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Economic Analysis of the Australian Turfgrass Industry[1]

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Abstract

Little information exists on the size, scope, and structure of the Australian turfgrass industry. As a result, a national survey of the turfgrass industry was undertaken in fiscal year 2006. Seventy-nine usable questionnaires were returned, representing a 36 percent response rate. For analytical purposes, farms were grouped by size (hectares): small (0–25 ha), medium (26–50 ha), and large (51–220 ha). Collected data fell under five topic areas: (1) Production and Harvesting; (2) Labor and Water; (3) Financial Information; (4)Harvesting Methods, Markets, and Transportation; and (5) Firm and Industry Problems.

An estimated total of 4,918 hectares (ha) of turfgrass was under production in 2006, of which roughly three-quarters (3,734 ha) was harvested. Small-, medium- and large-sized farms contributed 32, 28, and 40 percent, respectively, of total production. Warm season grasses accounted for 85 percent of all grasses grown in 2006. A reported 671 hectares of cool season grasses were grown, representing 13.6 percent of total warm and cool season production. Total value of turfgrass in production in 2006 was estimated in Australian dollars (A$) to be A$235.7 million (M). Buffalograss (A$94.7 M), couchgrass (A$67.1 M), and tall fescue (A$31.7 M) were the top three grasses in terms of value. Value per hectare of grass sold ranged from a high of A$70,415 for buffalograss to a low of A$32,485 for kikuyugrass.

Approximately 1,321 people were employed by the turfgrass industry in 2006, including 857 full-time, 348 part-time, and 116 seasonal workers. Employed full-time workers averaged 1.9 workers

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for small-sized farms, 6.4 workers for medium-sized farms, and 18.1 workers for large-sized farms. Of the survey respondents, 80 percent indicated that the supply of labor was adequate and 85 percent indicated that irrigation water was sufficient. The average amount of water applied per hectare was 6.5 megalitres (ML) while total water used was estimated at 34,668 megalitres. Returns per megalitre of water used for turfgrass irrigation averaged A$7,480 in 2006.

On the income side, turfgrass producers were found to be quite diversified. Forty-three percent of revenues were derived from turfgrass sales, 27 percent from turf-related services, 17 percent from food production, and 13 percent from "other" sources. For turfgrass, annual sales averaged A$1.79 M for all producers. The average revenue generated by small-, medium-, and large-sized farms was A$305,288; A$1.3 M; and A$3.8 M, respectively. Wages and salaries comprised the dominant share (41%) of total expenses, followed by production-related activities (36%), administration (15%), contracting (5%), and landscape services (3%).

More sod (36%) was harvested in spring and early summer than at other times of the year. The vast majority (68%) was harvested using semi-automatic equipment, 28 percent was harvested manually, and only four percent was harvested using fully automated equipment. Nearly half (45%) of all sod was transported within a 50 kilometer (km) radius; just over one-fourth (28%) was transported 50–100 km and another 17 percent went 100–200 km. Homeowners were the largest market segment (35%) served by producers, followed by landscape services (20%), developers (18%), and garden centers (11%).

When asked to identify the most important problems facing survey participants as a business, water (34%) and financial (32%) concerns were dominant. Lesser concerns were labor, production problems, regulatory issues, marketing, and lack of grades and standards. Industry-level worries focused primarily on the future access to water (45%). Financial issues (16%), lack of effective marketing to educate the public (14%), and prohibitive regulations (14%) were also important issues.

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Introduction

Sod production in Australia encompasses the production and maintenance of specialized grasses and other ground covers required in the development and management of facilities for activities that include sports, landscaping, home gardens, and recreational purposes. The industry encompasses not only turfgrass production and sales, but also its related products and services in the domestic marketplace.

Detailed industry statistics specifically on the sod industry are not readily available. While the Australian States of Queensland, Western Australia, and New South Wales have carried out broad turf and amenity horticultural industry surveys over the past few years, only a few surveys have been carried out on individual sports that use grasses. In 1996, McIver estimated that there were 1,500 golf courses, covering 48,000 hectares and employing 6,500 maintenance staff, and about 2,000 lawn bowling clubs, employing 3,000 green keepers to maintain 3,200 greens and over 5,000 hectares of sporting fields over Australia's 748 city and shire councils, summing to over 10,000 prepared turf surfaces in Australia. Results indicate that there is the equivalent of one hectare of sports turf per 100 Australians (Aldous 1999), which equates favorably with 85 New Zealanders, 500 Americans, and 769 Britons

(McLaughlin 1994). McIver (1996) also estimated that there were 200 turfgrass sod primary production farms and over 5,000 hectares in Australia. In the same year, Martin and Aragao estimated the market value of the sod production industry in eastern Australia to be in excess of A$100 million per annum, with smaller numbers of sod farms found in Tasmania, South Australia, and Western Australia.

Recent Australian Bureau of Statistics figures (ABS 1998) estimate that the area of Australian turf (also known as sod) production is 6,400 hectares and produces some 63 million m^2 of turf. On average, if the turf crop were cut three times every two years, there would be a yield of some 190 m^2 of turf over that two-year period. The percentage of turf production on a State and Territory basis ranges from 40 percent in New South Wales to 18.5 percent each in Queensland and Victoria, 10.5 percent in Western Australia, 8.0 percent in South Australia, 3.5 percent in Tasmania, and 1.0 percent in both the Northern Territory and the Australian Capital Territory (2006).

In 1998, ABS figures estimated that there were 420 sod farms, with farm gate sales at A$380 million per annum. Since only 100 of these farms were members of the Turfgrass Producers of Australia Ltd., it suggests that turf production in Australia could be as high as A$450 million per annum. Individual components of the industry, such as turf maintenance, which has been estimated at over A$500 million per annum and the turf machinery market at approximately A$70 million, also contribute significantly. Sales of turf, turf maintenance, and related products and services in Australia have been valued at around A$1 billion per annum (with production valued at A$300–$350 million and the balance being turf maintenance and related services). According to Aldous (2005), the Australian turf grass industry could well cover 1.1 million hectares, contribute A$5.0 billion in maintenance costs, and employ 80,000 people. In addition, an estimated A$3.5 billion may be spent on turf-related businesses and services, A$104 million on turfgrass sod, and A$100 million on turfgrass seed, with an estimated annual payroll of over A$300 million going back into the economy. Currently, there is little basic economic information on such issues as the size, structure, and cultural practices associated with the Australian turfgrass industry, with many figures yet to be collected or currently imbedded in the statistics of the wider horticulture industry.

Based on previous estimates from the sources cited above, it is difficult to arrive at a firm conclusion regarding the actual size and structure of the Australian turfgrass industry. To date, no single study has actually surveyed the industry to quantify these statistics. Rather, secondary data were used to project estimates. The aim of this project is to provide primary data through a formal survey process to estimate as reliably as possible the economic and agronomic characteristics of this industry.

The study has three major objectives. The first objective will provide industry benchmarks on turf production and marketing that will allow Australia's turf producers to compare their individual operations with that of other firms. Variables examined include the number of hectares in production, number of employees, major grasses grown, production practices, harvesting methods, and marketing channels. The second objective will determine financial costs and returns of turfgrass producers. Each existing firm can compare its financial performance with other like firms. New firms seeking to enter the turf business will have concrete information to assess the viability of such an investment. Similarly, the various trade associations can develop educational materials and programs to improve their members' financial performances. The third objective will identify research priorities for the turf grass industry. Given limited funding resources, producers can still identify which issues are most pressing and where scarce resources should be directed to maximize returns to the industry. Identifying and verifying research priorities will benefit producers, allied firms, and trade organizations that provide member services.

Materials and Methods

A two-phased approach to implementing the economic analysis of the Australian turfgrass industry was employed. In Phase 1, researchers conducted listening sessions with a representative sample of producers and allied firms (roughly 6 to 12 people). The purpose of the sessions was to: (1)

obtain descriptive information on the turf industry, (2) review potential questions that would be investigated to achieve project objectives, and (3) utilize knowledge gained from the sessions to develop the survey instrument. When feasible, farm visits were included with the listening sessions to observe the types of production, and cultural and management practices utilized by turfgrass producers.

The meetings began in August at the University of Melbourne's Burnley Campus in Richmond, Victoria. Discussions were held with turfgrass representatives from both Victoria and Tasmania. A second set of meetings coincided with the annual conference of the Turfgrass Producers Australia, Limited (TPA) and the Queensland Turfgrass Producers Association (QTPA) in September in Cairns, Queensland. By that time, a draft of a survey instrument had been developed and a group of about 12 producers from Queensland and New South Wales met with the researchers to review it. Based on their recommendations, changes were made to the questionnaire prior to a third round of meetings with growers in South Australia in October. Based on their suggestions, additional modifications were made. A fourth and final set of meetings occurred with eight growers from the Western Australia Turfgrass Producers Association (WATPA) in Perth later in October. Information acquired from this session was used to revise the survey instrument a final time. This version was later sent via electronic mail to representatives of each of the five states for pre-testing. No further suggestions were offered, so this became the final version of the questionnaire.

Since this was the first formal survey of the Australian turfgrass industry, one of the most important challenges was to acquire an accurate mailing list, which is a tedious process that will need to be updated on a regular basis if future surveys are anticipated. Population lists of turfgrass producers were eventually obtained from two primary sources: an address list provided by TPA in November 2006 and an electronic address version of producers by the Australian post in March 2007. The initial list from TPA, consisting of 588 business names, was used in the first mailing, sent in mid-November. Approximately 40 usable (completed) surveys were returned from this mailing. A second mailing was sent out in mid-January with an additional 39 usable surveys returned. The original TPA-provided list included many businesses that were not turf producers. Instead, they were ancillary businesses such as allied suppliers, or producers who were no longer in business. Finally, a fairly large number of surveys were returned with incorrect addresses, changed addresses, absent post office box numbers, or changed trade names. The second list acquired in March 2007 was used to compare with the TPA list, and through careful elimination of non-turfgrass producing firms, a final population list of 217 turfgrass producers was developed. Based on this new turfgrass producer list, population numbers and response rates by state are shown in Table 1.

Information collected from the survey was on a fiscal-year basis (July 1, 2005 through June 30, 2006) rather than a calendar year. This decision was based on the following rationale:

1. Farm financial records are based on a fiscal year, thus farmers would not need to make conversions across periods, thus minimizing response errors.

2. Water consumption records are also based on a fiscal year, and given water constraints in many parts of Australia, irrigation use is important to investigate.

3. Data collected would be more current by six months since the survey was initiated in late (November) 2006.

Since many production, cultural, and management decisions are affected by scale of operation, farms were grouped and analyzed according to size. A second reason for segregating by size was that it facilitated development of an “expansion factor” that is necessary for estimating total industry output from sample firms. The expansion factor is defined as the total population divided by the sample number; in this case, it was 217/79 = 2.746. However, this is an average number, and to improve accuracy, expansion factors were needed for each size class. To do so required selecting size parameters for small, medium, and large farms. Of those producers surveyed, sizes ranged from about

one-half hectare for the smallest operation to 220 hectares for the largest. Size parameters were selected based on the distribution of size across the survey sample (Table 2). Small-sized farms (0–25 ha) accounted for two-thirds of the respondents, medium-sized farms (26–50 ha) represented one-fifth, and the large-sized farms (51–220 ha) accounted for the remainder (14%).

Another step required projecting a size distribution for the estimated 217 firms in the industry. In agriculture, the larger farms typically represent the fewest in terms of numbers, but they account for the majority of output. Larger farms are also economically prominent in a given geographic area because of their size, and their owners tend to be more active politically in state and national trade organizations. Hence, the approximate numbers of large farms can be determined with a fair degree of confidence. The same cannot be said for small farms whose absence from a list compiled by government statistical agencies or trade organizations may not be so noticeable.

The authors assumed the percentage distribution of small-, medium-, and large-sized farms based on over 50 years of combined experience in agriculture and turfgrass, as well as specific information on the largest class of producers. As a result, percentages were modified slightly from the sample distribution. This is shown in the third and fourth columns in Table 2. Based on the authors' assumptions, small-sized farms would account for 75 percent of the population, medium-sized farms would be 17 percent, and large-sized farms would be 8 percent. From these percentages, the population of producers for each size is categorized as follows: small (217 x 0.75 = 163); medium (217 x 0.17 = 37); and large (217 x 0.8 = 17). From this information, the third and final step involved calculating expansion factors for each size group. Expansion factors were used to adjust hectares in production, hectares harvested, hectares not irrigated because of water restrictions, and industry employment. For instance, if the 52 small farms in our sample had 250 hectares of couchgrass, this was multiplied by 3.135, yielding 784 hectares, which would then also account for the 111 (163 minus 52) small-sized farms that were not included in the survey.

Results and Discussion

Part 1. Production and Harvesting

A total of 4,918 hectares of turfgrass were estimated to be in production in Australia in 2006. Small farms accounted for just under one-third (32%) of total production although, in terms of number of farms, they are assumed to comprise three-fourths of the industry population. Medium-sized farms accounted for 28 percent of total output while representing 17 percent of industry firms. The largest farms contributed 41 percent of output, yet constituted only 8 percent of all turfgrass producers. On average, small turfgrass farms comprised 9.6 hectares; medium-sized farms, 37.7 hectares; and large-sized farms, 115 hectares. Stated differently, the largest farms were three times the size of medium farms, and medium farms were four times larger than small farms. In terms of total harvesting, about 75 percent of the area under production was harvested and sold (Table 3). Medium-sized farms reported the highest harvest ratio (88%), followed by small-sized farm (80%) and large-sized farms (64%).

Trends

The figures in Table 3 are indicators of the size of the industry in 2006 but are not measures of how the industry may have changed over time — has it grown, shrunk, or remained static? To address this, producers were asked to indicate how their farms had changed in the past three years and what management decisions they anticipated in the next three years. Nearly two-thirds (61%) of all growers stated that they had increased production between 2003 and 2006, exactly one-third indicated there was no change, and only 6 percent said they had actually reduced production (Figure 1). From the 79 respondents, with a combined 2,369 hectares in production, this suggests the industry grew by nearly 500 hectares (488), or approximately 20 percent, during this period (Table 4).

In terms of the future, growers were slightly more conservative — 55 percent indicated that they would increase production, 38 percent said they would stay the same, and 7 percent claimed they would actually decrease production. Based on this information, area under production would expand by

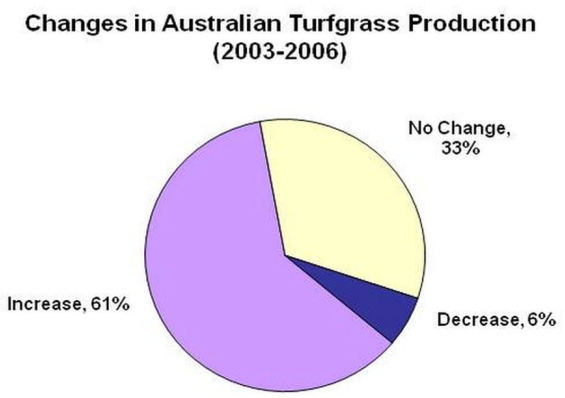

Figure 1. Percent of Australian turfgrass farms indicating type of change in area under production, 2003-2006.

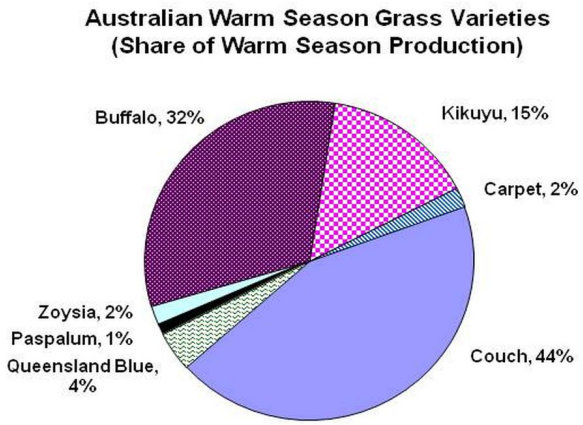

Figure 2. Percent share of warm season turfgrass varieties in production, Australia, 2006.

16 percent (390 hectares) in the next three years (Table 4). Interestingly, the smallest producers indicated the most aggressive growth (34 percent), which is over three times their 10 percent growth between 2003 and 2006. Conversely, the largest producers, who were the most aggressive in the past three years, were much more conservative in their outlook, with a modest anticipated 6 percent growth. In terms of changes in actual area, the average small farm expected to grow by 5 hectares, the average medium farm would add nearly 14 hectares, and the average large farm would increase by 20 hectares.

Grass Varieties

Warm season grasses accounted for roughly 85 percent of all grasses grown in Australia in 2006; cool season grasses, primarily blends, comprised the remaining 15 percent — in terms of both dollar value and area under production. The share of warm season grasses in terms of hectares grown is shown in Figure 2. The various couchgrass selections and hybrids (*Cynodon dactylon* x *C. transvaalensis*), which include Wintergreen, Greenlees Park, Wintergreen, Santa Ana, and Conquest, comprised 44 percent of the total acreage. Buffalograss (*Stenotaphrum secundatum*) comprised the second largest share, with nearly one-third (32%) of total production. Kikuyugrass (*Pennisetum clandestinum*) came in third with 15 percent, followed by Queensland blue couch (*Digitaria didactyla*), with 4 percent; zoysiagrass (*Zoysia* spp.) and carpetgrass (*Axonopus compressus*), with 2 percent each; and seashore paspalum (*Paspalum vaginatum*), with 1 percent.

A breakdown of both warm and cool season grasses in terms of area under production, turfgrass value, and farm size is shown in Table 5. Total value of turfgrass under production was estimated by taking the area under production and multiplying it times the price of the particular grass. Hence, this does not represent sales or revenues, but simply the value of the product in the field during 2006. Harvest value, which will be discussed later, will represent revenues generated by the industry.

An estimated total of 4,246 hectares of warm season grasses were grown in 2006. Couchgrass selections and hybrids were the most important in terms of area in production (1,844 ha), but had the second highest value (A$67.1 M). Buffalograss had 1,374 hectares in production, but was valued considerably more at A$94.7 M. This disparity is due to the average higher price received for buffalograss. Kikuyugrass was ranked third in both area (655 ha) and value (A$22.2 M). The remaining grasses were much less significant economically as is apparent in Figure 2. Combined, all warm season grasses in production were valued at A$200.9 M.

A total of 671 hectares of cool season blended grasses were produced in 2006, valued at A$34.8 M. Cool season blends represented 13.7 percent of total turfgrass production (warm and cool seasons) and 14.8 percent of total turfgrass value. Tall fescue (*Festuca arundinaceae***)** was the dominant cool season blend grown, with 91 percent share both in terms of area under production and value. Only 60 hectares of blends with Kentucky bluegrass (*Poa pratensis*) were

grown. Broken down by farm size for cool season grasses, the largest farms were responsible for over two-thirds (69%) of total production. Medium-sized farms produced 23 percent of the total, and small farms picked up the remaining 8 percent. Small-, medium-, and large-sized farms were responsible, respectively, for 32, 28, and 40 percent of the total area under production in 2006.

The estimated number of hectares that were harvested of both warm and cool season turfgrasses is shown in Table 6**.** Expanded values were derived by multiplying the data supplied by survey respondents by the appropriate expansion factor based on farm size. Prior to expansion, the reported harvest value (representing total sales) was A$85.4 M. The harvest value also accounts for the fact that some producers are able to obtain two harvests annually. For warm season grasses, couchgrass was the dominant variety in terms of area harvested (1,380 ha) but second in terms of total value (A$51.7 M). Buffalograss was second in area harvested, with 1,123 hectares, but first in terms of value (A$79.1 M). Kikuyugrass was third for both area harvested (555 ha) and value (A$18.0 M). Harvest ratios were calculated for warm season grasses by dividing area harvested by area in production. Harvest ratios are an efficiency indicator, with higher numbers implying more turfgrass harvested per area, further implying more revenues generated per hectare. For all turfgrass varieties, roughly 76 percent of the total area under production was harvested. Harvesting ratios ranged from a low of 73 percent for seashore paspalum to a high of 86 percent for Queensland blue couch.

Finally, comparisons of warm and cool season grasses in terms of harvest values per hectare are shown in Figure 3. As is evident from the figure, three revenue tiers stand out quite clearly. Buffalograss and seashore paspalum were in the highest tier, with revenues exceeding $60,000 per hectare. Zoysiagrass, Kentucky bluegrass, and tall fescue formed a second tier, with revenues in the $50,000 per hectare range. The remaining grasses comprised the third tier, with revenues in the mid-to-upper $30,000 per hectare range.

Value per hectare can also be assessed on a square meter basis by dividing by 10,000 m^2. These estimates represent average weighted prices for all producers responding to the survey. The average selling price per square meter of couchgrass was A$3.75; Queensland blue couch was A$4.26; seashore paspalum, A$6.21; zoysiagrass, A$5.66; buffalograss, A$7.04; kikuyugrass, A$3.25; carpetgrass, A$4.12; Kentucky bluegrass, A$4.80; and tall fescue, A$5.03.

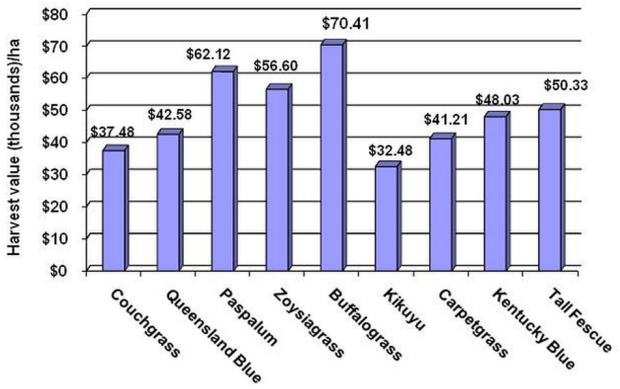

Figure 3. Average per hectare harvest value of warm and cool season grasses, Australia, 2006.

To put these values in perspective, it may be useful to compare them with their U.S. counterparts. The highest valued grasses (Buffalograss and Seashore paspalum) sold for roughly four to five times more per square meter than similar grasses in Florida. Why such a discrepancy? The traditional answer is supply and demand, reflecting different market conditions between the two countries. In 2003, Florida had about 125 producers with approximately 37,000 hectares in turf production (Haydu et al. 2005). This implies Florida's average turf farm was 300 hectares, which is 10 times larger than that of the average Australian producer. In addition, the 125 producers with their 37,000 hectares were located in an area one-third the size of Victoria. In contrast, the roughly 220 Australian producers with 2,000 hectares are scattered over an area the size of the United States. In other words, Florida's market is extremely competitive compared to that of Australia, hence the lower prices received by Florida producers. Ultimately, however, production costs must be compared to obtain a more accurate picture of the economics of turfgrass production between the two countries. In other words, higher dollar returns do not reflect *profitability*. Profits are the net figure

after total costs (direct plus indirect) have been deducted. Positive profits require that total revenues exceed total costs. Therefore, higher product prices in Australia do not necessarily imply greater profitability compared to Florida. Detailed information on total expenses per hectare would be necessary to determine that, which is beyond the scope of this report.

Part 2. Resources

Labor

For any agricultural producer, a major resource critical to running a successful business is an adequate supply of qualified labor. In societies with free market economies, labor is a mobile factor of production. As a mobile resource, labor will tend to be drawn to those industries offering the best compensation, including benefits, for a given set of skills. For many agricultural production firms, retaining an adequate labor pool is difficult because profit margins are often low compared to non-agricultural industries, such as building construction or manufacturing. As a result, many farm operations struggle to pay employees competitive wages and to retain qualified workers once hired.

The Australian turfgrass industry employed an estimated 1,321 people in 2006, including 857 full-time (65%), 348 part-time (26%), and 116 seasonal (9%) workers (Table 7). Of the total turfgrass workers, the small-size farms employed the most workers (40%), followed by large-size farms (33%) and medium-sized farms (27%). The average turfgrass producer employed 5.1 full-time workers, 1.9 part-time, and 0.7 seasonal workers. In terms of farm size comparisons, the average small farm employed 2.0 full-time workers, medium-sized farms employed just over 6.0, and large farms employed 18.0 full-time workers.

When asked if the supply of labor was adequate for their operation, 80 percent of producers indicated that it was (Figure 4), and this was true regardless of farm size. To have 20 percent state that labor was insufficient in 2006 is a sizable portion of the industry. To what extent this 20 percent was affected by a labor shortage is unknown. However, given the many labor-intensive tasks in turfgrass production, a shortage of labor would certainly have a negative impact, especially if it occurred during a peak demand period.

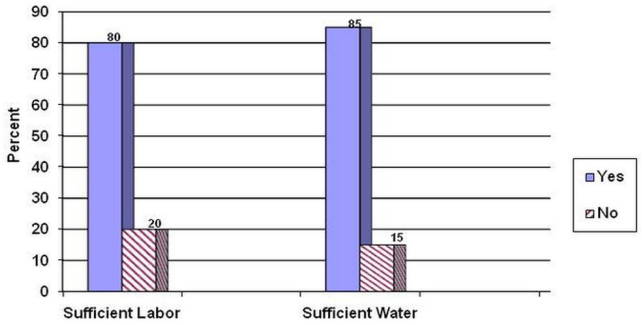

Figure 4. Percent of Australian turfgrass production indicating adequate labor and water resources, 2006.

Water

A second critical resource in Australia is water. Australia is the driest inhabited continent on Earth, averaging only 450 millimeters (mm) of precipitation annually. In addition, the continent is exposed to highly variable rainfall patterns. This variability means that Australian communities frequently face water supply and water quality problems (http://www.waterquality.crc.org.au/). The southern half of Australia experienced drought conditions during 2005–2006, the period in which this study was underway. Consequently, agriculture and all other industries that are large water consumers were competing for water and frequently had to justify its use. Large urban populations are also substantial users of water and these are given the highest priority when supplies become threatened, as occurred in southern Australia in 2006.

In the interviews just prior to the survey, many growers observed that if the drought did not lift soon, there would be serious consequences for the next season. Given the potential impacts of the 2005–2006 droughts, the survey asked producers whether water availability was an issue. Nearly all (85%) indicated that they had sufficient water for irrigation purposes. If producers indicated that water was inadequate, they were asked a follow-up question — how many hectares of turfgrass were not irrigated due to the shortage? Of the 15 percent of producers who were faced with shortages, a total of 625

hectares, representing 13 percent of industry output, was not irrigated. The majority of this acreage (344 ha) was on medium-sized farms. Assuming the non-irrigated acreage was not in production and an industry average gross return of A$48,621 per hectare, non-irrigated areas represent a loss of A$30.4 M in unsold product.

In terms of the types of irrigation water used in production, the majority of respondents indicated using water from multiple sources: surface water, well water, or reclaimed water. Surface water was the primary source, with two-thirds (67%) of all producers claiming to use it (Figure 5). Wells were the second most commonly used source at 44 percent, followed by reclaimed water at 6 percent. For those producers claiming to use a single source for irrigation water, just over half (52%) used surface water, 30 percent used water from wells, and 3 percent used reclaimed water.

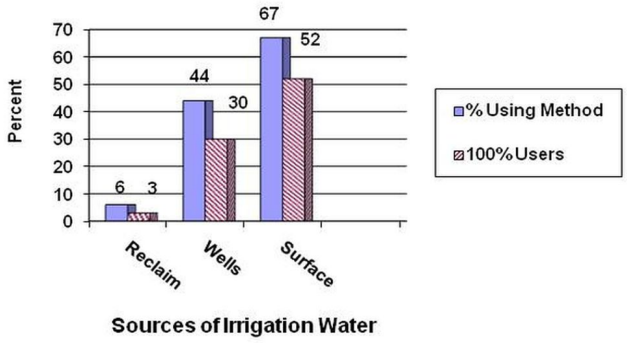

Figure 5. Percent of Australian turfgrass producers using reclaimed water, wells, and surface water, and percent of all producers using a single source for irrigation water, 2006.

Just under half of all producers (48%) had water-monitoring devices on their irrigation equipment (Table 8). The largest producers were most likely to monitor their water use (73%), medium-sized producers the least (37%), and smallest producers somewhere in the middle (44%). Interestingly, roughly one-half of those producers who indicated that they did not have monitoring devices still tracked how much water they were applying. Average annual water use for all turfgrass producers on a per hectare basis was 6.5 megalitres (ML). The smallest producer category applied the least (5.7 ML), medium-sized producers applied the most (8.8 ML), and the largest producers were somewhere in the middle (7.1 ML). In total, the turfgrass industry applied an estimated 34,668 ML of water in 2006. Small-sized farms applied 9,035 ML (26%), medium-sized farms used 12,153 ML (35%), and the large-sized farms applied 13,480 ML, which was 39 percent of all the water used.

Returns per Megalitres (ML) of Water Used

Using the average revenue generated by all grass varieties (A$48,621 per hectare) and dividing this by the average water application of 6.5 megalitres, this calculates to A$7,480 (gross returns) per megalitre of water used in turfgrass production. Again, using the 6.5 megalitre average, returns per megalitre would range from a low of A$5,277 per megalitre for kikuyugrass to a high of A$10,600 per megalitre for buffalograss, assuming that water use is equal for all grasses. How these figures compare to other segments of Australian agriculture would be an interesting inquiry, and would probably be quite favorable to the turfgrass industry.

Part 3. Financial Information

Income

Acquiring financial data from commercial businesses can be difficult because of its inherently sensitive nature. Revealing financial information can expose a firm's strengths and weaknesses to competitors. This protective behavior is also true for agricultural producers in general and turfgrass producers in particular. As a result, two different approaches were used to estimate annual revenue, which provides a check on the accuracy of the financial data. If both estimates are close to one another, then there is a strong likelihood that they are close to the real number, whereas if the estimates diverge considerably, then there is less of a chance that the numbers are reliable. The first method used was a more indirect approach that utilized harvest area in conjunction with the turfgrass prices. Turfgrass is generally not harvested until a transaction with a buyer has been made. This practice is necessary because of the highly perishable nature of turfgrass — once cut, it must be moved within a couple of days. Consequently, the harvested area of a grass variety multiplied by its price should be a good indicator of sales revenues. The total sales calculated

using this approach (A$85.4 M) were determined (results not shown) prior to expanding the data and reporting it in Part 1.

The second approach offered a range of sales categories from which the producers selected the closest match. In this study, a total of 11 ranges were given:

1. Less than A$50,000.
2. A$50,000 – $99,999.
3. A$100,000 – $249,999.
4. A$250,000 – $499,999.
5. A$500,000 – $999,999.
6. A$1,000,000 – $1,999,999.
7. A$2,000,000 – $3,999,999.
8. A$4,000,000 – $5,999,999.
9. A$6,000,000 – $7,999,999.
10. A$8,000,000 – $10,000,000.
11. More than A$10 million.

For the analysis, the mid-range of each category was chosen and this number was multiplied by the number of producers in that category. The expectation is that firm revenues will vary randomly above or below the mid-range so that the estimate closely approximates actual sales for the group. Results of this analysis are shown in Table 9 and total annual sales using this method (A$78.1M) is 91.5 percent of that found utilizing the first approach (A$85.4M). The fact that the results of the two approaches are close provides assurance that revenue estimates are reflective of actual revenues.

It is important to note that the numbers in Table 9 do not represent the entire industry, but only those firms surveyed. Expanded values were not included since this would require the assumption that turfgrass producers not included in the survey would indicate the same range of sales as the survey respondents — in our view, an unrealistic assumption. Small firms with an average size of 9.6 hectares contributed A$15.8M, or 20 percent of the total. Average sales for this group were A$305,288, with sales per hectare averaging A$31,800. Medium-sized farms averaged 37.7 hectares in production area and generated A$20.2M, or 26 percent of the industry total. Average sales for this group were A$1.3M and sales per hectare were A$33,589, slightly higher than the averages for the small-sized group. The large-sized farm group averaged 115 hectares, contributed A$42M (54%), averaged A$3.8M in farm income, and generated A$33,149 per hectare.

The information discussed above addresses income derived solely from turfgrass sales; however, many farms have other sources of income as well (Figure 6). For the industry as a whole, the majority of income (77%) was derived from the production and sale of turfgrass, where 15 percent came from turf related services (transporting turfgrass, landscape installation and/or maintenance), 5 percent was derived from food production (vegetables, wheat, cattle, sheep, etc.), and 3 percent was from miscellaneous business activities. Examples of this last group include tree and landscape nurseries, flower production, truck driving, machinery rental, waste disposal, and seed and fertilizer sales.

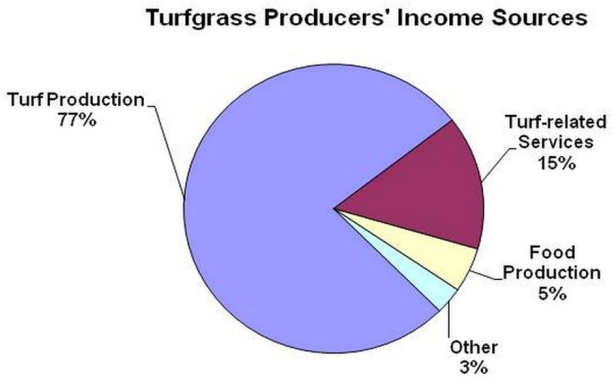

Figure 6. Average annual sources of income for Australian turfgrass producers, 2006.

In general, the Australian turfgrass industry is quite similar to its American counterpart in Florida in which sod production accounted for 73 percent of total income (Haydu et al. 2005).

Figure 7 provides more information on the distribution of income derived from turfgrass. Just over one-fourth (29%) of the producers responding to the survey concentrated on turfgrass as their sole

(100%) business activity. This compares to 46 percent for Florida growers. However, an additional 37 percent received 76–99 percent of their income from turfgrass and 15 percent received 51–75 percent. Therefore, nearly two-thirds of all growers obtained at least three-fourths of their total income from the production and sale of turfgrass.

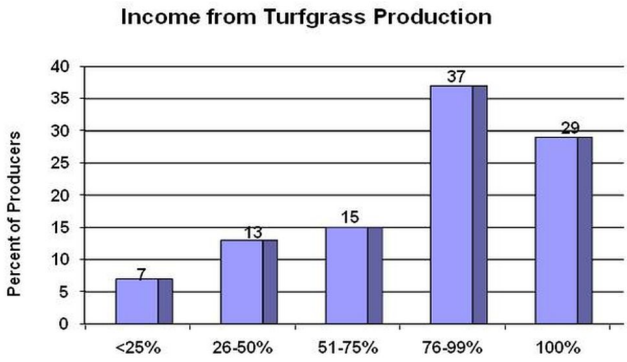

Figure 7. Share of Australian turfgrass producers' total income derived from turfgrass production, 2006.

Expenses

Keeping track of expenses is an essential part of operating a business. Monitoring expenses over time allows one to determine how effectively the business is being run. If costs are rising in one expense category, accurate accounting procedures will identify it and allow the manager to take appropriate action. Expenses must be kept in line with income, and in fact should be a major factor (along with other things such as the competitors' prices and product quality) in determining the right price to charge for a product or service. Unfortunately, agricultural producers frequently do not keep track of their expenses. As a result, those who do not could be selling their product below cost of production. In the long term, this practice is unsustainable and could eventually drive the business into bankruptcy. Selling below cost also disrupts other firms in the industry as they try to adjust to unprofitable price setting. Even a few producers behaving in this manner can make life difficult for everyone.

For turfgrass producers who keep track of their costs, it would be particularly helpful to know how their expenses compare with industry colleagues. For this reason, expense information was collected for presentation by major expense category in Figure 8.

These percentages represent averages for the turfgrass industry as a whole. These figures are for turfgrass production and ancillary activities that support the turfgrass business, such as administration, sales, and lawn care services, but do not represent other non-turfgrass related activities such as food production or nursery crop production.

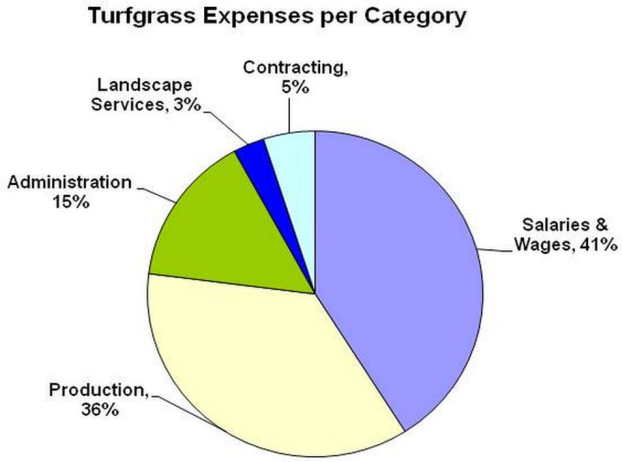

Figure 8. Share of expenses, by category, for Australian turfgrass producers, 2006.

Typically, labor is a significant business expense item. Knowing the true cost of labor is necessary for evaluating alternative production activities, providing fair compensation for labor performance, determining the appropriate level of automation, and evaluating the purchase of laborsaving equipment. Wages and salaries for the average turfgrass farm accounted for 41 percent of total costs, representing the single largest expense category.

A more comprehensive breakdown of expenses is shown in Table 10. Expenses are grouped under three main headings: (1) production-related activities; (2) administration, sales, and marketing; and (3) landscape services. The latter category was included because many producers also engage in landscape service activities such as design, installation, and maintenance. All three expense categories sum to 100 percent. It should also be noted that each of the three categories includes the salary of the manager or owner as well as labor costs associated with each respective activity. Hence, the sum of wages and salaries for all three categories represents the 41 percent shown in Figure 9.

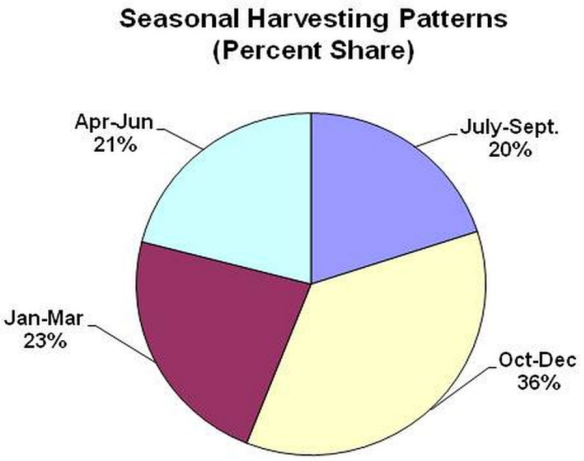

Figure 9. Seasonal harvesting patterns of Australian turfgrass, 2006.

"Growing Activities" comprised 11 separate expense items and accounted for nearly two-thirds (65.5%) of total business expenses. Salary expenses comprised 28 percent of total costs: almost 16 percent for employee salaries and 12 percent for manager/owner salaries. Production and harvesting expenses comprised about 45 percent of total costs. Royalties paid on turfgrass averaged 2.5 percent.

Administration, sales, and marketing accounted for nearly 28 percent of total costs. The largest single item (7%) was transporting the product to market (or the buyer). Combined wages and salaries were just over 9 percent while marketing and advertising were each just over 4 percent of total expenses. Finally, landscape services averaged 7.2 percent of total costs, with wages and salaries comprising 4 percent and landscape design and installation adding another 3 percent.

Part 4. Marketing and Distribution

Harvesting

Just-in-time harvesting of turfgrass usually coincides with warmer seasonal months, which also facilitates reestablishment in the landscape. Thirty-six percent of harvesting occurred in the spring and early summer months between October and December (Figure 9). Of course, given the large size of Australia, this would likely vary depending on a farm's location. Generally, warmer areas like Queensland and Western Australia would tend to have more uniform harvesting than other areas. Conversely, the more southern states, such as New South Wales, Victoria, Tasmania, and the lower parts of South Australia, would have a greater concentration of sales in the warmer months. For the remaining three periods of the year, harvesting hovered around 20 percent.

Information was also sought on the level of mechanization used in harvesting and stacking sod for transport (Table 11). Producers were asked if their harvesting procedures were fully automatic, semi-automatic, or manual. Fully automated systems have all functions controlled from the tractor seat. These tasks include automatic cutting and rolling, automatic cut-off length, and automatic net wrapping to reduce turf damage. Harvested rolls are then picked up with a tractor or forklift and loaded onto a truck for transport. Semi-automatic systems, such as turf slab harvesters, require some manual labor. The harvester automatically cuts the turfgrass and places it onto a conveyor belt that moves the turfgrass to the tractor's rear where it is then positioned on a pallet by a sod handler. For manual systems, the turfgrass is cut automatically by a harvester, but the sod remains in the field. Harvesting teams must then follow behind the harvester and stack the sod on pallets so that forklifts can place them on trucks for transport to market.

As a percent of total turfgrass harvested, very little (4%) was reported as harvested with fully automated systems. Just over two-thirds (68%) of all turfgrass was harvested using semi-automated systems, meaning a fair amount of human labor was employed in the process. Perhaps the single greatest use of labor would be stacking the sod on pallets once it has been harvested. Over one-fourth (28%) of all turfgrass was harvested using manual systems.

Even though fully automated systems were used minimally for harvesting, farm size analysis indicates that the medium-sized farms used these systems slightly more than smaller or larger farms did, 5.4 percent versus 2.4 and 3.9 percent, respectively. Over one-half of each farm size utilized semi-automatic systems, but the large majority (83%) of large farms used it, followed by two-thirds (66.8%) of the medium-sized farms. Overall, small-sized farms were

less capital intensive and relied much more (41%) on manual systems compared to the large-sized farms (13%).

Nearly all (96%) Australian producers harvest their own sod, with very little contracting occurring. Once it has been cut, 97 percent of producers indicated that the sod is sent to market the same day; an additional 19 percent transport it within 1 to 2 days, and only 5 percent wait more than two days. This practice of transporting sod soon after harvest indicates that producers are highly aware of the perishable nature of turfgrass as well as the importance that quality plays in retaining customer satisfaction.

Markets

Most markets were relatively close to producers — 45 percent of producers transport turfgrass less than 50 kilometers off-site and another 28 percent of producers transport turfgrass between 50 and 100 kilometers off-site (Figure 10). Stated differently, market outlets for nearly three-fourths of all turfgrass sold were located within a one-hour drive from the farm. An additional 17 percent was transported within a two-hour drive (100–200 km), and only 10 percent was transported beyond 200 kilometers. In terms of farm size, larger farms transported nearly two times as much sod over 200 kilometers than did small- or medium-sized growers. Similarly, the majority of small growers concentrated on the closest markets, with two-thirds (66%) of the sod being transported less than 50 kilometers, compared to roughly one-third (38%) for the largest sod farms. Regarding the practice of exporting turfgrass, 22 percent of growers indicated that they sold sod to out-of-state or international markets. Of those that did, export sales accounted for 11 percent of their total sales value.

What were the primary markets targeted by turfgrass producers? Interestingly, the most common market served was the homeowner — fully 35 percent of all turfgrass sold went directly to this group (Figure 11). Selling to the individual homeowners probably allows growers to extract higher prices since they are selling at the retail level, but at the same time, selling to homeowners raises transaction costs. The financial incentive to sell to homeowners must be ample or this market would not be served to the

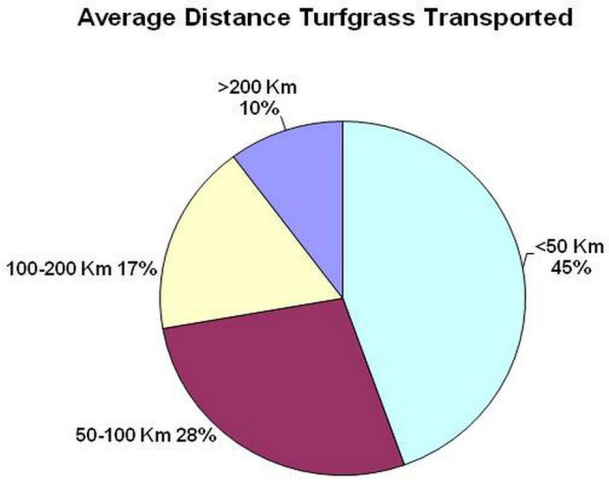

Figure 10. Percent of producers transporting turfgrass to various distances, Australia, 2006.

extent that it is. The second largest market was at the wholesale level to landscape installation or maintenance firms (20%), followed by commercial or residential developers (18%). Less significant were sales to retail garden centers (11%), other turfgrass farms (7%), golf or sports field venues (5%), and brokers (3%). Sales to other farms would probably arise when a producer fell short on an order and needed to supplement it.

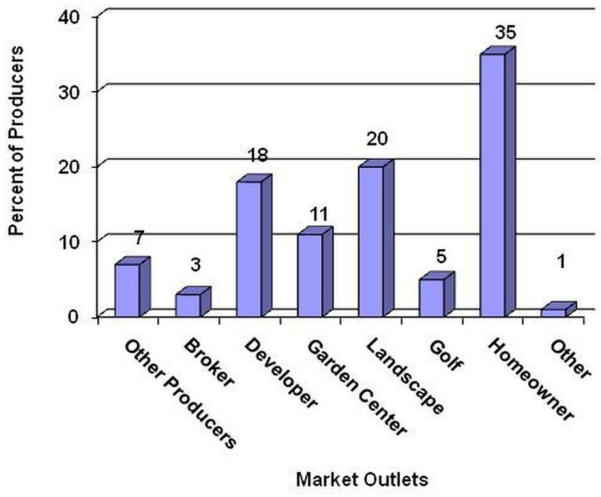

Figure 11. Market outlets utilized by Australian turfgrass producers, 2006.

Transportation

Transporting sod to market is a vital activity for the successful operation of a turfgrass business. Not only is it necessary to have access to trucking equipment, it is equally critical to ensure timely

delivery due to the highly perishable nature of sod. Both of these reasons help explain the high incidence of truck ownership — 87 percent of growers indicated that they owned their own transportation equipment. However, even for producers owning trucks, it may be necessary to hire additional equipment during peak demand. With this in mind, producers were asked if they encountered difficulty acquiring transportation equipment during certain times of the year. Forty percent of producers interviewed said that they experienced no problems in acquiring adequate transportation, 16 percent (one-in-six growers) indicated problems on a regular basis, and 44 percent indicated occasional problems. With 60 percent indicating some degree of difficulty, transportation is clearly an important issue, especially at certain times of the year.

During the listening sessions prior to the survey, growers were keen to know the extent to which producers factored in the cost of transportation in the price of sod. Consequently, respondents were asked specifically if they charged for transport and, if so, the price they charged for this service. The vast majority (82%) indicated they did charge for transportation, with an average price of A$0.64 per square meter (Figure 12). Fewer than one-in-five growers indicated transport charges were not included in the sales transaction. Figure 12 also shows the variability of transport charges based on farm size. There is a direct correlation between farm size and price per unit of sod. On average, larger farms charged more than smaller farms. This feature is probably because large-sized farms tended to transport products farther than smaller farms, as discussed earlier.

Finally, there was interest in determining where quality reducing damage to turfgrass was most likely to occur — in the field prior to harvest, during the harvesting process, during transporting and unloading, or after the buyer receives it. Overall, respondents felt damage occurs at all four stages. However, the producers responded that there was a slightly greater likelihood of damage (29%) occurring after the buyer receives it while the least damage (18%) takes place during transporting and unloading. Roughly, one-fourth of all damage was thought to transpire in the field (27%) as well as

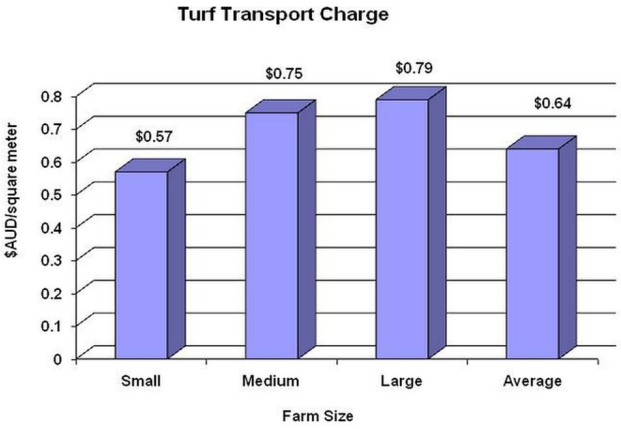

Figure 12. Average transportation charge per meter square of turfgrass, by farm size, Australia, 2006.

while harvesting (26%). Most of the damage occurred after leaving the farm, so there exists the need for preventative action once the product leaves the farm to reduce off-the-farm damage.

Price Setting

An interesting issue facing any producer is the price to charge for products. This is especially true for specialty products such as turfgrass for which there are no established or formal market price-setting mechanisms in place. Classical economics would say that the producer should charge “what the market will bear” (i.e., if the price is too high, prospective buyers will go elsewhere; if it is too low, the producer risks bankruptcy in the long term). Finding the “right” price may not be that simple. However, there are various strategies or guidelines that producers can use in their estimates. Respondents were asked to rank, in order of importance, the most important method employed to set prices for their products. Clearly, most producers use a combination of approaches. For instance, at 44 percent, the most common method used by turfgrass producers was “cost of production” (Figure 13). This is a common sense approach since selling below cost is not profitable; at the same time, how much above cost of production can one sell? At 28 percent, the second-ranked price-setting guideline was “selling price of competitors”. Quality of one's product was the third-ranked guideline, at 19 percent. A higher quality product implies a higher price, and vice-versa. Transportation cost was the fourth-ranked criteria (7%), followed by “availability” of the product

(supply and demand) in last place. If little product is available in the market, prices will be driven up by demand. If a surplus exists, prices will be driven down as producers try to reduce excess inventories. Clearly, when all these factors are used together as many producers do, the “correct price” for a given point in time may be found.

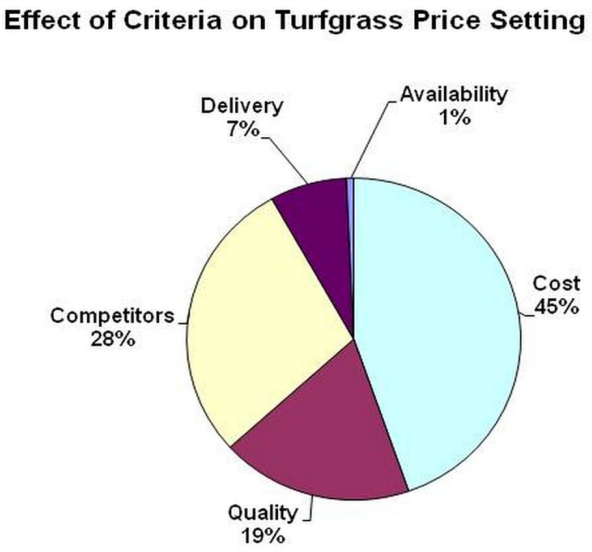

Figure 13. Percent of producers giving a number one rank to various criteria used in setting price of turfgrass, Australia, 2006.

Part 5. Firm and Industry Problems

In this section of the survey, producers were asked to identify the four most important problems facing them from an individual business standpoint as well as the four most challenging problems from an industry standpoint. Results were then grouped into categories that were representative of the types of answers. Seven broad areas affecting individual businesses were identified: water, financial, labor, production-related, regulatory, marketing, and grades and standards. Points were assigned to rank each area, with 4 points representing "most important" problem and 1 point representing "least important" problem. Points scored for each problem were then summed to provide a weighted ranking. Results were then converted to percentages, summing to 100 percent, and are shown in Figure 14.

For firm-level problems, two issues were of over-riding importance: water and finances. Water was the number one concern (32%) among turfgrass

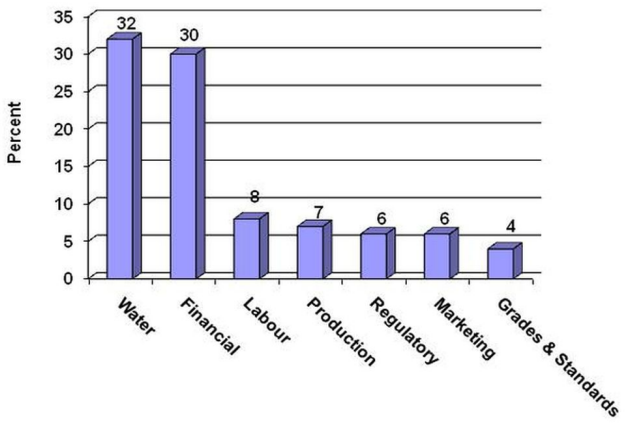

Figure 14. Weighted ranking of problems confronting Australian turfgrass producers, 2006.

producers. This is not surprising given that Australia has been in the midst of a prolonged drought, which persisted through 2006, coinciding with the time of the survey. Concern over water shortages was seen to affect both producers and consumers, the latter of which ultimately compounds producer problems. On the supply end, water shortages increase the risk that producers will be unable to irrigate their turfgrass adequately. Indeed, survey results indicated that 625 hectares valued at A$29.45 million were not irrigated in 2006 due to a lack of water. This represented 13 percent of total production. On the demand end, producers are concerned about the impact that water restrictions will have on homeowners. Southern portions of Australia have been under severe water restrictions that prevent homeowners in these areas from watering their lawns. Without water, lawns dry up, as does the demand for turfgrass. Producers rely on continued demand to sustain operations over time.

Financial concerns ranked very closely (30%) to water as a problem for turfgrass producers. These worries include high operating costs (e.g., labor, fuel, insurance, equipment, etc.) as well as over-production and competitive undercutting of prices. The combination of high costs and low prices imply negative pressures on profit margins.

A secondary tier of issues includes labor, production, regulatory, marketing, and grades and standards. Labor was ranked third (8%) and addressed inadequate supply of labor as well as insufficient skill levels of employees, including good business managers. Production-related concerns (7%)

include weeds and insect problems, maintaining quality, and providing the right grass varieties for the future. Regulatory issues (6%) include difficulties dealing with government agencies, loss of chemicals and fertilizers deemed unsafe for the environment, and taxes. Marketing concerns (6%) range from distribution and delivery problems to educating the public and government as to the benefits of turfgrass. Lack of industry grades and standards (4%) addressed the problems in controlling the quality of turf on the market.

Industry-level problems are shown in Figure 15. The categories identified for firms are the same as the industry because of the interrelated nature of the issues; however, their rankings generally differ from those of individual businesses. As is evident, the "problems" appear to consist of three distinct stratifications. The first is water, which is substantially more prominent (41% versus 32%) than it was for the average producer. Whereas some firms may not have felt personally threatened by water shortages, generally, firms did perceive it as a real threat to the long-term viability of the turfgrass industry. A second tier of industry problems included financial (15%), marketing (13%), and regulatory issues (12%). From an industry perspective, if individual firms struggle for financial solvency, depending on the scope of the problem, the turfgrass industry itself could be vulnerable. However, compared to water, this issue was not nearly so important. Regarding the nearly equal concerns with marketing and regulatory issues, many producers felt that the industry was not doing enough to promote the economic and environmental benefits of turfgrass. Producers felt that a lack of adequate and effective marketing and promotion was a reason for many of the regulatory restrictions affecting growers. Finally, the third tier consists of the lack of industry grades and standards (5%), production-related problems (4%), and competition (4%). Clearly, all three were considered rather minimal in their impact compared to other issues. Competition referred to "non-turfgrass industries" offering competing products such as artificial turf.

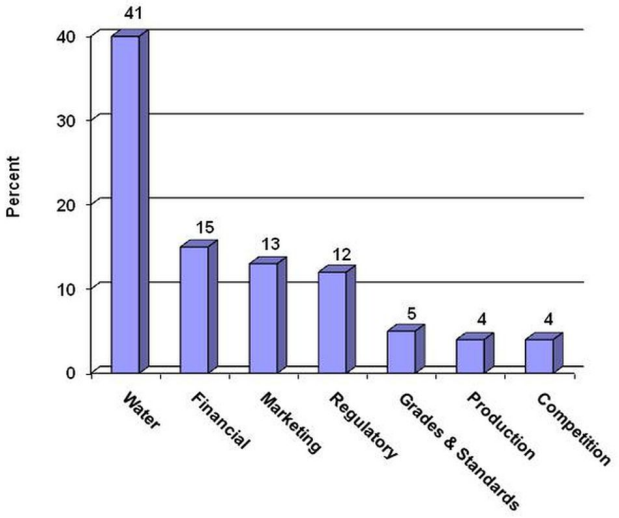

Figure 15. Weighted ranking of problems confronting the Australian turfgrass industry, 2006.

Recommendations

This survey was the first comprehensive study conducted on the Australian turfgrass industry. As such, it represents baseline information from which future studies can be compared. A second study should be implemented in roughly three years to follow up and measure trends. This study sought to address issues important to the turfgrass industry in 2006. However, priorities identified the study will likely be superseded by others in the near future (3 years). This study examined various characteristics of the turfgrass industry by sampling the population and extrapolating the data to represent the entire industry. However, there are difficulties in doing this. Survey methodologies are an art as much as a science. Surveys can be refined and improved over time if appropriate steps are taken. With this in mind, the following six recommendations are suggested.

1. *Plan and implement a follow-up study in 3 years.* The 2006 turfgrass study was essentially a snapshot of the industry at a point in time. While this is important because of the baseline data it provides, a second study will allow documentation in changes that have occurred over time. Trend analysis shows where the industry is headed and allows decision makers to develop proactive (as opposed to reactive) strategies to ensure the industry's long-term sustainability. Trend analysis answers such important questions as: Has the industry grown, remained stagnant, or declined? Where have

changes occurred? Why have changes occurred? What has happened to turfgrass markets and the prices that producers receive for their product? Which grass varieties have fared the best and the worst, and why? What has happened to the labor market for turfgrass? Is the turfgrass labor market adequate, or is it losing ground to competing industries?

2. *Update the population directory of turfgrass producers.* Perhaps the biggest challenge when conducting a study on an industry that has never before been surveyed is developing an accurate and comprehensive population address list. The initial address listing obtained for the 2006 survey was comprised of 588 businesses. After the first mailing, it became apparent that many in the directory were not turfgrass producers but allied firms such as hard goods suppliers or brokers. Eventually the address list was paired down to 217 businesses. The question, however, still remains — how accurate is the revised list? Although it was the best available at the time, it is unlikely that it was a complete listing. Many small-sized growers may not be included if they fell "under the radar screen" of Turfgrass Producers Australia (TPA) and government statistical agencies. In addition, over time, there are always businesses entering and exiting the industry. Consequently, the list needs to be modified and updated on a regular basis. TPA should direct resources to accomplish this objective.

3. *Modify and improve the survey instrument.* First, as noted above, issues important to an industry today will likely be different a few years from now. Consequently, the survey instrument (questionnaire) should be modified to reflect these changes in priorities. Second, many variables come into play that ultimately impact the reliability of results: a country's geography and variable climatic conditions impacting producers (hot versus cold regions, wet versus dry, etc.); the knowledge-base of researchers regarding cultural, financial, or technical terms used by producers; the relevance of the questions to achieving the goals of the survey; the degree to which producers trust the confidentiality agreement and are willing to participate; and the extent to which the industry understands the purpose and importance of the survey. [Note: Results of this initial study provided information on these three items that can be used to improve the questionnaire for the next round. Release of study results are anticipated to enhance participation for the next survey because producers will see that the study was confidential and that their participation in industry events can have tangible effects. These reasons prompt the next recommendation.]

4. *Disseminate results of the study to the turfgrass industry and beyond.* Information is useless if it is not used and it will not be used if it is not published and shared through various communication outlets. Results should be published in popular trade association magazines, including allied trade journals. TPA should invest in a tri-fold, color brochure that highlights key findings of the research, including the number of producers, types of grasses grown, number of employees supported by the industry, and the economic value of the turfgrass industry. These brochures should be distributed to potential investor groups, educators, and appropriate government agencies. Results should be disseminated at conferences via seminars and workshops to both the turf and allied industries.

5. *Utilize the study to reassess TPAs strategic plan and to educate members and non-members as to the benefits of participation*. Prior to this study, little comprehensive information on the turfgrass industry was available, or it was incomplete or perhaps even speculative. Results of this study provide concrete information, in four broad topic areas, that was not previously known. New knowledge places turfgrass industry leaders in a better position to identify, develop, and recommend strategic actions for the future. This should include a program targeting non-members with the critical objective of "growing the membership" base. A viable and unified trade association provides resources and leverage against competing organizations when necessary.

6. *Develop educational programs and materials focusing on key research results*. For instance, this study documented the extent to which

producers are concerned over water availability and financial sustainability. Clearly, these two issues are interrelated. Water shortages in a dry country with a crop that requires significant irrigation could push marginal producers into financial ruin. Water shortages affect producers not just on the production side, but also financially, as water prices increase. Given the likelihood of continued or even more restrictive regulations facing agriculture, educational materials that offer practical approaches to reducing risk should be developed. Important areas to address are production risk (including constraints to irrigation), financial risk, market or price risk, and human resource risk. For instance, producing more drought tolerant grasses and investing in more water-efficient irrigation systems would be useful in reducing production risk. Many farmers are highly prone to financial risk because the "economics of business" is normally low priority. Yet even simple steps, such as instituting a good record-keeping system, can pay huge dividends. Much like a doctor examines vital signs to determine our physical health, accurate record-keeping allows financial managers to assess a business health. Recommendations to improve a firm's health can be easily made once this information is known. The point is, as members become financially stronger, the association will become stronger and more able to assist its members in new and better ways.

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Table 1. Information on the Australian turfgrass industry, by population, size, state, and the number of survey responses, 2006.

State	Population Number	Responses	Response Rate
	(number)	(number)	(percent)
Western Australia	37	10	27
South Asustralia	13	1	8
Queensland & ACT	63	19	30
Victoria & Tasmania	11	8	73
New South Wales	93	22	24
Location Unknown*		19	
Total	217	79	36

* Nineteen returned and usalbe surveys could not be identified as to the resident state.
ACT = Australian Capital Territory

Table 2. Number and distribution of Australian turfgrass producers, by farm size, 2006.

Farm Size	Sample Farms	Share of Sample	Assumed Share	Assumed Population	Percent Response	Expansion Factor
	(number)	(percent)	(percent)	(number)	(percent)	(number)
Small (0–25 ha)	52	66	75	163	32	3.135
Medium (26–50 ha)	16	20	17	37	43	2.312
Large (51–220 ha)	11	14	8	17	64	1.545
Total	79	100	100	217	36	

Table 3. Distribution of turgrass area in production and area harvested, by farm size, Australia, 2006.

Farm Size	Production (ha)			Harvest (ha)	
	Total	Share	Average	Total	Ratio
	(number)	(percent)	(number)	(number)	(percent)
Small (0–25 ha)	1,566	32	9.6	1,258	80
Medium (26–50 ha)	1,394	28	37.7	1,230	88
Large (51–220 ha)	1,957	40	115.2	1,247	64
Total	4,918	100	30.0	3,734	76

(ha) = hectares

Table 4. Change in turfgrass production area in past three years and anticipated change in next three years, Australia, 2006.

Farm Size	Change, 2003–2006			Change, 2007–2010		
	Total Hectares	Percent	Average Hectares	Total Hectares	Percent	Average Hectares
Small (0–25 ha)	51.7	10.4	1.4	170.6	34.2	5.1
Medium (26–50 ha)	105.1	17.4	10.7	137.1	22.7	13.7
Large (51–220 ha)	331.2	26.1	33.1	82.0	6.5	20.5
Total	488.0	20.6	8.7	389.7	16.4	8.3

Table 5. Turfgrass area in proudciton, by grass variety, Australia, 2006.

Grass Type	Farm Size			
	Small	Medium	Large	Total
	Total Hectares			
Warm Season				
Couchgrass	589	527	727	1,844
Queensland Blue	112	58	14	184
Seashore Paspalum	1	0	17	18
Zoysiagrass	11	29	52	92
Buffalograss	538	338	498	1,374
Kikuyugrass	242	286	128	655
Carpetgrass	18	0	60	79
Warm Season Total	1,511	1,239	1,496	4,246
Cool Season				
Ketucky Bluegrass	17	27	16	60
Tall Fescue	38	129	445	611
Cool Season Total	54	156	461	671
Total	1,566	1,395	1,957	4,917

Table 6. Estimated number of hectares harvested and value of turfgrass, grass variety, Australia, 2006.

Grass Type	Small Farm		Medium Farms		Large Farms		Total Farms	
	Hectares	Value	Hectares	Value	Hectares	Value	Hectares	Value
	Total	$000	Total	$00	Total	$000	Total	$000
Warm Season								
Couchgrass	528	17,562	399	15,197	453	18,844	1,380	51,703
Queensland Blue	103	4,745	44	1,607	10	371	158	6,722
Seashore Paspalum	0	32	0	0	13	787	13	819
Zoysiagrass	6	631	27	1,364	37	1,954	70	3,949
Buffalograss	394	28,336	350	25,354	380	25,410	1,123	79,100
Kikuyugrass	181	5,737	289	9,408	85	2,895	555	18,039
Carpetgrass	15	785	0	0	48	1,832	64	2,616
Warm Season Total	1,227	57,828	1,108	52,928	1,027	52,193	3,362	162,949
Cool Season								
Kentucky Bluegrass	19	652	19	1,146	3	165	41	1,962
Tall Fescue	12	508	102	5,262	216	10,855	331	16,666
Cool Season Total	31	1,160	122	6,408	219	11,050	372	18,618
Total	1,258	59,987	1,230	59,337	1,246	63,244	3,734	181,568

Table 7. Information on labor use in the Australian turfgrass industry, 2006.

Farm Size	Full-time Labor		Part-time Labor		Seasonal Labor		Total Labor
	Total	Average	Total	Average	Total	Average	
Small (0–25 ha)	314	1.9	166	1.0	50	0.3	530
Medium (26–50 ha)	236	6.4	83	2.3	32	0.9	351
Large (51–220 ha)	307	18.1	99	5.8	34	2.0	440
Total	857	5.1	348	1.9	116	0.7	1,321

Table 8. Megalitres (ML) of water applied (total industry and er hectare), and return value per ML of water used per hectare, by farm size, Australia, 2006.

Farm Size	Water Applied	Share of Total	Average Megalitres Per Hectare	Returns* Per Megalitre, Per Hectare
	(ML expanded)	(expanded percent)	(ML expanded)	(Australian dollars)
Small (0–25 ha)	9,035	26	5.7	$8,228
Medium (26–50 ha)	12,153	35	8.8	$5,482
Large (51–220 ha)	13,480	39	7.1	$7,146
Total / Average	34,668	100	6.5	$7,480

* Average harvest value per hectare / average number of megalitres applied per hectare.

Table 9. Annual turfgrass sales, industry total, average per farm, and average per hectare, Australia, 2006.

Farm Size	Total Sales	Average Sales Per Farm	Average Sales Per Hectare	Percent
Small (0–25 ha)	$15,875,000	$305,288	$31,800	20.3
Medium (26–50 ha)	$20,250,000	$1,265,635	$33,589	25.9
Large (51–220 ha)	$42,000,000	$3,818,182	$33,149	53.8
Total	$78,125,000	$1,796,365	$59,878	100.0

Table 10. Detailed expense information for growing activities, administration and marketing, and landscape services, Australia, 2006.

Expense Category, Including GST	Percent Share
A. Growing Activities	
Manager or owner salary	12.1
Labor (full-time, part-time, seasonal)	15.8
Land preparation (weed control, cultivation, harrowing)	4.5
Fumigation	1.0
Planting (sod/seed + equipment operating cost)	3.8
Production (mowing, fertilizing, applying pesticides, herbicides)	12.7
Irrigation (water and/or pump costs [maintenance + fuel/electricity])	5.0
Harvesting costs (equipment operating cost, pallets)	6.1
Contracting costs associated with growing/harvesting activities	2.0
Royalties	2.5
Growing Activities Total	65.5
B. Administration / Sales / Marketing	
Manager or owner salary	5.1
Labor costs (full-time, part-time, seasonal)	4.1
Marketing & Administration (sales, collections, phone, fax, supplies)	4.4
Advertising	4.2
Transportation costs	7.0
Contracting costs	2.8
Administration / Sales / Marketing Total	27.6
C. Landscape Services	
Manager or owner salary	1.7
Labor costs (full-time, part-time, seasonal)	2.2
Landscape design and installation	3.1
Landscape maintenance	0.2
Landscape Services Total	7.2
Total	100.0

Table 11. Number of hectares and percent of turfgrass harvested, by farm size, using various harvesting methods, Australia, 2006.

	Automatic		Semi-automatic		Manual	
Farm Size	Hectares	Portion of Reported harvest, by Farm Size	Hectares	Portion of Reported Harvest by Farm, Size	Hectares	Portion of Reported Harvest, by Farm Size
	(number)	(percent)	(number)	(percent)	(number)	(percent)
Small (0–25 ha)	31.4	2.4	733.9	56.8	527.7	40.7
Medium (26–50 ha)	67.1	5.4	830.0	66.8	345.2	27.8
Large (51–220 ha)	46.2	3.9	975.8	83.1	151.7	112.9
Total	14.7	3.9	2,539.7	68.5	1022.6	27.6