SUGARCANE REPLANT DECISION SUPPORT TOOL: AN UPDATE

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1: INTRODUCTION & METHODOLOGY

This decision support tool (DST) is designed to ultimately guide a grower on the optimal ratoon length for a specific situation or scenario. This is based on maximising economic returns from the crop taking the timing of user defined expenses and subsequent returns into account.

The DST is customisable for various farm specific operations, but requires the timing and associated cash flows to be specified. Figure 1 describes the typical timeline of operations pertaining to a typical field's cropping cycle.

Initial setup of the DST requires the user to provide detailed scenario inputs.

This Replant DST is an update on the work and replant DSP originally based on work conducted by Hoekstra (1976). Reporting of economics is based on the recommendations by Wynne and Gilmour (2010).

User inputs include:
- Crop starting yield and harvest ages
- Yield decline rates (various options provided)
- RV price
- Crop RV and yield variances over time
- Soil remediation and planting expenses can be included in the crop cycle
- Customised harvesting costs
- Customised ratooning costs
- Timing of operations for cash flow accounting

Outputs:
- Discounted payback period
- Profitability index
- Modified Internal Rate of Return (MIRR) %
- Equivalent Net Present Value (NPV) per year
- Suggested replanting crop age

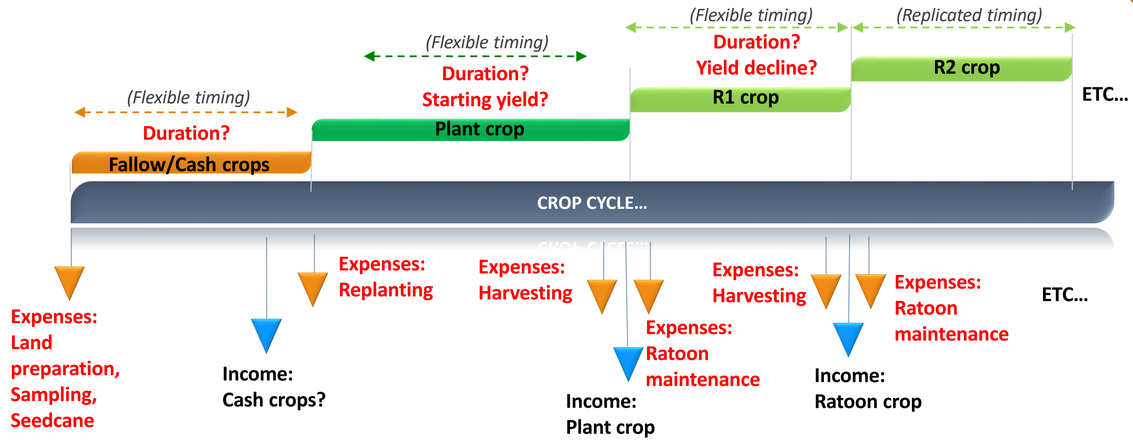


FIGURE 1: OPERATION AND CASHFLOW TIMELINE

2: YIELD DECLINE DATA FROM COMMERCIAL TRIALS

Ratoon decline trends from a range of commercial field record datasets were gathered to model various scenarios pertaining to the change of crop production over time.

An example of one of the datasets is indicated in Figure 2 and used to show the effect of yield bias on the dataset. When adjusted to exclude latter ratoons and area weighted, the ratoon decline increased from 3,8% to approximately 4,7% (Figure 3). When averaged across multiple seasons, the ratoon decline rate increased to approximately 5.1%. The circle sizes indicate the sample size for each ratoon.

Table 1 provides an indication of some of the yield decline variances across various commercial datasets throughout the industry. These provide the DST user with a range of initial yields and upper and lower ratoon decline rates that are based on the commercial datasets.

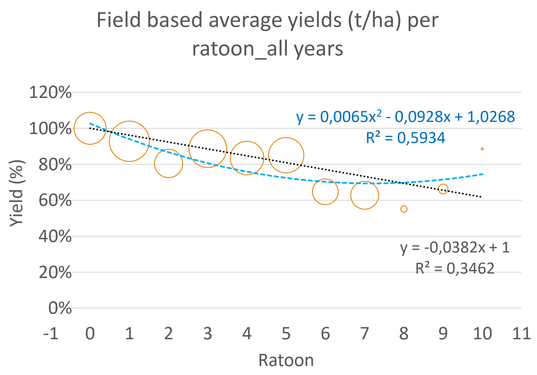


FIGURE 2: UNCORRECTED RATOON YIELDS

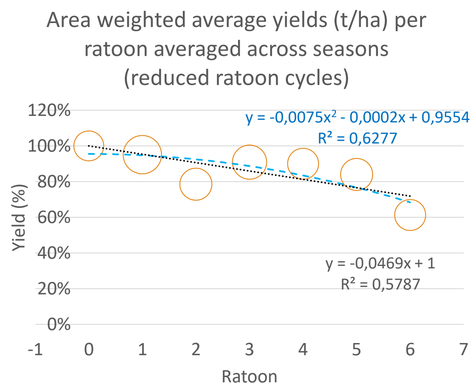


FIGURE 3: AREA WEIGHTED RATOON YIELDS

TABLE 1: COMMERCIAL YIELD DECLINE DATASET

COMMERCIAL DATA:	STARTING YIELD:	AVERAGE DECLINE:	
	t/ha	t/ha/ratoon	%
Lower South Coast Estate	64	0,8	3,4%
South Coast Estate	70	3	5,6%
South Coast (long cycle)	80	3,6	5,1%
North Coast Estate	54	1,6	3,9%
Upper North Coast Estate	53	0,2	0%
Midlands Estate	73	2,6	5,0%
Midlands (P – 4R)	73	2,6	10,7%
Eswatini (Swaziland)	107	1,7	2,2%
Nothern Irrigated - Nkomazi	114	1,4	1,7%

3: UPDATED REPLANT DECISION SUPPORT TOOL (DST)

In this updated version, various additional aspects are included in the analyses. One of the advantages of the revised DST is the ability to account for variable cash flow timing events that occur over the crop cycle. Any cash flow and income can be included in the analyses. The DST is designed to assist growers to investigate the most feasible replant strategy for their particular crop yield profile. The DST calculates the equivalent annual return from the series of cash flows provided up to the particular ratoon being evaluated. For each subsequent year, the equivalent annual return is provided. A graphical display of the monetary value of the investment allows one to easily see the optimum cycle length.

Two scenarios are provided to indicate very different crop yield profiles, namely a high initial plant crop yield followed by a high ratoon decline (RD) rate and a low initial plant crop yield followed by a low rate of yield decline.

In the first scenario, the profit is a lot higher, but the high ratoon decline rate necessitates a more rapid replant programme.

SCENARIO A:

High initial yield;

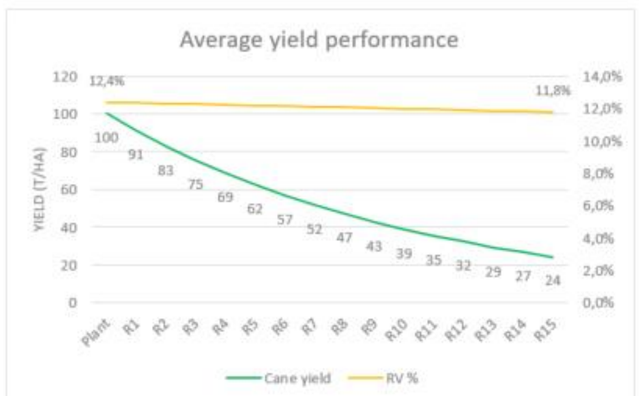
High RD rate (%)

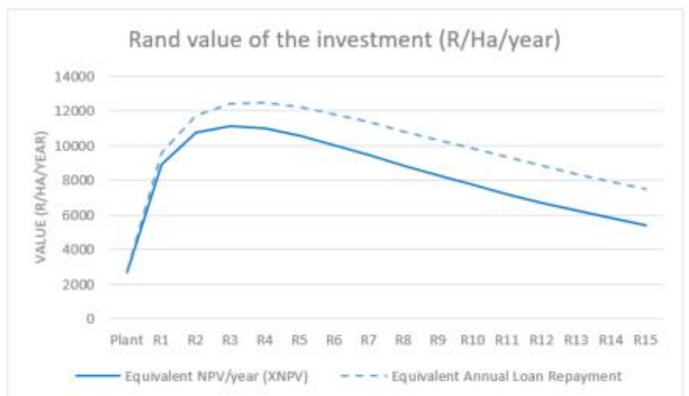
REPLANT PARAMETER INPUTS:

Normal crop age at harvest:	12	months
Length of fallow period:	4	months
Plant crop age:	14	months
RV Price used in this analysis:	3574	R/t RV
Present cost of planting: (separate input sheet)	16720	R/ha
Present cost of ratooning: (separate input sheet)	8969	R/ha
Present cost of harvesting: (separate input sheet)	120,5	R/t
Real Discount rate:	4,00%	
RV % average: (separate input sheet)	12,2%	
Average yield for a plant crop:	100	t/ha
Yield decline rate:	Custom	9%

REPLANT STRATEGY OUTPUTS:

Discounted pay back period:	1,27	years
MIRR (%):	48%	
Based on the replant parameters and assumptions:		
Replanting should be done when the crop reaches:	3	ratoons
Threshold yield for replanting:	68	t/ha
Average yield for the optimum crop cycle (3 ratoons)	87,3	t/ha
Equivalent NPV of annualized crop profit:	R11 123,41	R/ha/yr
Average yield for a traditional P+9r crop cycle:	65,2	t/ha
Equivalent NPV of annualized crop profit: P+9r	R8 281,09	R/ha/yr
Value loss by not adopting optimum replant strategy:	-R2 842,33	R/ha/yr
Value loss by not adopting optimum replant strategy:	-34%	%





SCENARIO B:

Low initial yield;

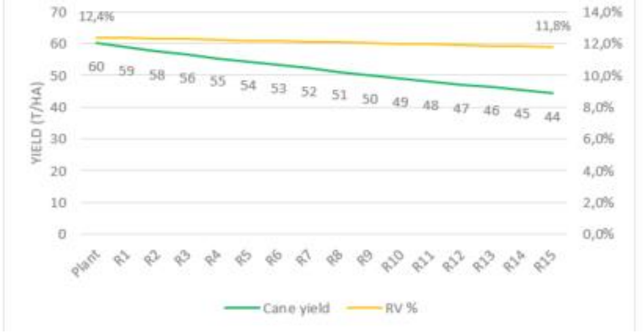
Low RD rate (%)

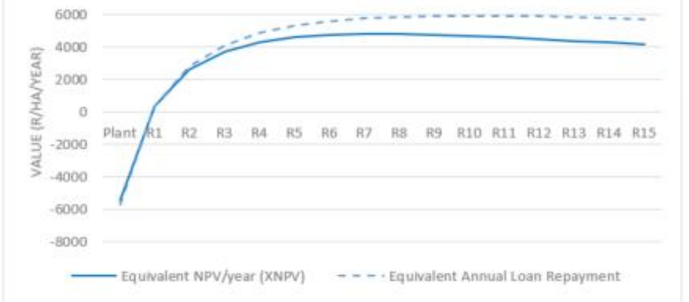
REPLANT PARAMETER INPUTS:

Normal crop age at harvest:	12	months
Length of fallow period:	4	months
Plant crop age:	14	months
RV Price used in this analysis:	3574	R/t RV
Present cost of planting: (separate input sheet)	16720	R/ha
Present cost of ratooning: (separate input sheet)	8969	R/ha
Present cost of harvesting: (separate input sheet)	120,5	R/t
Real Discount rate:	4,00%	
RV % average: (separate input sheet)	12,2%	
Average yield for a plant crop:	60	t/ha
Yield decline rate:	Custom	2%

REPLANT STRATEGY OUTPUTS:

Discounted pay back period:	2,41	years
MIRR (%):	22%	
Based on the replant parameters and assumptions:		
Replanting should be done when the crop reaches:	7	ratoons
Threshold yield for replanting:	48	t/ha
Average yield for the optimum crop cycle (7 ratoons)	56,0	t/ha
Equivalent NPV of annualized crop profit:	R4 779,01	R/ha/yr
Average yield for a traditional P+9r crop cycle:	54,3	t/ha
Equivalent NPV of annualized crop profit: P+9r	R4 729,30	R/ha/yr
Value loss by not adopting optimum replant strategy:	-R49,71	R/ha/yr
Value loss by not adopting optimum replant strategy:	-1%	%





4: DISCUSSION & CONCLUSIONS:

The Replant Decision Support Tool (Replant DST) has been redeveloped to guide on various replanting strategies. This tool allows one to customise for site- and operation-specific scenarios and cash flows.

Potential applications for Growers, Extension Specialists and Advisors:
- To guide growers on farm-specific ratoon decline replanting strategies
- To show the impact of various rates of yield decline and replanting strategies to improve farming profitability
- To use the tool as a way to gauge the costs and benefits of adopting alternative farming practices or systems, e.g., soil health improvements, introducing break or cash crops, adjusting fallow period lengths, adopting controlled traffic systems.

The Replant DST generally indicates that crops with a steep yield decline should be replanted more frequently. Starting yields tend to influence the optimum cycle lengths from an economic profitability perspective with fields of lower initial plant crop yields theoretically favoring longer crop cycles compared to those of high initial yields.

Starting yield:	Low			Med			High		
Starting yield (t/ha):	60			79			110		
Yield decline rate*:	L	M	H	L	M	H	L	M	H
Approach (ratoons):	8-14	7-9	7-9	6-12	5-8	3-4	4-11	4-7	2-3
Threshold level (t/ha):	57	47	39	75	64	51	105	91	73

* L, M, H equivalent to 1%; 3.1% and 7.5% yield decline rate as an approximation.

Growers need to consider ratoon bias when evaluating whole farm ratoon decline trends. Bias tends to underestimate actual yield decline trends. Yield decline rates can be checked against fields containing long cycle yield records but seasonal climatic variations would also need to be considered.

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