Canola Yield Loss Calculator App

Report by

The Bureau for Food and Agricultural Policy (BFAP)

for

Oilseed Advisory Committee (OAC)

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Acknowledgement

The study was undertaken in collaboration with Mr Chris Cumming (Protein Research Foundation – PRF) and Mrs Izané Leygonie-Crous (Agronomist at Southern Oil (Pty) Ltd, SOILL). They provided invaluable support and ground-level insights to complete this short study.

1. Background

During the 2018 canola harvest season, Canola yield loss trials were initiated by the Protein Research Foundation (PRF) in collaboration with SOILL in the Southern Cape and Swartland regions. Harvest losses between 152kg/ha and 606kg/ha were recorded, which implied R806/ha to R3 212/ha based on an average canola price of R5300/tonne in the 2018 season. These were substantial losses and in order to help farmers curb and limit these losses (through harvester speed and settings) the harvest losses per farm or field had to be measured before and after changes to harvester speed and settings. The PRF and SOILL together with a few collaborating farmers developed a methodology by which farmers can determine their yield losses themselves (see Appendix A summarising the methodology).

In order to roll this out to more farmers, they approached the Oilseeds Advisory Committee (OAC) for assistance in appointing service providers to develop a user-friendly Mobile Application (App). The OAC appointed BFAP to develop an App Customisation for a first-time roll-out in the 2020 season with a dedicated group of farmers or app-users. This app is designed to feed georeferenced data into a database which can be used in various reporting outcomes and can also be shared with stakeholders effectively. The results of the 2020 harvest season are presented in the sections below.

2. Findings

The roll-out of the app was undertaken in collaboration with 11 agents from three agro-chemical companies who visited 26 farms in 10 districts across the Western Cape. In total 33 fields were visited, and 50 yield loss measurements were recorded. Yield losses ranged between 0 and 350 kg/ha, implying that monetary losses up to R2 219.54/ha were incurred based on the average canola price of R6 341.53. Although these are still significant losses, they are lower than the ones recorded in the 2018 season, which ranged between 152kg/ha and 606kg/ha. It is also interesting to note that the 2020 season produced an all-time record harvest. According to the fifth production forecast of the Crop Estimates Committee (CEC) that was released on 18th December 2020, a total of 74 120 hectares of canola were planted and 163 256 tonnes were harvested, resulting in an average record yield of 2.2 tonnes/ha.

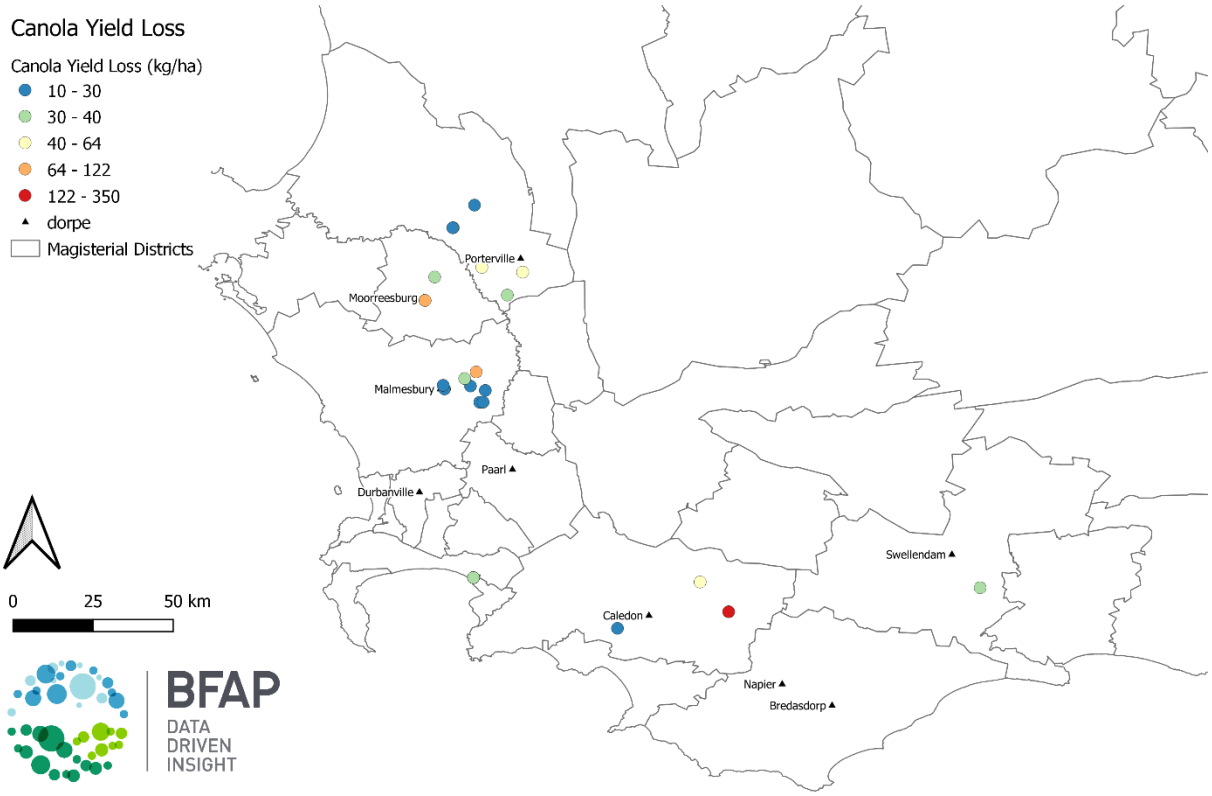


Figure 1: Mapped canola yield loss

2.1. District analysis

Figure 2 below illustrates the average recorded harvest losses per district and production region (Southern Cape, Swartland and Overberg). The largest average losses per district (close to 150kg/ha) were recorded in the Caledon and Napier districts, amounting to R950/ha losses. The worst performers in the Swartland region were the Durbanville and Moorreesburg districts with 82kg/ha (R523/ha) and 87kg/ha (R550/ha) yield losses respectively.

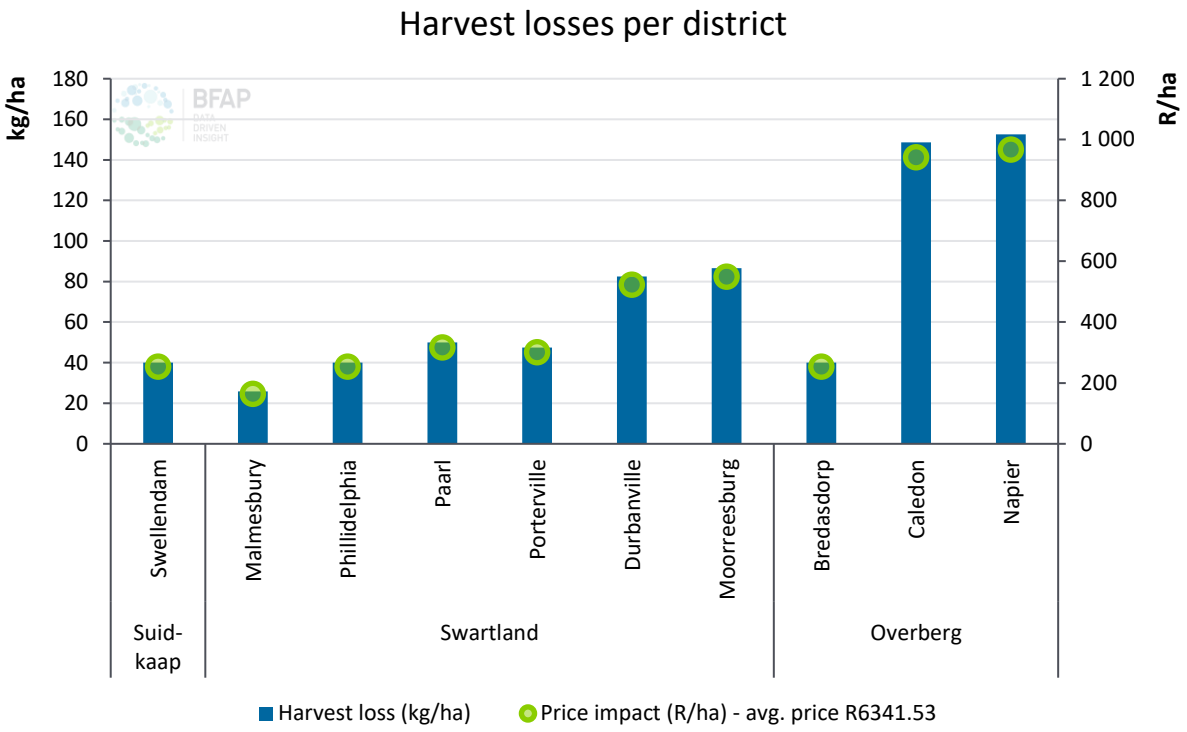


Figure 2: Harvest losses per district

2.2. Cultivar analysis

A list of the newest cultivars was provided as part of the app form and Figure 3 presents the average harvest losses per cultivar. The gathered data suggests that the top performing cultivars include 45Y93 and 44Y87 Clearfield cultivars as well as the Quartz Conventional cultivar; these cultivars recorded 0kg/ha, 10kg/ha and 25kg/ha (R158.54/ha) losses respectively. Given the limited number of observations per cultivar in the data collected (only one or two observations for some cultivars) these cannot be interpreted as conclusive results: repetitions over multiple seasons are required to identify consistently top-performing cultivars.

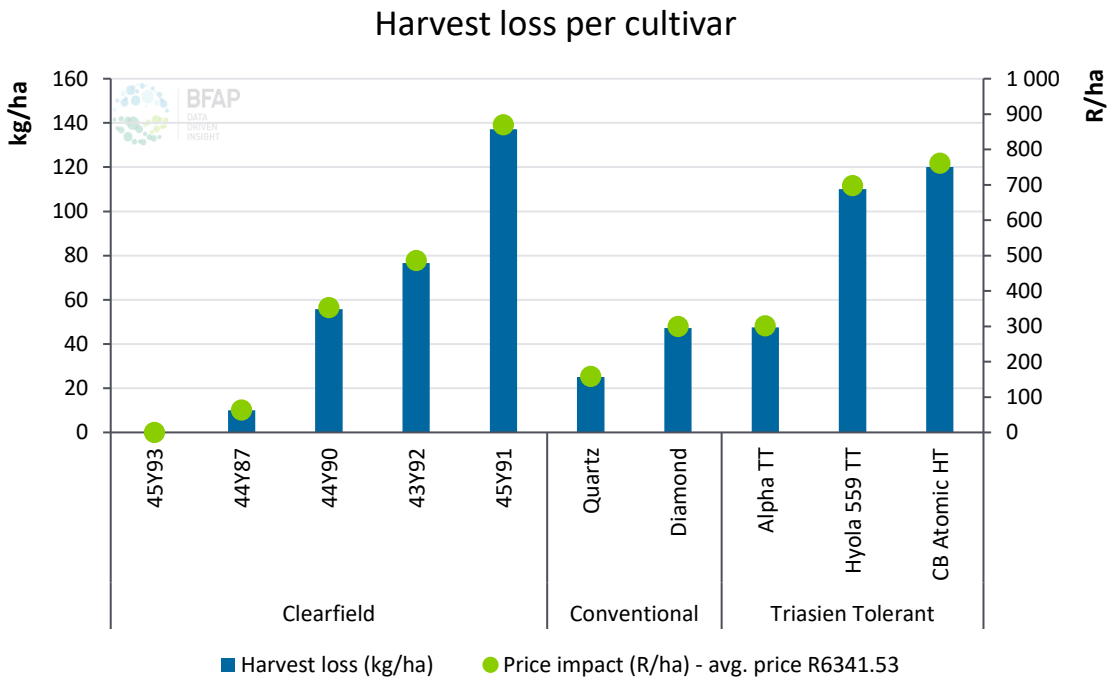


Figure 3: Harvest loss per cultivar

2.3. Equipment analysis

From Figure 4 and Table 1 it can be concluded that, for the points and farms sampled, Case harvesters registered the largest harvest losses with an average of 117kg/ha (R744.07/ha) while the New Holland and Claas harvesters recorded the lowest harvest losses, especially in the Malmesbury and Caledon districts. John Deere harvesters were most frequently used in the sample for this analyses.

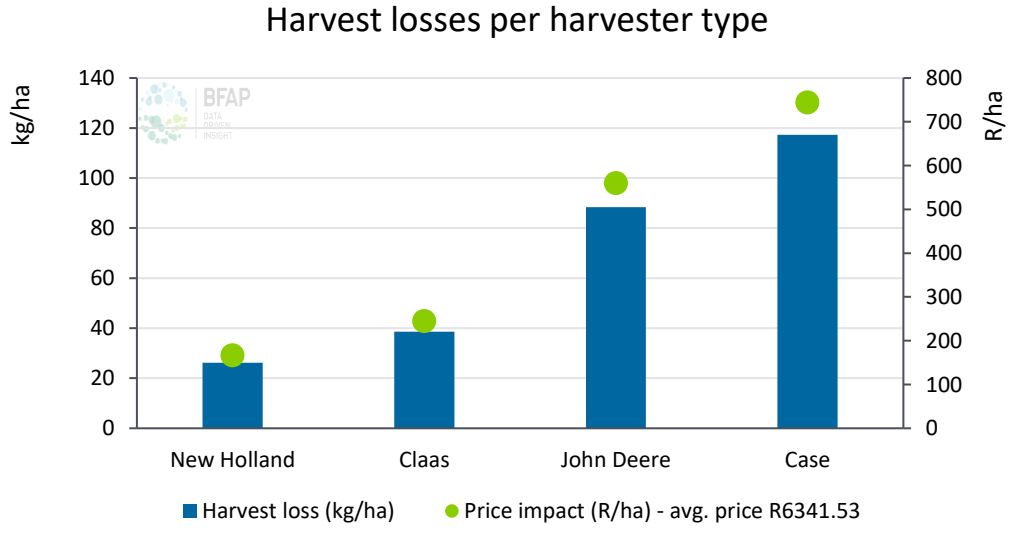


Figure 4: Harvest losses per harvester type

Table 1: Average harvest losses (kg/ha) by harvester type and district

		New Holland	Claas	John Deere	Case
Suid-kaap	Swellendam			40.00	
Swartland	Malmesbury	18.33		33.33	
	Philadelphia				40.00
	Paarl			90.00	
	Porterville	50.00	46.67	35.00	70.00
	Durbanville				82.50
	Moorreesburg		40.00		110.00
Overberg	Bredasdorp		40.00	40.00	
	Caledon		10.00	171.67	
	Napier			120.00	157.14

2.4 Financial impacts

Figure 5 illustrates the effect that the 2020 average yield loss (78kg/ha), 2020 maximum yield loss (350kg/ha) and the maximum yield loss measured in 2018 (606kg/ha) can have on the canola gross margin (R/ha), relative to the baseline of no yield loss, per region. The baseline gross margin is based on an average realised canola price of R5 500/tonne. In the average yield loss scenario during the 2020 season, a farmer's gross margin was R467 per hectare lower than the baseline. For the historic maximum yield loss of 606kg/ha, Overberg farmers would have only made a R56 profit per hectare, and R1 026 in the Swartland.

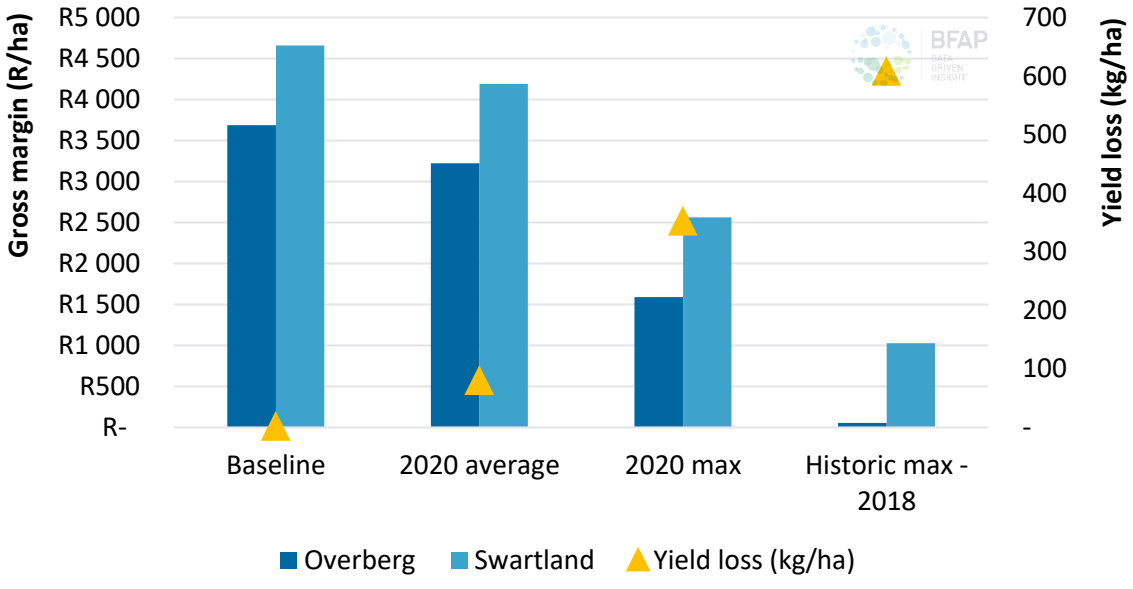


Figure 5 Impact on gross margin (R/ha) per yield loss level

Figure 6 depicts how much profit a farm would lose, given a total area canola planted (100ha, 200ha or 300ha) as a result of the various levels of yield losses. A farm cultivating 200ha of land, will lose R94 500, given the 2020 average yield loss of 78kg/ha, while the same farm, would lose just over R400 000, given the 2020 maximum yield loss of 606kg/ha.

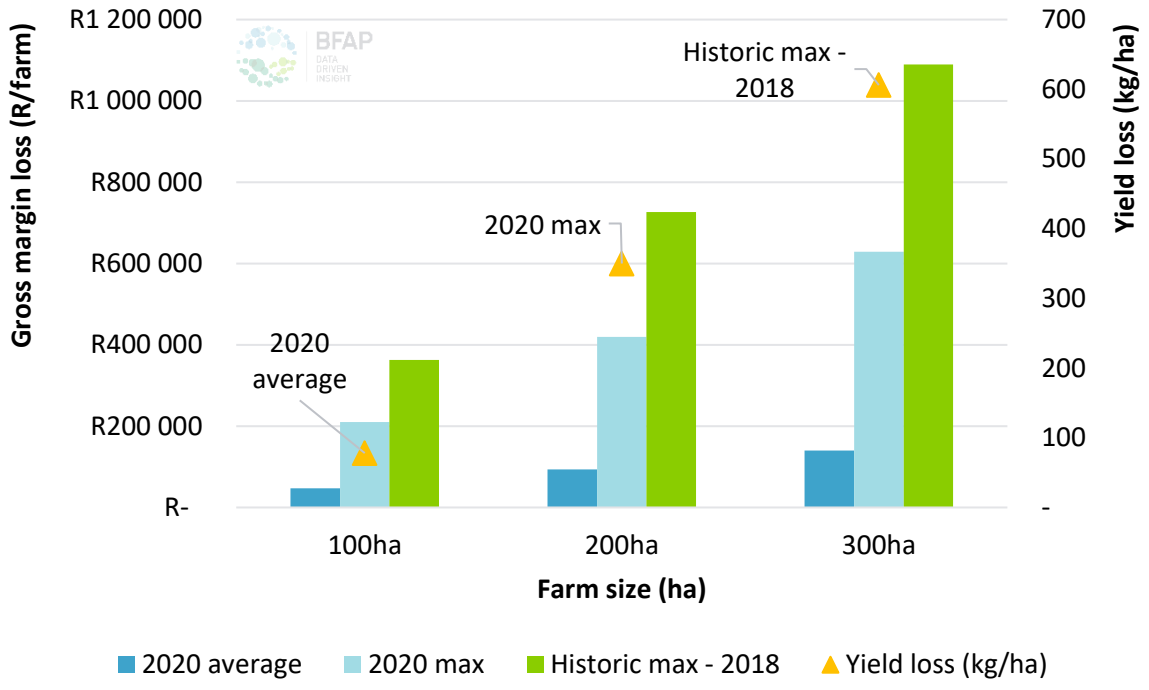


Figure 6 Farm profit loss due to yield loss per farm

Appendix A – Harvest loss Methodology

The harvest losses were measured as follows:

- A standard size ice cream container was placed between the wheels of the harvester during the harvesting process (at the time of the study, the size of the ice cream container was measured at 279.2cm^2, see photos below).
- All leaves and sticks were carefully removed from the container after the losses were captured.

The harvest losses was calculated on a volumetric basis as follows:

The following harvest losses were measured (in weight): 0.5g, 1.0g and 2.0g (see photos 1,2 and 3 to see how these volumes look in a standard sized ice cream container).

Photo 1, 2 and 3: Illustration of various harvest losses in a 379.2cm^2 ice cream container

Area of the ice cream container = length x width

= 23.7cm x 16cm (The opening / top of the container was measured since this is the area that would determine the collection of seed).

= 379.2cm^2

=0.04m^2

Now, the relation of the size of the ice cream container to 1m^2 is calculated as follows:

Relation = 1 m^2 ÷ 0,04 m^2

= 25

Therefore, the mass of seed collected in the container, needs to be multiplied by 25 to determine the seed collected per 1m^2.

The losses were thus calculated as follows:

0,5 g X 25 = 12,5 g/m^2. A hectare contains 10 000 m^2 , therefore 12,5 g/m^2 = 125 kg/ha.

1 g X 25 = 25 g/m^2 or 250 kg/ha

2 g X 25 = 50 g/m^2 or 500 kg/ha

At an average price of R5000/ton, a 2g collected in the container represents a loss of R2500/ha.

The following table (Table 1) can be utilised to translate harvest losses on a volumetric basis:

Table 1: Measurement of harvest losses on a volumetric basis

Volume metingsmetode om opbrengsverlies te bepaal									
CF - Snywydte vergelyk met windrybreedte wat agter stroper uitval (CF = snywydte ÷ windrybreedte)									
CF	4	5	6	7	8	9	10	verlies (t/ha)	verlies (R/ha)
ml verlies agter stroper bymekaar gemaak in 1m^2	0,9	10,8	14,0	16,1	18,3	20,5	22,6	0,02	R106
	1,8	22,6	26,9	31,2	35,5	40,9	45,2	0,03	R159
	2,7	33,4	40,9	47,4	53,8	60,3	67,8	0,05	R265
	3,6	45,2	53,8	62,4	72,1	80,7	89,3	0,07	R371
	4,5	56,0	67,8	78,6	89,3	101,2	111,9	0,08	R424
	5,4	67,8	80,7	94,7	107,6	121,6	134,5	0,1	R530
	6,2	78,6	94,7	109,8	125,9	141,0	157,2	0,19	R1 007
	7,2	89,3	107,6	125,9	144,2	161,5	179,8	0,14	R742
	8,9	111,9	134,5	157,2	179,8	202,4	225,0	0,15	R795
	10,8	134,5	161,5	188,4	215,3	242,2	269,1	0,17	R901
	12,6	157,2	188,4	220,7	251,9	283,1	314,3	0,19	R1 007
	14,4	179,8	215,3	251,9	287,4	324,0	359,5	0,2	R1 060
	16,1	202,4	242,2	283,1	324,0	363,8	404,7	0,22	R1 166
	18,0	225,0	269,1	314,3	359,5	404,7	448,9	0,24	R1 272

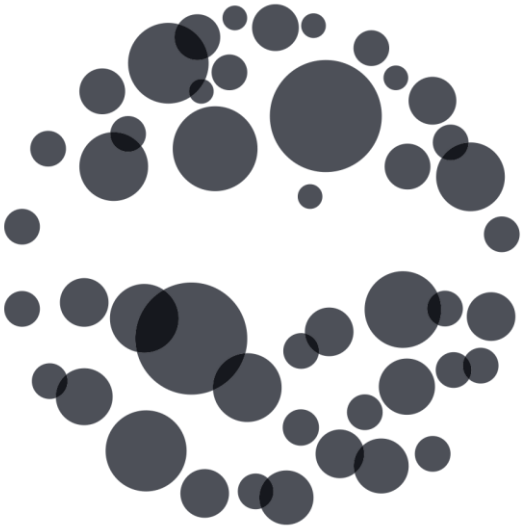
Use Table 1 as follows:

Calculate your harvester's CF relation in m^2 (correction factor = cut width divided by "kaf strook wydte" – width of row falling out of harvester after passing):

CF = cut width ÷ ''kaf strook wydte"

If CF = 5 (see example marked in Table 1), the next steps are as follows:

Determine your harvest loss by collecting seed in the ice cream container and use the measurement silinder to measure the volume of seed collected. Then mulitply the volume of seed measured from the container with 25 to obtain the total volume of seed per 1m^2. If the losses collected were measured at 56 ml/m^2, that translates to 0.08t/ha or R424/ha at an average price of R5000/ton (see blue markings in Table 1).



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