

# AGRICULTURAL DIRECT COSTS – AN EXTENSION TOOL

EO HULBERT

*South African Sugar Association Experiment Station, P/Bag X02, Mount Edgecombe, 4300*

## Abstract

The paper describes a routine procedure to obtain Agricultural Direct Costs (ADC) which growers and extension officers can use to improve the choice of cost effective agricultural operations. Results of 24 ADC are described which show a wide range in Rand/ton and Rand/hectare harvested and the reasons for the differences are given. The value of the ADC as an extension tool is that, by quantifying the costs of harvesting, infield transport, ratoon maintenance and planting, it gives authentic on-farm motivation to change.

## Introduction

In simplistic terms, a farmer can increase his profits by increasing his yields per unit area, by reducing costs or by benefitting from an increased crop price; the last being beyond his control. Increasing yields per hectare through the adoption of appropriate technology from the Experiment Station is one of the goals of the extension officer, and a useful tool for the attainment of this goal is the Field Record System (Culverwell, 1984; Hellmann, 1988, 1993). However, the extension officer is always conscious that adopted agricultural practices need to be cost effective. To date the only comprehensive measurement of costs has been a compilation entitled 'Actual Costs, Income and Margins by Mill Areas' done by the SA Cane Growers' Association. These costs are allocated as follows:

- |                         |                                       |
|-------------------------|---------------------------------------|
| 1. Wages                | 6. Mechanical and general maintenance |
| 2. Rations              | 7. Services                           |
| 3. Chemicals            | 8. Administration/levies              |
| 4. Fertiliser           | 9. Insurances/licences                |
| 5. Fuels and lubricants | 10. Sundries.                         |

The above allocation is suitable for the economist when attributing reasons for profitability or non-profitability, but does not help the agricultural extension officer to determine the cost effectiveness of systems used for operations such as harvesting, infield haulage, ratoon maintenance and planting.

A method of measuring costs of agricultural operations was attempted by Roberts (1980), based on a system used by economists in Zimbabwe. Due to a lack of suitable computer hardware and software at the time, this system of costing was not established.

This paper proposes a routine procedure to obtain Agricultural Direct Costs (ADC) which cane growers can use to improve the choice of cost effective agricultural operations. In economic terms the ADC are similar to operational or variable costs. The ADC essentially include costs of labour, materials and machinery without any overheads or fixed costs.

## Approach

A computer program using the Quattro Pro Version 5 spreadsheet has been developed that makes it possible to de-

**Table 1**  
Example of Agricultural Direct Costs in R/ton and R/ha by agricultural operation for an individual grower and other growers in the group

| Operation                               | Individual grower |                 | Other growers |                 |
|---|-------------------|-----------------|---------------|-----------------|
|   | R/ton             | R/ha harvested  | R/ton         | R/h harvested   |
| <b>Direct Agricultural Costs</b>        |                   |                 |               |                 |
| <b>Cutting and stacking</b>             |                   |                 |               |                 |
| Cutter wages and rations                | 5,02              | 251,6           | 4,50          | 259,51          |
| Induna wages and rations                | 1,60              | 79,96           | 0,74          | 40,71           |
| <b>Loading and infield transport</b>    |                   |                 |               |                 |
| Mechanical loading                      | 0,00              | 0,00            | 1,00          | 37,05           |
| Tractor and trailer costs               | 0,83              | 41,61           | 2,87          | 164,81          |
| Fuel and lubricants costs               | 0,61              | 30,78           | 1,94          | 111,94          |
| Wages                                   | 1,13              | 56,62           | 0,66          | 37,49           |
| Rations                                 | 0,29              | 14,36           | 0,13          | 7,21            |
| <b>Ratoon maintenance</b>               |                   |                 |               |                 |
| Spreading tops/trash management         | 0,16              | 8,00            | 0,15          | 9,17            |
| Nematicide                              | 1,07              | 53,79           | 0,32          | 21,04           |
| Fertilizer topdressing                  | 9,99              | 500,48          | 8,19          | 463,54          |
| Herbicide                               | 2,90              | 145,13          | 2,56          | 140,81          |
| Hand weeding                            | 3,61              | 180,68          | 1,14          | 64,77           |
| Verges and breaks                       | 1,30              | 64,96           | 0,90          | 50,72           |
| <b>Planting</b>                         |                   |                 |               |                 |
| Stools eradication and land preparation | 0,65              | 32,40           | 0,97          | 57,32           |
| Planting labour and machinery           | 0,57              | 28,47           | 0,95          | 54,48           |
| Planting materials                      | 2,01              | 100,42          | 3,54          | 204,48          |
| <b>Total Agricultural Directs Costs</b> | <b>31,74</b>      | <b>1 589,24</b> | <b>30,55</b>  | <b>1 725,06</b> |
| <b>Planting costs – per ha planted</b>  |                   | ha planted      |               | ha planted      |
| Stool eradication and land preparation  |                   | 423,36          |               | 491,68          |
| Planting labour and machinery           |                   | 372,00          |               | 467,32          |
| Planting materials                      |                   | 1 312,00        |               | 1 753,93        |
| <b>Total</b>                            |                   | <b>2 107,36</b> |               | <b>2 712,93</b> |

termine the direct costs of manpower, machinery and materials. Data necessary for the calculations is collated on a laptop in the farm office, and it takes about 2½ hours to complete the initial exercise during the first farm visit. The output (see Table 1) computes the ADC in terms of Rand/ton and Rand/hectare harvested for the major agricultural activities of harvesting, infield haulage, ratoon maintenance and planting. The program has the capacity to include an individual grower's costs in a weighted average of the costs recorded for other participants to date.

While Table 1 reports on weighted averages for all cost components, it is also possible to provide the full range for each of the cost components incurred in Table 1. A sample of these can be found in Table 2. One hundred and forty two such columns are presently used in the ADC exercise. It is therefore possible to report on any aspect of the input data, e.g. quantities, rates and costs of the various herbicides used, the range of N, P and K applied per hectare, the wages for tractor drivers, the man-days required per 1 000 tons for agricultural operations, the average stack weights, etc.

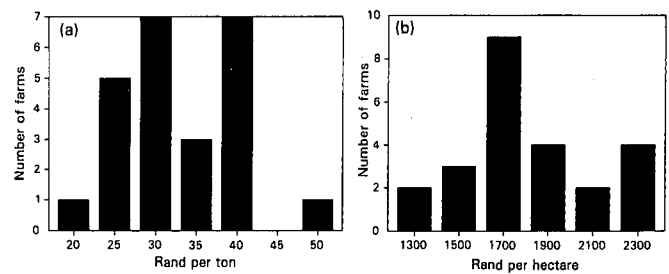
**Table 2**  
Agricultural Direct Costs for a sample of cost components for all growers in the group

| R/ha harvested | R/ton harvested | N applied/ha | Wages/tractor driver/month | Herbicide/ha treated | Man-days per 100 tons |
|----------------|-----------------|--------------|----------------------------|----------------------|-----------------------|
| 1,152          | 28,3            | 124          | 461                        | 152                  | 751                   |
| 1,229          | 30,4            | 113          | 494                        | 137                  | 759                   |
| 1,404          | 36,3            | 120          | 325                        | 300                  | 601                   |
| 1,407          | 23,9            | 130          | 541                        | 73                   | 555                   |
| 1,419          | 25,7            | 108          | 338                        | 151                  | 719                   |
| 1,547          | 30,2            | 128          | 550                        | 158                  | 522                   |
| 1,551          | 23,4            | 117          | 480                        | 179                  | 496                   |
| 1,589          | 31,7            | 123          | 500                        | 119                  | 850                   |
| 1,698          | 28,2            | 123          | 645                        | 105                  | 346                   |
| 1,603          | 24,6            | 107          | 580                        | 136                  | 641                   |
| 1,614          | 22,5            | 80           | 400                        | 136                  | 410                   |
| 1,615          | 35,7            | 139          | 508                        | 195                  | 372                   |
| 1,664          | 35,8            | 129          | 480                        | 167                  | 797                   |
| 1,677          | 27,8            | 131          | 371                        | 143                  | 630                   |
| 1,725          | 28,7            | 90           | 540                        | 133                  | 510                   |
| 1,804          | 37,3            | 148          | 390                        | 180                  | 394                   |
| 1,896          | 17,4            | 114          | 520                        | 139                  | 395                   |
| 1,899          | 27,9            | 120          | 600                        | 134                  | 750                   |
| 2,052          | 39,8            | 124          | 600                        | 150                  | 949                   |
| 2,069          | 26,0            | 120          | 520                        | 176                  | 372                   |
| 2,132          | 37,1            | 131          | 600                        | 147                  | 372                   |
| 2,160          | 24,1            | 118          | 420                        | 174                  | 553                   |
| 2,179          | 35,0            | 112          | 500                        | 76                   | 544                   |
| 2,259          | 45,1            | 140          | 446                        | 277                  | 694                   |

In a second, follow-up, visit the extension officer presents a short written report which highlights above and below average costs and suggests where improvements could be made.

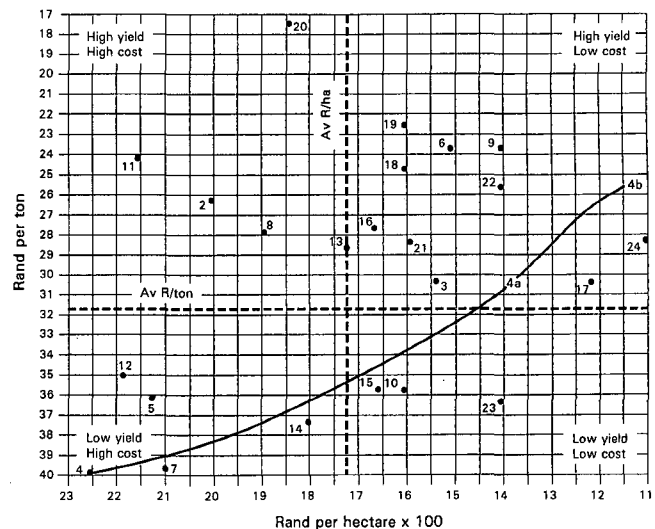
## Results

The ADC exercise has been completed for 24 private growers in the Durban North Coast extension area for the 1994-95 season. The number of farms falling within the various Rand/ton and Rand/hectare class intervals are shown in Figure 1(a) and (b). It can be seen that the range in costs is as wide as 250% for R/ton and 175% for R/hectare. The fact that such a wide range of costs was recorded makes this exercise worthwhile, as it has been demonstrated that there is scope for improvement.



**FIGURE 1:** Number of farms falling within various class intervals. (a) Rand per ton (b) Rand per hectare

For any given cost per hectare, the greater the yield per hectare, the lower the cost per ton will be. Thus, to an extent, cost per ton ADC reflect yield, although the R/ton and R/hectare calculations can never be mutually exclusive. This is particularly so where machinery and labour are high cost components; for example, harvesting (labour) and infield haulage (machinery). Having acknowledged this limitation, the R/hectare and R/ton ADC can be conveniently summarised in Figure 2. Each number (2 to 25) represents a grower plotted for R/hectare and R/ton ADC, and the four yield/cost quadrants are the result of plotting lines for average costs per ton and per hectare.



**FIGURE 2:** ADC plotted for R/ton and R/ha for each grower (numbered 2-25) in the group

The values determining these quadrants will vary from season to season. For the 1994-95 season, farms falling within the high yielding quadrants were often those from the Upper Tongaat area which was least affected by the drought. However, this was not always the rule. For example, farm 24 had extremely poor yields but, due to the extremely low costs per hectare, the farm is positioned in the high yield/low cost quadrant. Conversely, farm 4 is found in the low yield/high cost quadrant but in fact had high yields per hectare. High costs on a large replant programme (20%) and high weed control costs place it in the unfavourable quadrant. A further example of quadrant positioning relates to farm 20. The deep soils on this farm allow a well above average age at harvest, with the subsequent high yield per hectare and therefore a low cost per ton. However, this incurs a high harvesting cost per hectare which moves the farm into an above average cost per hectare quadrant.

It is not possible in this paper to discuss all farm data on an individual basis. The following represent some of the important findings which resulted in the variation in costs reported in Figure 1 (a) and (b).

*Situations leading to higher costs (in any one season)*

- Small quota (7 500 tons) split into two farms (15 km apart) with separate harvesting and haulage operations.
- Shortened milling season leading to high infield haulage costs.
- Above normal replant programmes.
- High weed control ADC (due to cost-cutting in previous seasons).
- Unnecessarily high standard for weed control.
- Long infield haulage distances.
- Conventional stool eradication.
- Low stack weights at harvest.
- Excessive verge control measures.
- High rates of seedcane at planting.
- High mechanical loading costs in a drought year (low tonnage).

*Situations leading to lower costs (in any one season)*

- High yields per unit area (this also can be due to cane age).
- Below normal replant programmes.
- High productivity (manpower usage).
- Minimum tillage.

Because the calculations are done on a spreadsheet, the 'what if' potential can be used. For example, farm 4 (see Figure 2) would move to the 4a position if a normal replant programme had been followed, and to position 4b if above average standards of weed control had not been an objective.

### Discussion

Many of the findings of the ADC programme may have been predictable. Yet, for farmers who have never costed operations in this way, the results came as a surprise and it was only on reflection that the implications of other choices be-

came clear. The greatest value of the ADC is that, by quantifying the costs of various operations, it gives authentic on-farm motivation to change – hence its value as an extension tool.

A further advantage of ADC is the uniformity of costing for all participants that make it possible for peer comparisons to be made that indicate where more cost effective methods can be adopted. The ADC programme does not attempt to analyse profitability, although the direct costs obtained do have a bearing on profitability. It is estimated that overheads (fixed costs) not costed are in the region of 100% of the ADC.

In the second follow-up visit mentioned earlier, it is important that the extension officer uses sound judgement when interpreting data; for example, the benefits of costs in any one year may only bear fruit in future years. Also, a low cost system used on one farm may not be suitable for another.

In addition to operational costs, and once more participants are included, the ADC program can provide more situation data for future planning in extension areas. For example, an analysis of the herbicides used on the 24 farms shows that only five herbicides (Velpar, Sencor, Diuron, Gramoxone and MSMA) account for 95% of the area treated in ratoon cane despite there being many more registered products available, which raises the question of whether extension effort is warranted.

The ADC programme does not attempt to record every direct cost, such as cutting and hauling seedcane. Growers find the 2-2½ hour input comfortable and consider the 80:20 principle of effort to result well served. The low input time and immediate feedback also facilitates regular annual participation and it is therefore anticipated that a wider participation can be achieved.

### REFERENCES

- Culverwell, TL (1984). Field records as an aid to the management of sugarcane crops. *Proc S Afr Sug Technol Ass* 58: 179-181.
- Hellmann, DB (1988). Using FRS to provide advice to growers on the optimum cane age at harvest in the Midlands South area. *Proc S Afr Sug Technol Ass* 62: 175-179.
- Hellmann, DB (1993). The use of FRS data to interpret the effect of different growth cycles on the yield performance of variety N12. *Proc S Afr Sug Technol Ass* 67: 88-93.
- Roberts, M (1980). Total costs by operations – 1981-82. S Afr Sug Ass Exp Stn, Internal Report. 10 pp.