Economic considerations of 'Maluma'

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ABSTRACT

The 'Maluma' cultivar has been in semi-commercial and commercial production for about 15 years, however in avocado cultivar commercialisation terms it is still considered quite new. 'Maluma' originated as a chance seedling of unknown parentage. For any new cultivar to be commercially viable it needs to present significant economic advantages in comparison to already existing commercial cultivars. A new cultivar should also mitigate some of the risks associated with the production and marketing of avocados.

Statistical data was obtained from within the South African context, while physical observations were also made in other countries where 'Maluma' has been planted commercially. Statistical data with regards to production and income per hectare as well as labour cost are analysed over consecutive seasons and compared to 'Hass' in the same environment for reference. The data was obtained from commercial orchards on different farms located in the main avocado production region in South Africa. Physical observations with regards to production and climatic factors are also analysed and compared.

Analysis of the data shows that 'Maluma' presents significant economic advantages in comparison with 'Hass' in terms of labour efficiency and income per hectare. It is shown that 'Maluma's' economic advantages also lie in the fact that it mitigates certain risks relating to avocado production. These risks include factors such as climatic risk and variability of production. Statistical analysis indicates significantly less variability in seasonal production of 'Maluma' relative to 'Hass'. Therefor it is concluded that 'Maluma's' economic advantages establishes it not only as a viable commercial cultivar, but an attractive one for the entire value chain.
Keywords: Profitability, Cultivar, Production, Avocado, Variety, Genetics.

INTRODUCTION

The 'Maluma' cultivar has been in semi-commercial and commercial production for about 15 years, however in avocado cultivar commercialisation terms it is still considered quite new. 'Maluma' originated as a chance seedling of unknown parentage. For any new cultivar to be commercially viable it needs to present significant economic advantages in comparison to already existing commercial cultivars. A new cultivar should also mitigate some of the risks associated with the production and marketing of avocados.

The objective of this study was to determine the economic advantages of 'Maluma', if any, in relation to other cultivars in commercial production in South Africa, specifically related to addressing certain production difficulties and risks in the South African context. A certain number of these difficulties and risks are also applicable to avocado production regions in parts of the world outside South Africa and certain observations were made in those regions where 'Maluma' is planted.

Plant growth regulators are commonly used in fruit production as a tool to manipulate growth and yield (Lovatt, 2005). Certain avocado cultivars, such as 'Hass', are known to be vigorous growers which can prove to be counter-productive where pruning practices are implemented to control tree size to manageable levels. Excessive vegetative growth causes inefficiencies in terms of production factors such as labour, tree energy management, nutrition usage etc. It has also been postulated that the phenomenon of irregular bearing might be addressed through application of plant growth regulators (Köhne & Kremer-Köhne, 1989). The statistical data obtained for this study with regards to 'Hass' represents the application of plant growth regulators for the control of vegetative growth as well as to increase fruit set and fruit size. Conversely the statistical data with regards to 'Maluma' represents the absence of any application of plant growth regulators.

Orchard cold damage on avocado fruit occur when the temperature drops low enough for a significant amount of time to cause damage to the fruit skin and/or pulp. This phenomenon has been the cause of significant losses in terms of avocado production in South Africa and other parts of the world. It is known that certain cultivars are more susceptible to orchard cold damage than others (USDA Economic Research Service, 1995). The susceptibility of 'Maluma' fruit to orchard cold damage was investigated and compared to similar 'Hass' orchards.

Irregular bearing from season to season is a well-known phenomenon in avocado production. The cycle of irregular bearing usually start with a heavy crop, which is thought to deplete the energy reserves of the plant, followed by a poorer crop. This is thought to be entrenched in the genetics of the avocado (Wolstenholme, 2010). Certain management practices have been introduced to lessen the severity of the seasonal variability of production of avocados. Despite these practices certain cultivars still seem to be more susceptible to this variability than others, probably due to different reactions to heavy crops influenced by genetics. The variability of production from season to season of 'Maluma' was statistically evaluated and compared to 'Hass'.

While South African labour is still relatively inexpensive compared to some other avocado producing countries, there has been a sharp increase in wage rates in recent years. Labour cost represents the biggest single contributor to the total production cost of avocados in South Africa, with harvesting being the most labour intensive activity. It is expected that smaller, more productive trees will be harvested quicker and more efficiently. Statistical data with regard to harvesting of avocados in South Africa has been analysed to determine if the characteristics of 'Maluma' provide any significant advantages in terms of labour efficiency during this activity.

'Hass' orchards, representing a significant proportion of the South African industry, is known to produce a large proportion of its fruit of fruit sizes comparably smaller than other cultivars. This tendency has been observed on 'Hass' regardless of tree health, although poor health exacerbates the problem, and seems to worsen with tree age. "Fruit size is fundamentally determined by genome, so the long-term and ultimate approach is to discover or breed new large-fruited black-skinned cultivars" (Moore-Gordon & Wolstenholme, 1996). A comparison is made on statistical data of fruit size distributions between 'Hass' and 'Maluma' orchards subject to similar practices and of similar condition and health.

MATERIALS AND METHODS

Statistical data was obtained from within the South African context, while physical observations were also made in other countries where 'Maluma' has been planted commercially. Statistical data with regard to production and income per hectare as well as labour cost were analysed over consecutive seasons and compared to 'Hass' in the same environment for reference. 'Hass' serves as a good reference due to it also being a black skinned cultivar and also the most widely known and planted avocado cultivar in the world. The data was obtained from commercial orchards on different farms located in the main avocado production region in South Africa. Physical observations with regards to production and climatic factors were also analysed and compared

RESULTS AND DISCUSSION

Orchard cold damage

Photographs (Figure 1) of 'Maluma' were obtained after a frost incident in New Zealand which occurred where 'Maluma' orchards are planted. A temperature of -6 degrees Celsius was recorded. The photographs indicate leaf damage to the 'Maluma' trees, but no visible damage to its fruit. The fruit were later confirmed to have had no internal damage after it had been harvested. Figure 1 also includes photographs of 'Hass' fruit that were visibly affected at -1 degrees Celsius in a separate incident in South Africa. The externally affected 'Hass' fruit were cut open to reveal typical internal symptoms of orchard cold damage.

These observations are in accordance with the experience of South African 'Maluma' producers that were interviewed. None of these producers have ever had any significant orchard cold damage on their 'Maluma' fruit, but each had reported experiencing catastrophic orchard cold damage to their "Hass' fruit in the past.

It is evident that 'Maluma' is, at the very least, much less susceptible to orchard cold damage than 'Hass'.

Figure 1. Photographs comparing 'Maluma' and 'Hass' after orchard frost

Irregular bearing (variability of production)

Figure 2 illustrates the production (in tons per hectare) over a number of seasons for a 'Hass' orchard as well as a 'Maluma' orchard. These two orchards are similarly sized and situated right next to each other. Both orchards were planted in March 2001 and is subjected to the same orchard practices, except that the 'Hass' orchard is sprayed with plant growth regulators (Uniconazole) for fruit set and vegetative growth control. The 'Maluma' orchard is not sprayed with any plant growth regulators.

The irregular bearing pattern can clearly be seen in both cultivars. The statistical variance of each cultivar's data series over the six seasons was calculated to be 40 in the case of the 'Hass' orchard and 23 in the case of the 'Maluma' orchard. This indicates that the alternate bearing is significantly less spread out in the case of 'Maluma' when compared to 'Hass'.

It is also interesting to note the difference of the level of production between the two cultivars. The sustained higher yield of 'Maluma' presents significant economic advantages in terms of a higher crop value per hectare.

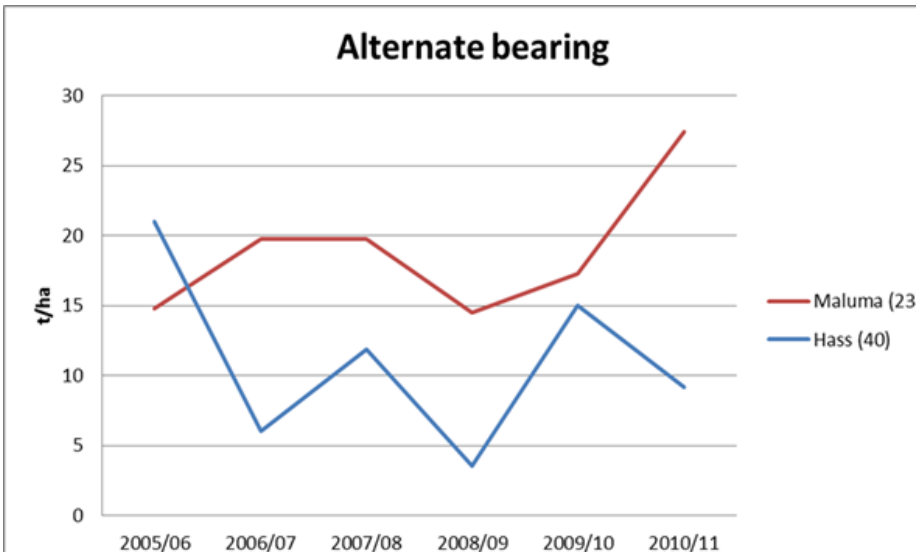

Figure 2. Alternate bearing pattern of 'Hass' and 'Maluma'

Labour cost (harvesting)

The common practice in South Africa is to harvest avocado fruit into small plastic bins, called lugs, which can each hold up to 18 kilograms of avocado fruit. These lugs are usually only filled with around 15 – 16 kilograms of fruit so that they can be stacked without damaging the fruit. Harvesting is done by hand with scissors on low-hanging fruit and with a harvesting pole for high-hanging fruit. Harvested fruit is placed in a bag slung over the worker's shoulder and is eventually carried out by foot to the edge of the orchard where the lugs are situated. The fruit is removed from the bag, sorted between waste- and packing grades, and placed in lugs. All of this is done by each individual harvesting worker him-/herself. It is important to keep this practice in mind when interpreting the data.

The average harvest rate, in terms of the number of lugs harvested per hour, over an entire season was calculated for a number of seasons for 'Maluma' as well as for 'Hass'. The results are illustrated in Figure 3. In order to take into account the labour cost involved, the wage rate (in Rand) per hour was incorporated into these results to determine the average labour cost per lug harvested. This is illustrated in figure 4 for the 2015 season.

From the data it is evident that workers are able to harvest 'Maluma' quicker and easier than they can accomplish with 'Hass'. This represents a greater harvesting efficiency in the case of 'Maluma' and translates into decreased labour cost per lug harvested. According to figure 4 the harvesting labour cost saving per lug was almost 18% during the 2015 season.

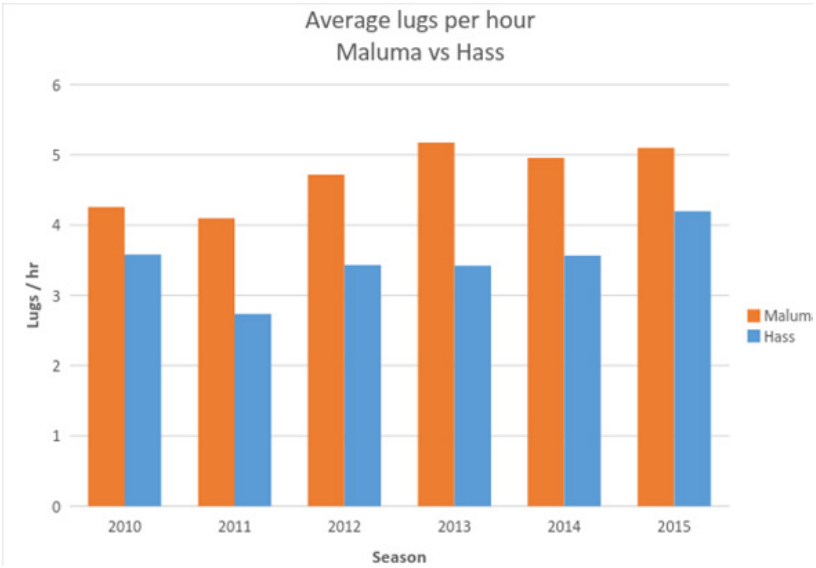

Figure 3. Average number of lugs harvested per hour per worker for 'Maluma' and 'Hass'

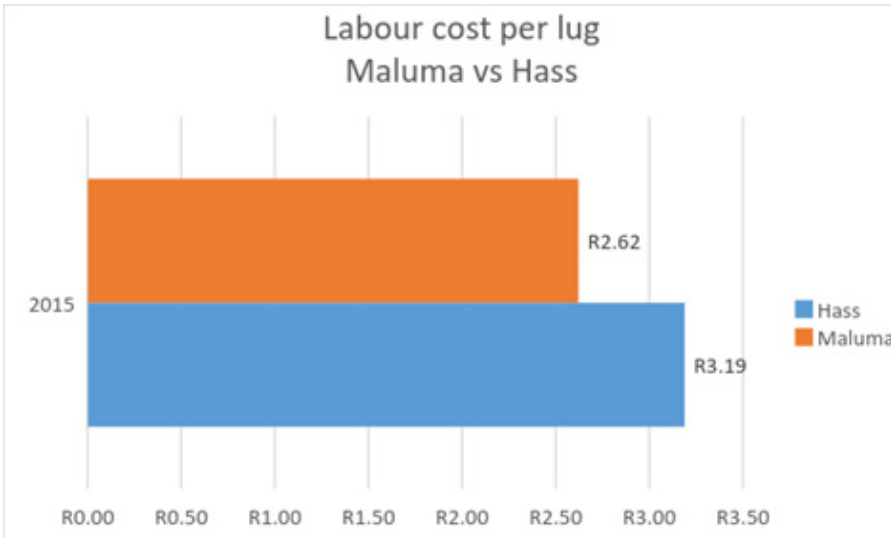

Figure 4. Average harvesting labour cost per lug for 'Maluma' and 'Hass' – 2015 season

Fruit size

Figure 5 illustrates the fruit size distribution of a 'Maluma' orchard and a 'Hass' orchard. These two orchards are similarly sized and situated right next to each other. Both orchards were planted in March 2001 and is subjected to the same orchard practices, except that the 'Hass' orchard is sprayed with plant growth regulators (Uniconazole) for fruit set and vegetative growth control. The 'Maluma' orchard is not sprayed with any plant growth regulators.

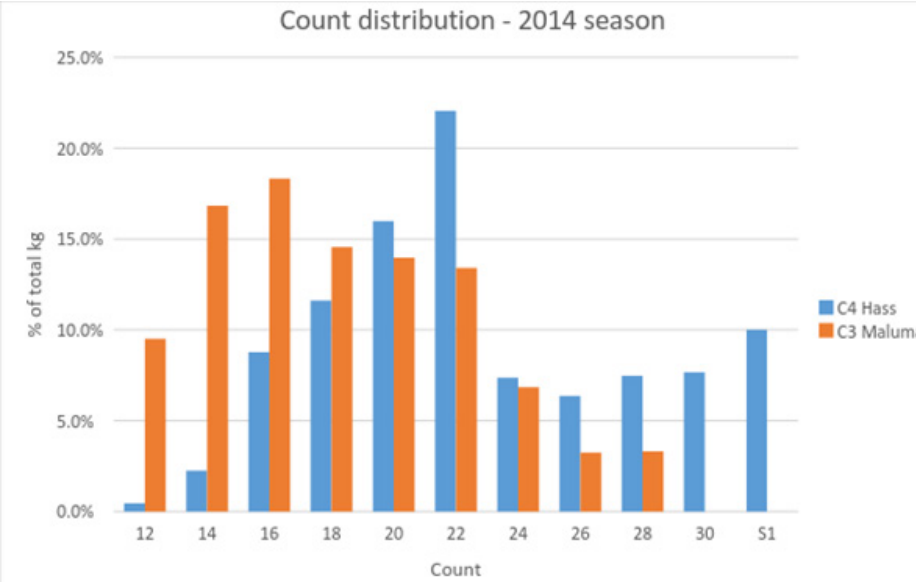

Figure 5. Fruit size distribution for 'Maluma' and 'Hass' orchards of same age

The 'count' number indicates the number of fruit in a 4kg box, thus the higher the number the smaller the fruit. It is clear from the figure that the 'Hass' peaked at count 22 and that approx. 39% of the total harvested mass were count 20 and larger. However, the 'Maluma' peaked at count 16 and approx. 73% of the total harvested mass were count 20 and larger.

Looking at the average farm gate prices in 2014 for black skinned avocado fruit, as illustrated in figure 6, it can be seen that the highest price was paid for count 16 fruit and that the highest paid fruit sizes are count 20 and larger. The fact that 73% of 'Maluma' fruit were in the highest paid size bracket, compared to only 39% of 'Hass' fruit, presents a significant economic advantage over 'Hass'.

Figure 7 illustrates the change of the size distribution peaks over a number of seasons for the 'Maluma' and 'Hass' orchards. In other words, it indicates the fruit size of the largest proportion of fruit for each season. The count peak for 'Hass' in 2010 (14) should be seen as an outlier, as the orchard received frost which affected mostly the smaller fruit which in turn skews the count distribution for that season toward larger sizes. It can be seen that, if the outliers are removed, the 'Hass' peak moves between count 20 and count 22, while the 'Maluma' peak moves between count 14 and 16.

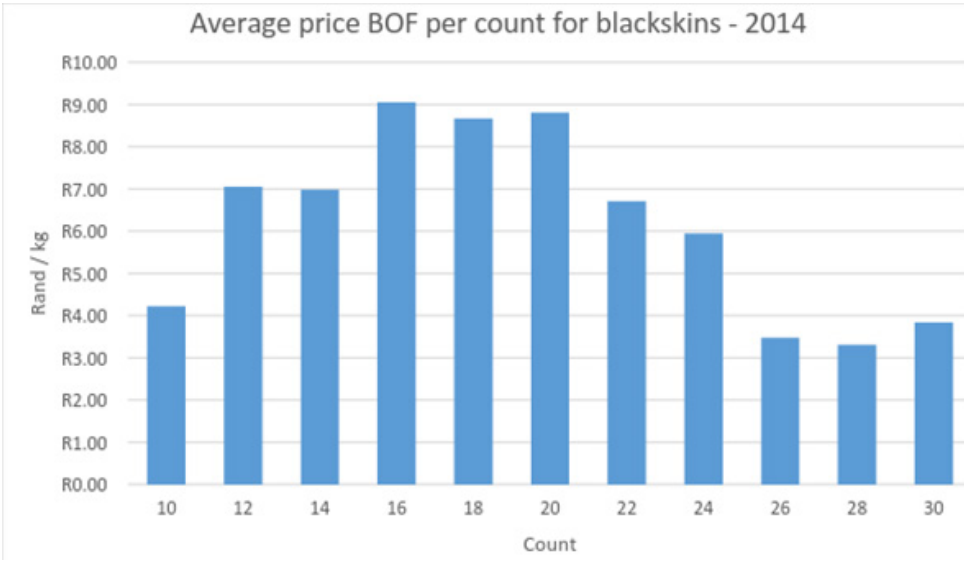

Figure 6. Average farm gate price per kg for black skinned avocados in 2014 (all grades)

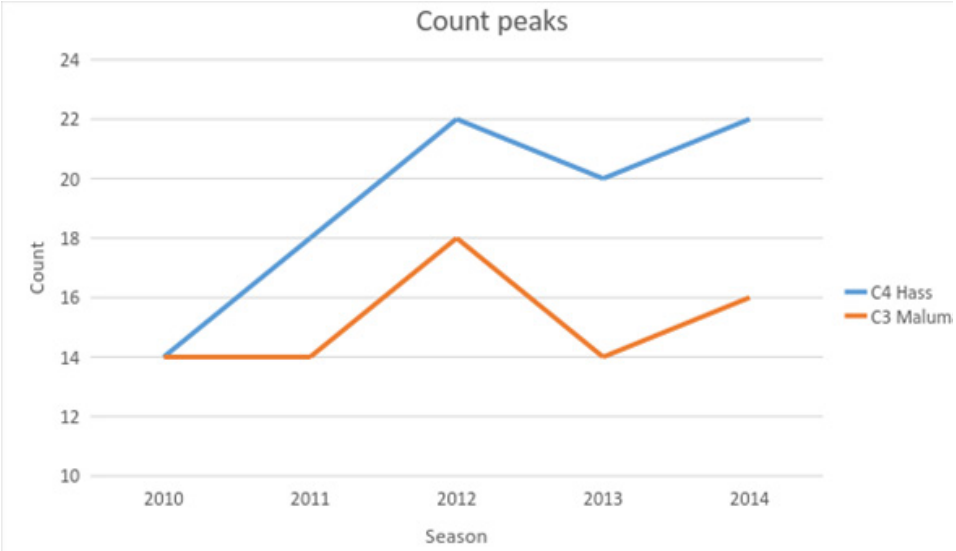

Figure 7. Count peaks over time for 'Maluma' and 'Hass' orchards of same age

Fruit quality

Figures 8 and 9 each illustrate the average proportion of total harvested mass for each quality grade over all 'Hass' and 'Maluma' orchards, respectively, that formed part of the study. The first observation is that 'Maluma' produced a higher proportion of grade 1 fruit during each season compared to 'Hass'. The second observation is that there was a quality drop during the 2014 and 2015 seasons in both 'Maluma' and 'Hass'. However, it is evident that with 'Maluma' the grade 2 proportion increased, while with 'Hass' the waste grade proportion increased. This seems to indicate that 'Maluma' is not as direly affected by factors that decrease external quality as 'Hass' is.

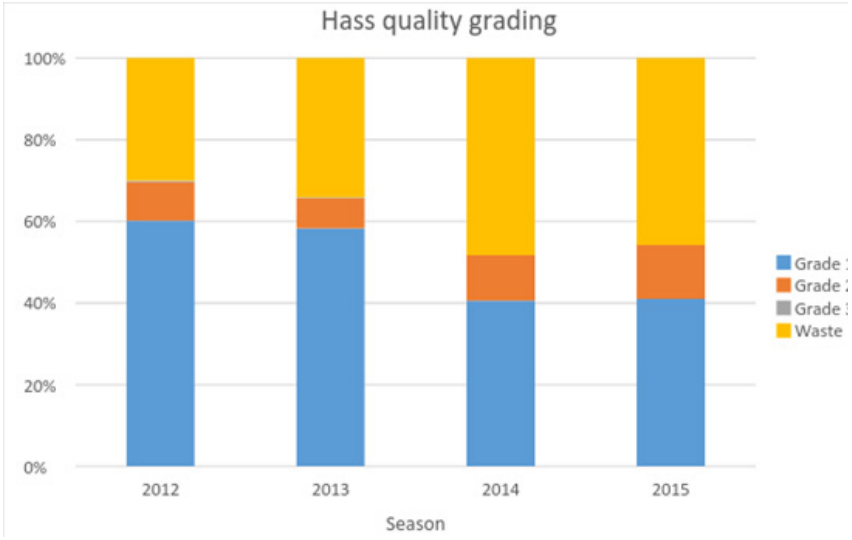

Figure 8. 'Hass' quality grading per season

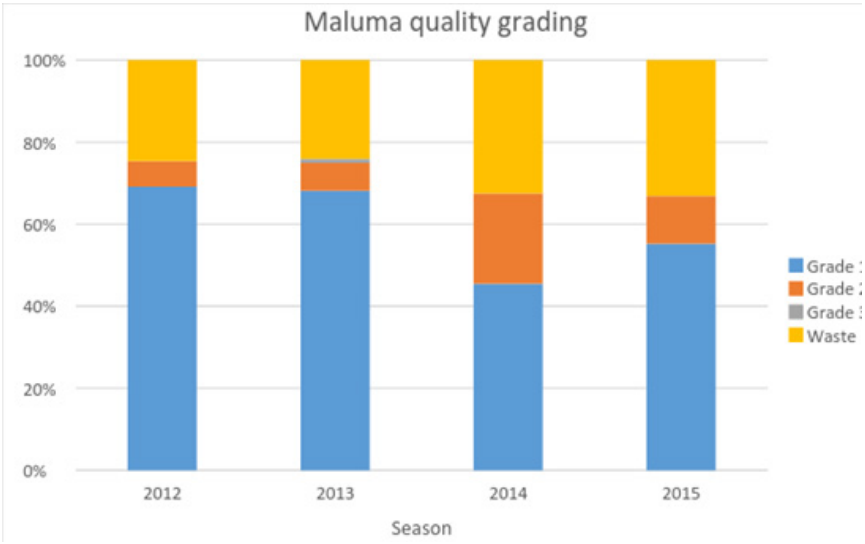

Figure 9. 'Maluma' quality grading per season

CONCLUSIONS

Analysis of the data shows that 'Maluma' presents significant economic advantages in comparison with 'Hass'. Evidence exists that 'Maluma' is highly tolerant of orchard frost. This presents a major advantage to producers who utilize land where frost is prevalent. It may even open up possibilities to utilize land that could not previously be utilized for this reason.

'Maluma' is significantly less susceptible to seasonal variation in production when compared to 'Hass', even where plant growth regulators might be used on 'Hass' to lessen the variability from one season to the next. Less variability from one season to the next translates into less uncertainty and enables the producer to budget more accurately as well as providing a more steady income stream in the medium term.

Harvesting avocados remains a labour intensive practice even where mechanisation has been introduced. The fact that 'Maluma' fruit can be harvested more efficiently and with less cost per unit harvested is a significant economic advantage.

Due to the fact that an individual producer is not able to influence price, the best mechanism a producer has to maximise income is to maximise production. However, maximising tonnage per hectare is only a starting point and care must be taken to produce optimal fruit size and quality in order to maximise income per hectare. It has been shown that 'Maluma' produces fruit of the appropriate sizes where prices are highest. 'Maluma' also delivers a higher proportion premium quality fruit when compared to 'Hass'.

It is clear that 'Maluma's' economic advantage lies in its ability to provide consistently good yields of avocado fruit, cost effectively, with the largest proportion of the fruit having the optimal characteristics required by the market. Therefor it is concluded that 'Maluma's' economic advantages establishes it not merely as a viable commercial cultivar, but an attractive one for the entire value chain.

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