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The macadamia benchmarking project (MC15005) is a joint initiative of the Queensland Department of Agriculture and Fisheries, the University of Southern Queensland and NSW Department of Primary Industries, with support from the Australian Macadamia Society. The project has been funded by Horticulture Innovation Australia Limited using the macadamia levy and funds from the Australian Government. The Queensland Government has also co-funded the project through the Department of Agriculture and Fisheries.

PERFORMANCE OF THE TOP 5% OF FARMS

Improving productivity has been a key focus for the Australian macadamia industry in recent years. Analysis of the top performing farms is useful, not only to understand what is achievable, but also to try to identify what factors drive high productivity.

Production and quality data has been collected for the last eight seasons as part of the industry benchmarking project. Cost data has also been collected for the last four seasons. The data sample includes all major production regions, irrigated and non-irrigated farms, trees aged from one to 46 years and farm sizes from less than 2 ha to more than 400 ha. The benchmarking team has been investigating farms that have achieved high average productivity over many seasons. This article compares the performance of those farms with the wider benchmark pool.

Understanding production variability

Productivity varies significantly within the benchmark sample, between both farms and seasons. When looking at mature farms in the sample (older than 10 years) over the last eight seasons, commonly the variation observed for any given farm was around 28% of its average production. In other words, a farm with average seasonal production of 100 t of nut-in-shell was likely to see that production range from 86 to 114 t over those seasons.

Severe weather events such as storms, cyclones and droughts certainly affect production in specific seasons. Other climatic conditions such as wet weather at flowering and dry weather during critical oil accumulation stages of nut development have also significantly affected productivity in some regions and seasons. Other factors such as seasonal pest pressure, canopy management and changes to nutrition or orchard floor management also influence seasonal productivity. While there are many instances of outstanding farm productivity in particular seasons, the influence of factors such as these mean that consistent productivity over multiple seasons is far less common, even among farms with high average productivity.

Productivity also varies significantly between mature farms in any given season. For example, in 2016 nut-in-shell production for mature farms in the benchmark sample ranged from less than 1 t/ha to more than 6 t per bearing hectare. This range in productivity varies according to season and production region. Average farm productivity has varied less in the Central Queensland region, for example, than in all other production regions over the last eight seasons.

Given this variability between farms and seasons, what do the top performing farms look like and how are they performing in relation to the industry average? The following figures compare seasonal results for the top 5% of farms in the benchmark sample with the middle 50% of mature farms in the sample. To minimise the impact of seasonal variation, these groups are based on average farm productivity of saleable kernel per bearing hectare over at least four seasons. The top 5% therefore comprises 14 farms tracked over a number of seasons. Each season of data for a single farm is referred to as a farm year. The top 5% is based on 95 farm years. The middle 50% of farms comprise 120 farms tracked over multiple seasons for a total of 744 farm years.

What do the top performing farms look like?

Figure 1 shows the distribution of the top 5% of farms by region, farm size and tree age. More than 60% of the top performing farms were located in the Northern Rivers region of NSW compared with 54% for the middle 50%. Twenty-nine per cent of top performing farms were in South-East Queensland, divided equally between Gympie and Glasshouse Mountains. The Mid North Coast region of NSW represented 7% of the top performing farms.

There were no farms from the Central Queensland region in the top 5% although the average age of farms in this region is substantially lower than other production regions. Given the relatively high productivity of farms in this region in recent years it is foreseeable that it will be represented in the top 5% in the future.

The average farm size for the top 5% was 16 ha compared to 44 ha for the middle 50%. As many of the larger farms in the benchmark sample are from the younger Central Queensland region, a lot of these are yet to reach their full bearing potential. There is no significant difference in average planting density between the top 5% (305 trees per hectare) and the middle 50% (318 trees per hectare).

The average tree age of the top 5% (20 years) was very similar to that of the middle 50% (19 years).

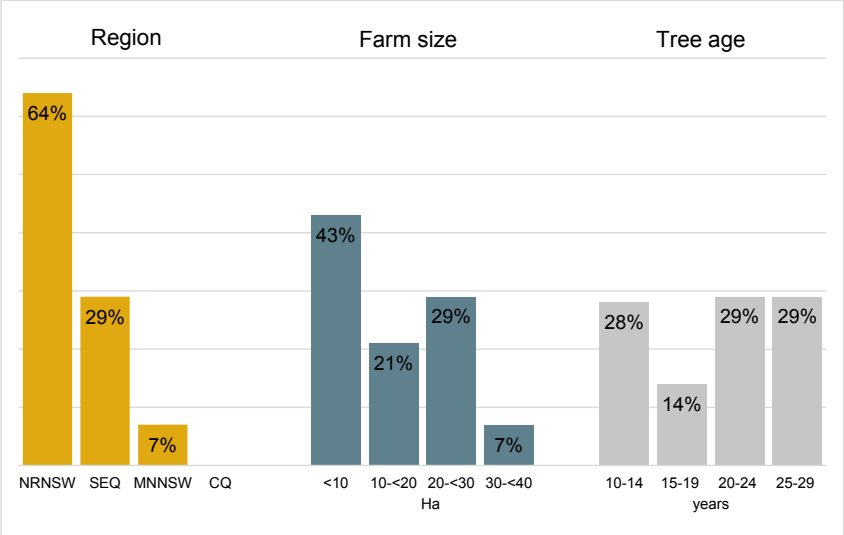

Figure 1. *Distribution of the top 5% of farms by region, farm size and weighted average tree age.*

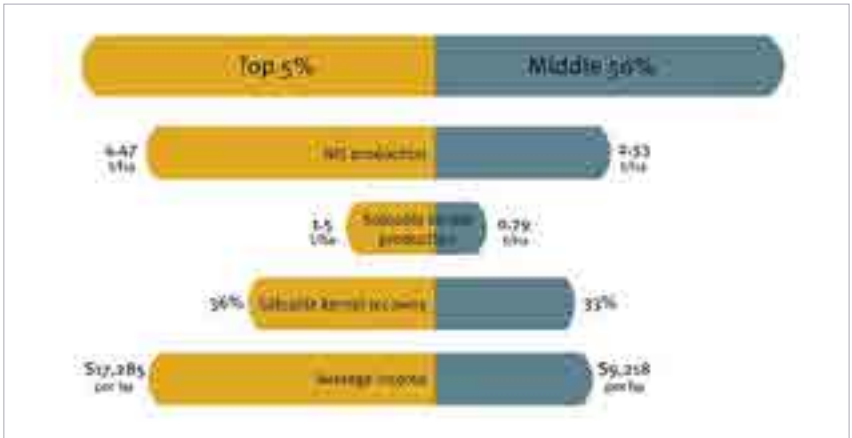

Figure 2. *Production, quality and income for top 5% farms compared to middle 50% farms*

Comparison of farm performance

Figure 2 shows average productivity, quality and income for the top 5% of farms compared with the middle 50%. Average nut-in-shell production per bearing hectare for the top 5% was 77% higher than the middle 50% for the 2009 to 2016 seasons. Average saleable kernel production was 90% higher than the middle 50% for the same period.

The top 5% of farms achieved approximately 3% higher average saleable kernel recovery than the middle 50%. The top 5% also averaged a lower reject kernel recovery (2.1%) compared with the middle 50% (2.8%).

The comparison of average income per hectare is based on average annual nut-in-shell prices from 2009 to 2016. The top 5% of farms achieved much higher average income per hectare, mainly because of their higher average productivity. The combination of increased yield and kernel recovery among the top 5% equates to a difference of more than $8000/ha in average annual income when compared with the middle 50%.

Figure 3 shows annual saleable kernel production for the top 5% and middle 50% of farms. Seasonal production trends are similar for both groups of farms. The obvious difference is that the top 5% have much higher average margins, which provide a buffer in challenging seasons. Even in the 2013, season when average productivity fell sharply, the top performing farms still averaged well above even the most productive seasons for the middle 50%.

Figures 4 and 5 show the difference between the top 5% and the middle 50% for saleable and reject kernel recovery respectively. The top performing farms have a higher average saleable kernel recovery than the middle 50%. Seasonal variation in average saleable kernel recovery is also lower among the top performing farms than the middle 50%.

Average reject kernel recovery for top performing farms from 2009 to 2016 was 0.6% lower than the middle 50%. The large variation between the two groups in 2011 was caused by brown centres (or internal discolouration), which mainly affected farms in the middle 50%. Despite a major spike in rejects in 2013, the average for the top 5% remained well below the middle 50%.

Farms in the top 5% had lower levels of reject kernel in all categories except germination. The most notable differences between the top farms and the middle 50% were in immaturity and internal discolouration.

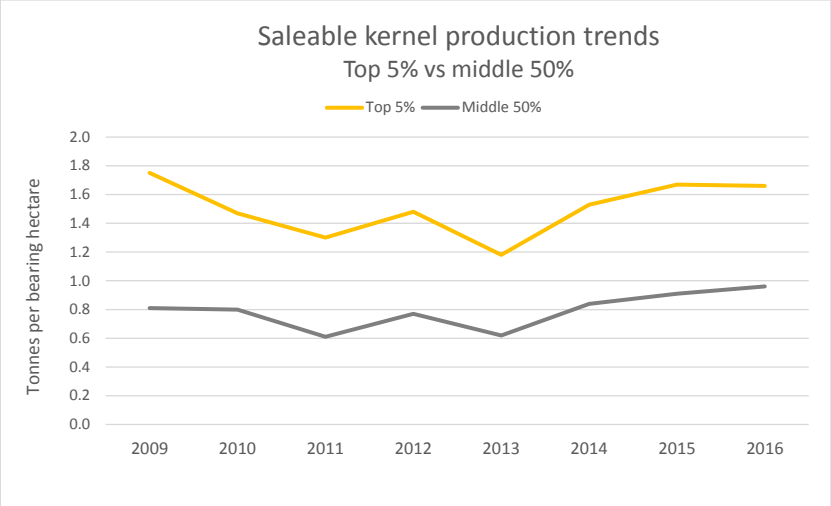

Figure 3. *Saleable kernel production for the top 5% and middle 50%.*

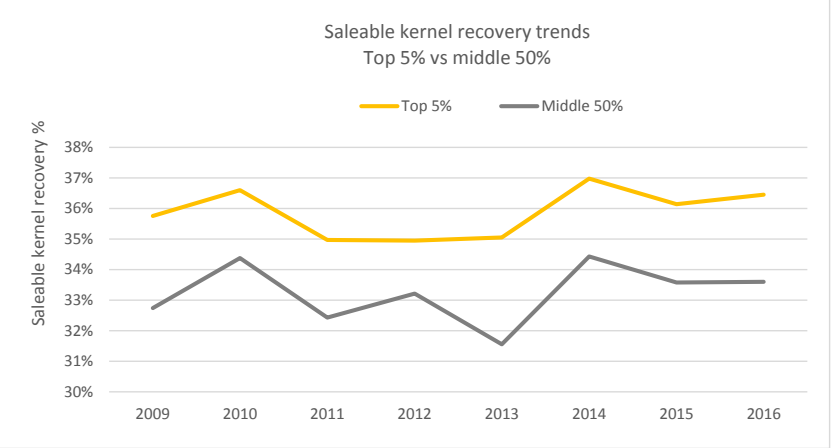

Figure 4. *Saleable kernel recovery for the top 5% and middle 50%.*

THE DATA ALSO SHOWS THAT TOP PERFORMING FARMS ARE ABLE TO REMAIN PROFITABLE IN THE LONG TERM, REGARDLESS OF CLIMATIC OR OTHER SEASONAL INFLUENCES.

What is the impact on profitability?

Figure 6 shows average annual gross margins per hectare for the top 5% compared with the middle 50%. Gross margin is a profitability measure that is based on the difference between income and costs. The revenue in the following gross margins are based on average annual nut-in-shell prices. Costs are based on a single average annual figure of $5,980/ha, which represents the average cost for mature farms in the benchmark sample between 2013 and 2016.

As seen in previous figures, the most obvious difference between the top 5% and the middle 50% is evident in their margins. Even in the most challenging seasons such as 2009, 2011 and 2013, the top 5% of farms remained profitable.

What does it mean?

The data suggests that there is potential to raise average farm productivity across the industry. This is further supported by growers who have experienced sustained yield gains through orchard rejuvenation and management changes in recent years.

The data also shows that top performing farms are able to remain profitable in the long term, regardless of climatic or other seasonal influences. Given that these top performing farms span a range of regions, tree ages and farm sizes, it's likely that their productivity is determined by a range of other factors.

Current industry initiatives and case studies are looking more closely at specific farm management practices and their impact on productivity. The benchmarking team is also investigating collection of additional agronomic and economic data to provide further understanding of the drivers of high farm productivity.

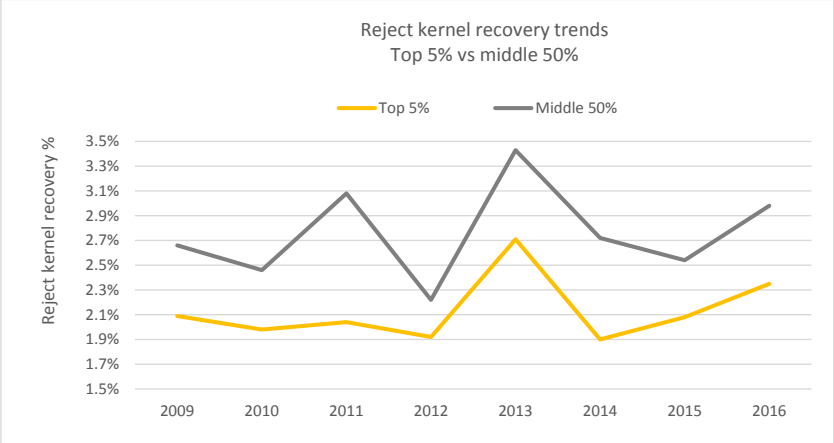

Figure 5. *Reject kernel recovery for the top 5% and middle 50%.*

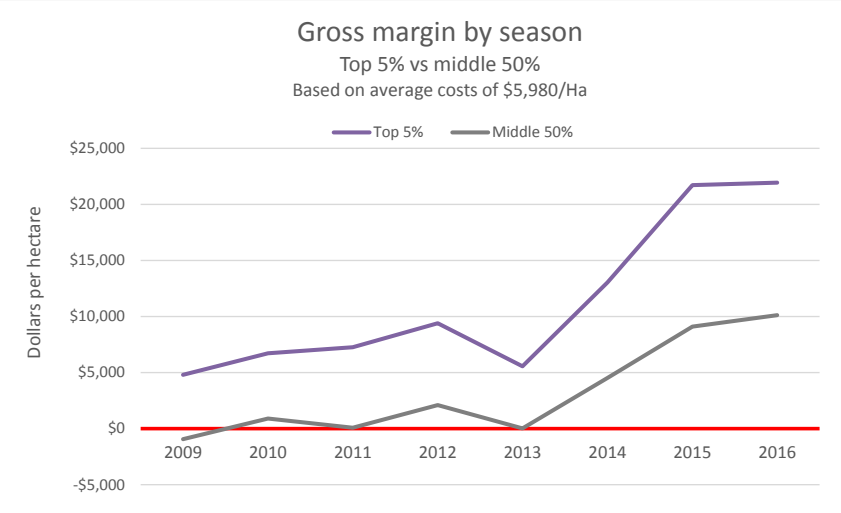

Figure 6. *Gross margin for top 5% farms and middle 50% farms.*

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