example, by sowing in desirable species and clearing undesirable invasive alien trees. The clearing of invasive aliens is a good example of the principle that commoditization of wildlife generates a value that brings about conservation. However, it is less clear if the wild harvesting component of the industry can demonstrate what effects they have had on biodiversity on their land. Furthermore, cultivation brings an interesting dilemma.

Focussing on desirable product cultivation clearly enhances the value of all fynbos product, including that harvested from the wild, and also relieves the pressure on the veld. But on the other hand, protea orchards, like all other orchards, are clean cultivated and has as low a biodiversity score as a vineyard. This is problematic, especially where virgin fynbos is ploughed up to establish cultivation.

The purpose of this report is to report the results of an industry survey aimed at testing a questionnaire developed to collect basic industry statistics. We also used the opportunity to investigate employment patterns and most importantly the industry's awareness of and participation in conservation efforts. The next section describes the data, Section 3 presents a producer profile, Section 4 an industry outlook and Sections 5 and 6 the detail of cultivation and wild harvesting respectively. Section 7 presents the labour statistics and Section 8 the biodiversity conservation status in some of the industry and the paper ends with brief conclusions.

Data description

Due to the fierce competition in the industry arising from limited market access, there is no complete producer list. On 2 February 2007 Farmers Weekly reported that the total area under *Proteacea* cultivation in the world is 6000 hectares of which half is in South Africa. This is a tenfold increase from the estimated 300 hectares cultivated in South Africa in 1992 (Cowling & Richardson, 1995). The group of 32 producers reported on here, is a sample of which the representativity will not be known until we have a better idea of the population. However, the sample reported a total of 526 hectares of orchards and a total area utilised for wild picking of more than ninety thousand hectares, which by any estimate must be a sizeable part of the industry.

The survey was conducted at a Protea Producers of South Africa (PPSA) field day at Flower Valley farm on 11 February 2009. We had a 100% response rate from those attending, with one respondent omitting demographic information. Minor non-responses on individual questions permitted 32 observations to most questions, and at least 29 in the most poorly answered cases. The unit of observation is a protea producing company that may own land or may have access to land in more than one location. We assigned a type of production to each respondents based on whether they completed the wild harvesting or cultivation section of the questionnaire, or both, and validated this description against a further question which asks the respondent to describe his land ownership by cultivated area and veld. In 90% of cases, the two approached produced the same result, and where there were discrepancies, we took response to the cultivation section (or lack thereof) as an indication of type of production.

Finally our overall guiding principle in cleaning up the data was internal consistency. Due to the heterogeneity of the sample we had to construct a questionnaire with separate cultivation and wild harvesting sections. While we indicated at the beginning of each section who ought to complete which section, we often got responses in the "wrong" section. For example, if a respondent told us that 100% of his product comes from his own veld where veld is associated with wild harvesting, we would omit a response of "no" to a question "Do you irrigate your cultivated flowers?". Another

example of striving for internal consistency is where a respondent indicated all his marketing channels without indicating the proportion of product sold through each channel. Where only one was indicated, we assigned 100% of his output to that outlet. Where more than one was indicated we assigned the proportions observed for other similar respondents.

Producers' profile

According to Table 1 protea producers are overwhelmingly white and male, and on average 42.03 years old. About half of the sample is Afrikaans speaking and the rest English speaking. The average protea producer has a tertiary diploma but not a degree. Four respondents reported a masters degree and two reported a PhD, which skews the average education upwards and means that other respondents actually have a little less education than the average might suggests. Age and education allows us to calculate a variable called working life, which is age in years minus six (the age for entering school) minus the respondent's years of formal education. The average working life for this sample even if one allows for two years military service, is 19.81 years, which is significantly longer than the average farming experience of 13.58 years reported by this group. A t-test of means assuming unequal variances (Underhill & Bradfield, 2001) confirms that this group on average had a different career before becoming involved in agriculture (t-stat = 3.4365, p = 0.00057). Average farming experience is slightly longer than the average experience with wild flowers, but the difference is marginally significant at a 90% confidence level (t-stat = 1.4184, p=0.08063). If recall is accurate, this means that people have entered agriculture before turning to flower production.

Table 1: Demographics of protea producers (n=31)

Characteristic	Value or proportion
Proportion Afrikaans speaking	55%
Proportion male	87%
Proportion white	90%
Age	42.03 years
Education	14.23 years
Working life	19.81 years
Farming experience	13.58 years
Experience with proteas	11.55 years
Proportion who are owners	65%
Proportion who belong to the local farmers association	68%
Proportion who are PPSA members	80%

Almost two thirds of our respondents were owners and the rest were managers of their flower businesses and 68% of the sample says they are active in the local farmers'

association activities. PSSA membership is even higher at 80% of respondents, but interestingly all types of producers are not equally likely to be PPSA members.

Figure 1 illustrates the size ranges of cultivation (x-axis) and wild harvesting (y-axis) reported in the sample. It shows three distinct groups: Wild harvesters, cultivators and a group that combines veld harvesting and cultivation. There are a couple of producers who really should be considered cultivators as they predominantly have cultivation businesses which are supplemented with a very small proportion of veld harvesting. There are also cases where the firm's main veld harvesting business is supplemented with a very small cultivated area. Where we had observations just off the horizontal or vertical axis we assigned those observations to the pure category. The combined businesses are only a small proportion of the industry, but there are small and large operations in this category and curiously they all have about the same proportion of cultivation to wild harvesting regardless of size. The remainder of this paper uses these three types of production categories.

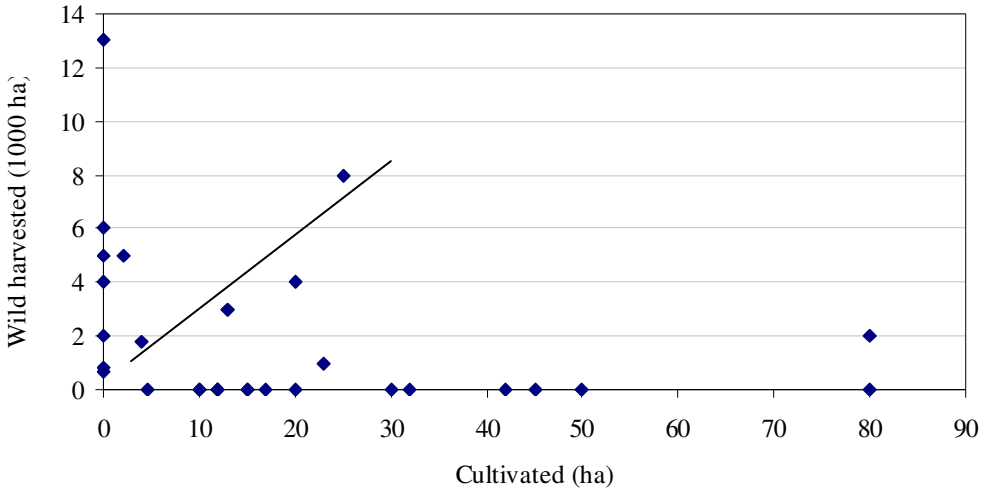

Figure 1: Size and type of fynbos production (n=31)[2]

Nine in ten cultivators (89%) and 78% of wild harvesters in the sample are PPSA members, while only one of the producers involved in both aspects of protea production is a PPSA member. It remains to be seen if this difference across the type of production is a statistical quirk deriving from the small sample size and if it persists in larger samples. If it persists it would indicate that combined firms have other networks (technical and marketing) that render PPSA obsolete.

Industry outlook

In spite of the current economic climate the majority of producers (66%) are optimistic about the future of the flower industry. Only about 16% are worried.

[2] We right censored to protect the identity of an outlier.

Afrikaans-speaking producers are not more optimistic than English speaking producers and we did not find a significant difference between wild harvesters, cultivators and those who do both. Responses to the categories provided are summarised in Figure 2. The direct inquiry after respondents' outlook on the future is supported with two other results. One of these asked wild harvesters if they think flowers are being harvested sustainably in their area. Most people (59%) said that they do not think flowers are being harvested unsustainably in their area, 12% were unsure and only 29% said that they think overexploitation is a problem in their area. The third result shows that a surprising 88% of our 24 cultivators, including those in the both category and those who plan to start cultivation in the next three years, indicated that they have expansion plans. Expansion is actually the strongest indication of confidence as producers would hardly invest money they do not expect to make a return on.

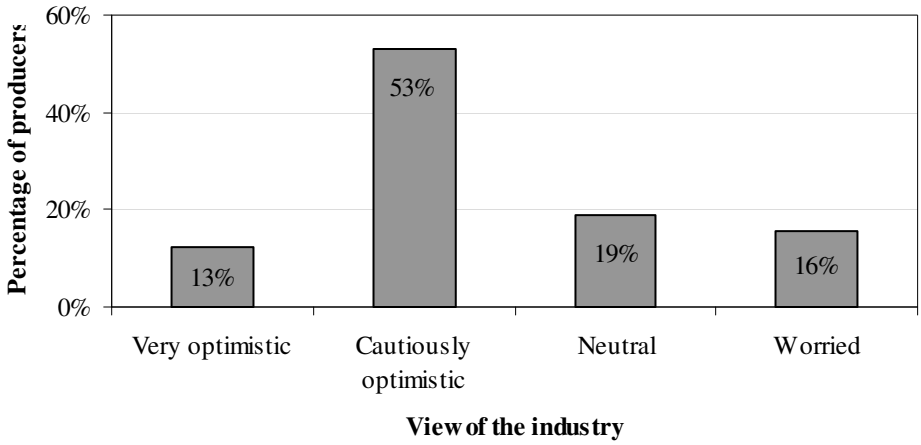

Figure 2: Industry outlook (n=32)

Where people were negative we unfortunately did not probe their reasons for concern. From our discussion in the introduction it is possible that these producers are aware of the climate change predictions for the Western Cape and thus fear for their livelihoods. The shorter fire cycles associated with higher mean temperatures (Midgley et al., 2005) could be a particular concern. For example, in Table 5 below we show that the average fire age of the veld reported on here is only 4.3 years. As climate change happens, fire management will become even more important if commercial flowers harvests from the wild are to be maintained.

Location, ownership, share of income and supply chain in the protea industry

Geographically our data clusters in three distinct production areas. The first is the Agulhas plain and environs, including the magisterial districts of Bredasdorp, Caledon and Hermanus. The second cluster is located around Riversdale, where the industry exploits the relative richness of the Riversdale coastal plain, but this eastern cluster actually extends from Swellendam in the west to Port Elizabeth in the east. A third grouping of producers is located west of the Du Toitskloof Mountains in Somerset

West, Stellenbosch/Paarl, Piketberg and Porterville. This sample does not include any production from the Breede River Valley or Ceres, but such respondents would have fallen in the western cluster as well unless they are located in McGregor just across the mountain from Greyton. Likewise our sample does not have any producers from the rest of the country, which logically would form the fourth production region. One could also argue the cultivation east of George is really part of the rest of the country, but as we have only one such observation we have included it with the eastern or Riversdale cluster.

Table 2: Type of flower production by region

	Western Cluster (n=10)	**Agulhas plain (n=17)**	**Eastern cluster (n=4)**
Cultivators	100%	41%	25%
Wild harvesters	0%	35%	75%
Combined	0%	24%	0%
Total	100%	100%	100%

Compared to the western and eastern region, the Agulhas plain has the highest biodiversity and might thus have the highest proportion of wild harvesting. Producers from this area are more than half the sample, but surprisingly Table 2 shows that the Agulhas plain producers by no means rely on wild harvesting only. In fact cultivation (41%) is slightly more important than wild harvesting (35%) while all the combined businesses in the sample are from this region. The entire western cluster in our sample relies exclusively on cultivation, while the eastern cluster is dominated by wild harvesting. The eastern cluster's heavy reliance on wild harvesting fits the pattern of wild harvesting of thatch reed and aloe bitters reported by Conradie et al. (forthcoming) who argued that the cost price squeeze force owners of marginal farmland to more heavily exploit the environment when under financial pressure than when they were more profitable.

Of course a headcount of producers could be misleading. What we really want to know is what the proportion of product is that originates from wild harvesting and cultivation respectively and what proportion of this is on owned and rented land. This data follows in Table 3 separately for focal flowers and filling. Unfortunately we do not have an accurate estimate of the proportion of filling to focal flowers or an accurate feeling for the size of the crop. Table 3 shows that more than 90% of all cultivation occurs on the producer's own land. This is consistent with ownership patterns in the fruit producing districts where the investment requirements of long term crops make rental agreements complicated and open to cheating. Surprisingly only about a third of wild harvesting occurs on rented land, and the proportion is virtually identical for focal flowers and filling. Table 3 thus suggests that wild picking teams do not scrounge the entire area for focal flowers with which to add value to the filling harvested on their own land, but rather we have a smaller component of the industry involved in 'sharecropping'.

Table 3: Ownership patterns of land used for protea cultivation and wild harvesting of fynbos flowers[3]

Land ownership by type of product	Wild harvesting (n = 14)	Cultivation (n = 23)
Focal flowers: own land	70%	97%
rented land	30%	3%
	100%	100%
Filling: own land	67%	91%
rented land	33%	9%
	100%	100%

The separation of ownership and production might prove a useful vehicle for transforming the industry, which according to Table 1 is as lily white as the rest of Western Cape agriculture. However, sharecropping could lead to overexploitation as we explain in the conservation and biodiversity section below. Most flower producers are specialised in flower production, deriving on average 76% of their income from this one industry. Table 4 lists the average share of income from flowers by type of business, showing that smaller business are more diverse than the larger ones which get 90% or more of their income from flowers. For cultivation 20 hectares are probably a reasonable cut-off while wild harvesting operations could usefully be classified into those 2000 hectares or smaller and those above 2000 hectares.

Table 4: Average proportion of income derived from flowers by size of operation (n=32)

	Size of wild harvesting operation	
Cultivated area	**<2000 hectares**	**≥2000 hectares**
<20 hectares	61%	79%
≥20 hectares	91%	90%

It must be reiterated that our sample is biased by our sampling procedure, which restricted observations to those interested in a field day on protea production. Those attending the field day are likely to be larger firms and firms more specialised in flowers, than would have been the case were we able to take a completely random sample. Under these circumstances the supply chain data in Figure 3 will be overemphasising own pack sheds and export. However, the 80-20 principle is well known in agriculture, and many argue that industry business should really focus on the 20% of producers who produce 80% of the industry's output.

[3] The total observations sum to more than 32 in this instance as we entered veld and cultivated land separately for all producers who have both.

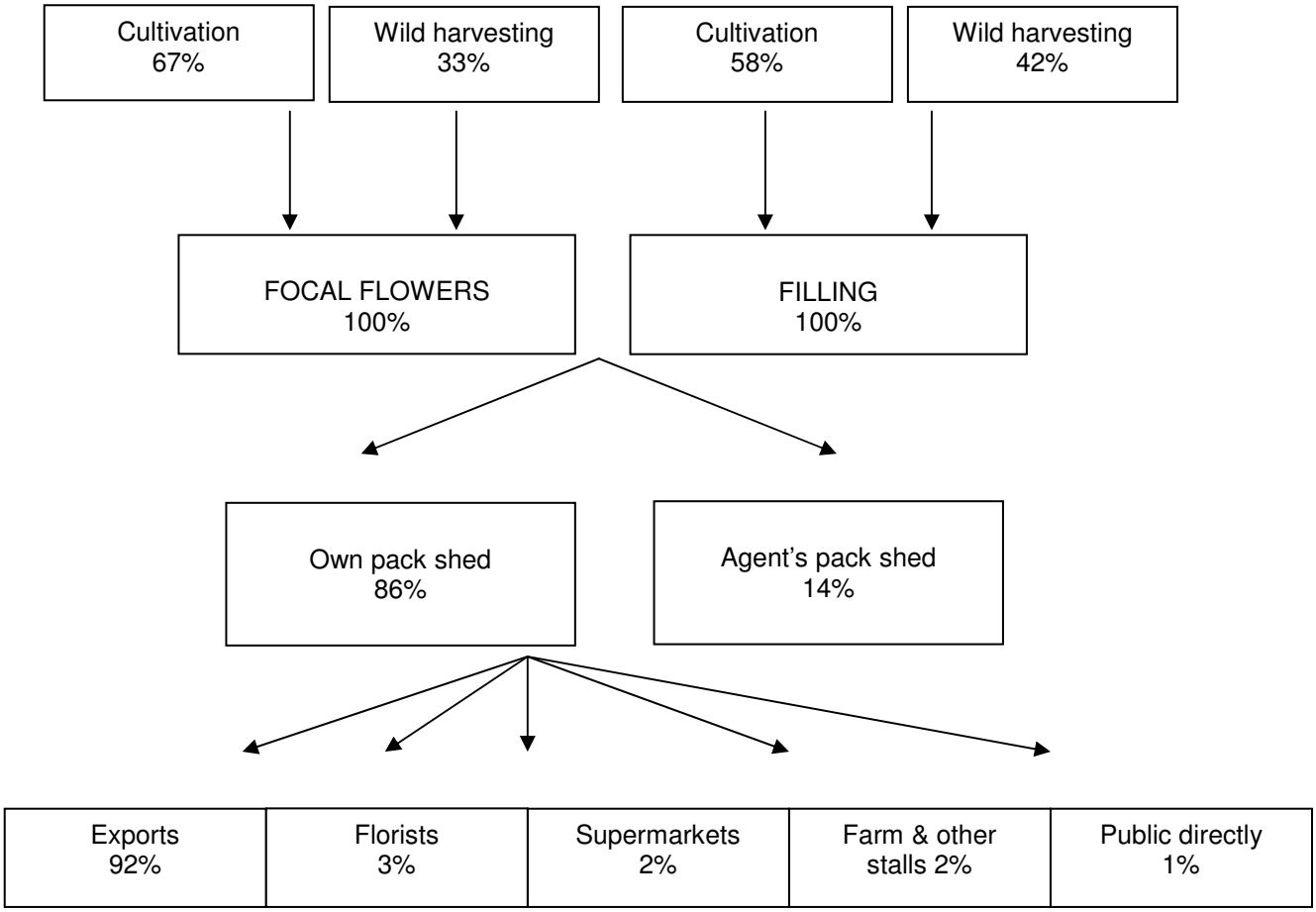

Figure 3: Supply chain of wild harvested fynbos flowers

Figure 3 describes the protea industry supply chain. Product originates from the wild and from cultivation, and is divided into focal flowers and filling. Focal flowers are all prominent blooms such as proteas and pincushions and without them a bouquet would not sell. Figure 3 shows that a third of focal flowers still originate from wild harvesting. These species amongst others include *Protea repens*, *P. compacta*, *P. cynaroides* and *Leucospermum cordifolium*. In nature proteas flower briefly towards the end of winter. In pincushions the timing of the harvest can be manipulated by debudding (Jacobs, 1983), but in proteas much work has gone into breeding to extend the flowering season (Greenfield et al., 1994; Gerber et al., 2001; Littlejohn, 2001). With so many *Proteacea* cultivars in circulation it is interesting that wild harvested focal flowers still seem to be able to compete.

Filling includes a huge range of the typical small-leafed fynbos vegetation uses as greenery around the focal flowers, such as the *Erica* species, *Brunia albiflora* and everlastings (*Syncarpha vestita*) and a range of *Leucadendron* species. The breeding programs also produced Safari Sunset (*L. laureolum x L. salignum*) and Rosette (*L. laureolum x L. elimensis)* which are strictly speaking cone bushes and thus filling, but are prominent enough to function as focal flowers. It is possible that the 58% of filling that is cultivated includes large amounts of these crossbred cone bushes. Alternative the normal filling species are grown from seed but irrigated and fertilised to improve

quality of which stem length and drought burn are probably the most important aspects.

We do not know by mass or by stems the ratio of focal flowers to filling but we know that most of the product (86%) is packed on the producer's land in his or her own packshed, while only 14% goes off to be packed on the wholesale / exporter's premises. Of the product packed on the farm, more than 90% is destined for export and the remainder is divided virtually equally between the domestic florists trade, supermarkets, farm and flower stalls and sales directly to the public. Our data does not distinguish between fresh and dried, but the dried product comprises a substantial portion of the industry. We asked about Fair Trade and other trade certification and generally found that only one respondent was certified in any of the schemes.

Cultivation

The details of cultivation are summarised in Table 5. Reported area under cultivation varies from 2 to 80 hectares, with an average of 24 hectares per producer. The cultivation sector is growing rapidly. In aggregate 25% of plantings are not yet in production, and 88% of cultivators say that they definitely plan to expand over the next three years.

Table 5: Protea cultivation (n=24)

Characteristic	Proportion or value
Average area cultivated (ha)	24
Proportion non-bearing	25%
Producers indicating expansion within 3 years	
- on transformed land	59%
- on virgin veld	41%
Using irrigation	75%
Using fertiliser	75%
Doing chemical pest control	79%
Most frequently mentioned varieties	*P. compacta*, Sylvia, *P. magnifica*

Of those who said that they will definitely or probably expand, 59% plan to plant on land that was previously used for something else, while 41% are planning to plough up virgin veld. We do not know if the virgin veld in question is fynbos or not, but even if it was not fynbos, ploughing up any natural veld destroys biodiversity. At least one respondent indicated that he or she will use land that is currently heavily invested with invasive aliens. This, and the high incidence of the use of old lands, is gratifying from a conservation point of view.

Cultivation is an intensive business. One in four of cultivators make use of irrigation, 75% uses chemical fertilisers and 79% reported the use of pesticides. Irrigation would not really be feasible in the wild, but if sufficiently dense natural stands occur, it might be possible to fertilise and do pest control on those patches if they are located on flat enough land. The most frequently mentioned financially most important protea varieties are *Protea compacta*, the Sylvia cultivar (*P. eximia x P. susannae*) and *P. magnifica*. Especially *P. compacta* is important to both wild harvesters and cultivators.

Wild harvesting

In most of Western Cape agriculture ownership and control reside with the same person. Such owner-managers have the incentives to operate sustainably as they can harvest or collect the economic rent from properly managed land over time. For example, it pays to invest in the right cultivars or a proper irrigation system as the owner is guaranteed of the proceeds of proper management. With veld harvesting this is not necessarily the case, as even on private land the protea veld is so remote that outsiders cannot practically be excluded. In such open access cases we have a tragedy of the commons (Hardin, 1968) where people exploit the resource as quickly as they can before someone else does. The standard arrangement in the protea industry is that wild harvesting is done by migrant picking teams who hold a portfolio of picking sites. In this sample the average area harvested per producer is 5842 hectares spread over 5.2 farms. The average maximum distance to a picking site is 66.5 kilometres from the producer's home base. In few of these cases do they actually rent the land (which is largely useless for other purposes and thus often heavily invaded by alien trees) but rather have a sharecropping arrangement by which income is split in thirds, one to cover costs, one for the land owner and one for the picker. The system lowers the hurdle for new entrants, but unless secure contracts stretching across several fire cycles can be enforced, wild harvesting might not be sustainable.

Wild harvesting practices are summarised in Table 6. Almost half of those picking from the wild (47%) plan to expand their enterprise over the next three years, 18% to keep the operation the same size and 24% indicated that they will most likely scale down their picking operation. The remainder was unsure of what would happen to their operation. Twelve percent of those who only do wild harvesting said that they plan to convert some of their veld to another type of use over the next three years. We did not ask what they want to convert to, but averaged over the sample clearing amounts to 1.47 ha per producer.

Privett (2002) outlines a system for sustainable harvesting of fynbos flowers based on a biological assessment conducted on Flower Valley farm in the Walker Bay conservancy. Almost nine in ten of wild harvesters (88%) say that they follow sustainable harvesting principles, and if one investigates Privett's particular recommendations, a higher percentage of our respondents actually follow his recommendations. For example, 76% of respondents restrict picking to half the flower heads on a bush, instruct their staff not to cut into old growth and to cut at 45º angles, while 82% say that they instruct their staff to leave sufficient bearing wood for the next year and to take care not to damage plants during the harvesting process. One

producer said sustainable harvesting principles are common sense if you want to remain in business. Still, Table 5 is a best case scenario and one might question the extent to which the sustainable harvesting principles reported by the owner are followed in the veld.

Table 6: Wild harvesting of fynbos flowers (n=17)

Characteristic	Proportion or value
Average area picked (ha)	5842
Number of farms on which picking is conducted	5.18
Furthest distance from homestead	66.5km
Proportion planning expansion in 3 years	47%
Proportion following sustainable harvesting principles	88%
Proportion who use the following practice:	
- harvest only 50% of flower heads	76%
- leaving sufficient bearing wood	82%
- not cutting into old growth	76%
- 45º clean cuts	76%
- no tugging out or breaking off plants	82%
Average time since last major fire	4.3 years
Veld improvements	
- clear alien vegetation	88%
- controlled burning	76%
- build or maintain firebreaks	88%
- sow or plant in commercial species	76%

The bottom section in Table 6 reports on extent of veld improvement. It also shows that the average time since the last major fire is only 4.3 years. Provided that invasive alien trees are under control, this recently burnt veld should be in an excellent condition yielding a lot of good stems which pickers deprived of an income by the fire will be eager to harvest. The only problem is that most of these plants would not have had the recommended two consecutive full flower seasons to set seed and replenish seed banks. To pick this veld at this stage is dangerous especially for re-seeders where a number of fires in short succession could wipe out entire populations. Fortunately 88% of respondents harvesting from the wild indicated that they make fire breaks and control invasive alien species on their land. The other forms of veld improvement, namely controlled burning and increasing populations of commercially valuable species are also done widely. One respondent reported fertilising his protea veld with manure and one other reported the use of chemical fertiliser. We know that if dense enough natural stands occur on land that is accessible by tractor, spraying is possible, but we failed to ask producers who harvest from the wild to report spraying if they do any. We also did not ask them about quality problems or how they are dealing with these quality problems.

Labour conditions in the protea industry

The average protea producer employs 26.25 permanent staff, 8.59 seasonal and 1.63 day workers. On a per-hectare basis, wild harvesting employs 7.33 workers per 1000 hectares if the firm packs its own flowers and 8.8 per 1000 hectares if it sells bulk flowers to another pack shed. Cultivation employs 0.91 workers per hectare if the farm has its own pack shed. Table 7 summarises the job security, gender split and skills composition of the labour force on protea farms.

Table 7: Employment in the protea industry

Description	Cultivators (n=18)	Wild harvesters (n=9)	Combined firms (n=5)
Job security (avg. proportion)			
- permanent jobs	78%	74%	50%
- seasonal jobs	22%	23%	26%
- day /casual jobs	0%	3%	24%
Gender (proportion female of)			
- of permanent staff	58%	67%	56%
- of seasonal staff	77%	56%	82%
- of casual staff	0%	100%	0%
Skills composition (avg. prop)			
- general farm workers	66%	55%	24%
- bouquet makers	17%	34%	62%
- tractor/ forklift drivers	5%	2%	7%
- truck drivers	2%	1%	0%
- supervisors/ team leaders	4%	6%	3%
- farm managers	3%	2%	4%
- other	2%	0%	0%

Less than one in five staff members (18%) live on the farm, but a very high proportion have permanent jobs. See Table 7 for details and Prins (2008) for a comparison of a more detailed investigation on a smaller scale. Cultivators employ 78% of their workers in permanent jobs and wild harvesters employ 74% of their staff in permanent jobs, while the combined business have a larger part time component and only half their staff in permanent jobs. Both permanent jobs and resident status are indications of secure livelihoods (Kritzinger & Vorster, 1996; Conradie, 2007), and by these standards the protea industry is a good/bad employer. Permanent positions in Western Cape agriculture are normally reserved for men (Conradie, 2007), but in the flower industry women make up more than half of the permanent labour force, indicating that jobs in the industry can easily be accessed by women. Women hold an even higher proportion of seasonal and part time jobs, but the lack of job security associated with these positions is no greater for these women than if they were in farm jobs elsewhere in the province.

From a skills point of view the relatively unskilled general farm worker dominates the skills mix as on other farms in the Western Cape. On flower farms there is a specialised category of females called bouquet makers. They are similar to the general farm workers who pack fruit on farms that have their own pack sheds, and therefore what one should actually do is combine the first two skills categories. Doing this produces a stable proportion of about one more skilled worker in four regardless of type of operation. Those who are skilled are divided roughly equally between drivers and supervisors. Farm managers or foremen make up between 2% and 4% of hired labour on protea farms.

Biodiversity and involvement in conservation

Taking sustainable harvesting as an indication of conservation attitude, the 88% of respondents saying that they follow sustainable harvesting principles indicates that the industry uses the environment in a responsible manner. Another way to probe conservation awareness would be to check for knowledge of rare and endangered species. Thirty nine percent of the farmers in the sample reported at least one endangered species on their farms and 75% of those could tell us what the endangered specie on their land was. Just being aware of the need for conservation is quite different from being involved in conservation, such for example enrolling one's farm in a formal conservation agreement. Almost two thirds of our respondents (62%) have a formal agreement, which in most cases is conservancy membership (37%). Twenty one percent each have a formal nature reserve or a biodiversity agreement, and 16% have an informal nature reserve. One respondent reported that he or she was a member of the Nuwejaars Wetland special management area (SMA) adjacent to the Agulhas National Park (South African National Parks, 2009).

SMA landowners have pooled their veld to form a conservation area managed by the park, but continue to farm on the transformed land and adapting their agricultural practices to minimise the impact on the natural veld surrounding them (Dennis Moss Partnership, 2007). The foundation of the SMA is sustainability based on inherent biological carrying capacity.

Table 8 takes it even further by analysing the level of adoption of particular biodiversity conservation strategies. We list the extent of adoption across the top and seven guidelines down the side. The categories sum across to 100% for each of the rows. The first column in Table 8 gives an indication of the extent of awareness of a particular biodiversity strategy and the second from last column gives an indication of the proportion of producers who are aware of a particular approach but rejects it. In the first case the appropriate response would be to do more extension but if rejection is high, the conservation fraternity really has to work with farmers to understand why a particular recommendation is not accepted.

Most protea producers are aware of most of the biodiversity conservation guidelines. The exception is the need for the use of integrated pest management (IPM), which one in four farmers say they were not aware of. The principle of IPM is to promote and protect beneficial organisms allowing nature-in-balance to contribute towards crop

productivity rather than trying to solve the problem through the use of aggressive chemicals (EPA, 2008). Surprisingly, the other recommendation of which producers are relatively unaware is that they need clearing permission. Act 43 of 1983 requires land owners to seek permission before they clear any veld for cultivation. No-one said that they were unaware of the need for clearing invasive aliens or of the need for using water efficient irrigation systems.

Table 8: Current state of adoption of biodiversity conservation guidelines (n =32)

Guideline	Not aware	Not implemented	Partly implemented	Fully implemented	Reject guideline	Total
Abstract as little water as possible	4%	7%	7%	71%	11%	100%
Buffer strips around cultivation	3%	6%	19%	65%	6%	100%
Use efficient irrigation systems	0%	4%	23%	65%	8%	100%
Need permission to clear veld	11%	7%	11%	61%	11%	100%
Control invasive aliens on land	0%	0%	39%	61%	0%	100%
Use integrated pest management	26%	11%	19%	37%	7%	100%
Use manure or compost to fertilise	7%	26%	30%	22%	15%	100%

Interpreting the responses a particular recommendation "did not make sense" in their situation as rejection, raises three red flags, namely the use of organic fertiliser, clearing permission and needing to abstract as little water as possible. In each case more than 10% of the sample fell in this category. If there are sound conservation reasons for using organic fertiliser, farmers are not aware of them or are aware of them but have weighed up private losses against possible social gains from switching to manure, and concluded that it makes no profit maximisation sense to do so. In the first case it calls for education and in the second for compensation possibly in the form of a tax benefit.

The only guideline not rejected by anyone is the need to clear invasive alien trees. This is some evidence that protea production is attaching some value to the land, whether through permitting wild harvesting or through improving water run-off, which makes it worthwhile to private landowners to remove these aliens. The clearing of invasive aliens can be quite expensive, up to R3301 per hectare for Acacia (Marais & Wannenburgh, 2008), making it very significant that 100% of respondents indicated either full or partial adoption of this principle. On the whole, biodiversity recommendations are fully adopted by about two-thirds of the sample suggesting that these individuals do not only talk about conservation, but do it.

Finally, cultivation is often endorsed as removing pressure from natural populations. This could be the case if it is cultivation of the same genetic material, but crossbred protea cultivars grown in proximity to wild populations could spread into the wild to

contaminate wild populations. This and other forms of veld "improvement" need further study if we are to produce in a responsible manner.

Conclusion

One of the most important contributions made in this paper is that it describes the relationship between the wild harvesting component and the cultivation sector of the protea industry. Cultivation is clearly the dominant partner with their own packing plants and export contacts, but the large proportions of both focal flowers and filling still sourced from the wild clearly indicates that cultivation is by no means self sufficient, and needs to keep in touch with wild harvesting in order to source sufficient supplies. On the other hand, quality parameters and fashion trends will continue to be set by the cultivation sector making it essential that wild harvesters keep in touch with cultivation.

A review of employment patterns show that the flower industry treats women more equitably than the rest of Western Cape agriculture and that all labour have better job security than in many other sectors of agriculture. While this survey did not collect any data on remuneration practices, the other employment practices should make it easy to get fair trade certification. The only concern is the environmental which seems to be risk free on most of the counts that we probed. While producers seem to be doing the right things, we do not have third party adjudication of whether these things actually happen in the veld, and thus no basis for environmental certification which is what the conservation fraternity wants for a world class biodiversity hotspot such as the Fynbos biome. As things stand, this small sample already protects 99310 hectares of fynbos veld, and if the industry does so sustainably and without harming general biodiversity, this could represent a substantial off-reserve conservation effort that pays for itself.

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