

The wheat that never reaches the silo

ARC-SC conducted a research project in the three major wheat producing provinces to determine production losses between the field and the grain silos. In the USA, a 12% loss of grain is estimated between the field and consumer. In Africa, grain is a staple food and it is thus important to ensure that losses in the value chain are minimised.

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THE LOSS OF FARM produce from the farm gate to the consumer has always been a matter of great concern worldwide, and especially in Africa, where the availability of food is not on the same level than in developed countries. While the emphasis is often on perishable products, grain is the staple food of many consumers and it is thus equally important to ensure that losses in the value chain are minimised.

While the broader picture is of important strategic value in terms of food security, losses of significant amounts of grain can also be of economic importance to producers.

ARC-Small Grain (ARC-SG) has been involved in the process of estimating the total production of winter grains in South Africa since the early 1990s. These estimations are the function of the National Department of Agriculture through the Directorate of Statistical Services. ARC-SG was co-opted by the National Crop Estimates Committee (CEC) as a technical adviser on the committee. In this exercise, ARC-SG provides the objective yields as it is measured in the field.

In the process of determining the yield that will finally be marketed, assumptions must be made by the CEC on the percentage of wheat that is lost between the field and the grain silos. In the USA, where extensive research is done on the subject on a continuous basis, a 12% loss of grain is estimated between the field and consumer.

The CEC expressed a need for these figures on grain losses to be determined under local conditions. In the context of the mandate of the CEC, "grain losses" are defined by the following:

- Harvest losses – grain lost in the process of harvesting with commercial equipment; and
- Transport losses – grain lost in the process of transporting the crop from the field to the silo.

ARC-SG was formally requested to conduct a research project to determine production losses under local conditions.

The methodology

Five wheat fields were selected randomly in the three major wheat producing provinces (Western Cape, Free State dryland and Northern Cape irrigation) to conduct the research. Eight sample points were selected in each field where the *in situ* potential yield was determined using the process developed for measuring yield for the CEC.

On completion of the field measurements, the following calculations were made:

- The average yield (ton/ha) for the points used in each field

was regarded as the maximum yield that can be obtained in the particular field.

- Producers involved were asked to harvest the different fields separately and record the total production as weighed at the silo.
- Correlations were determined between the calculated *in situ* yield and the final production figure as recorded by the producer over a three-year period.

Results

The average values of the measured yield for the five fields in the three provinces over the total duration of the project are compared with the final yield figure, provided by producers in **Tables 1 to 3**.

Discussion

In interpreting the results, it must be emphasised that the following two very important assumptions are made:

- That the eight samples taken in each field were representative of the yield obtained on the total area of the field, and
- that the final yields provided by the producers are accurate.

Over the three-year duration, the data for the Western Cape showed the highest values in terms of yield losses (12,85%) and also the highest variation in results obtained. The figures for the Free State were 2,87% on average for the three years. In the Northern Cape the loss was 4,48% on average. The correlations between measured and delivered grain were all highly significant, with R2 values of 0,99 for all three provinces.

From the three years' data that has been collected up to this point it is clear that the "harvest loss" is different for the three production regions and should be interpreted separately when assumptions are made on the actual production for these regions.

If these findings are applied to the final production figures for the 2017 season, the following picture emerges as far as production never reaching the silo:

- Western Cape: 70 000 tons
- Free State dryland: 30 000 tons
- Irrigation areas: 38 000 tons.

The total "loss" amounts to 138 000 tons, surely significant if the amount of wheat that is imported to meet the local consumption is taken into account.

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Table 1: Comparison of measured and final yield for the Western Cape.

Year	Field	Yield (ton/ha)	Producer yield	Difference (ton/ha)	Difference (%)
1	1	4,49	3,93	0,56	12,57
	2	3,32	2,6	0,72	21,66
	3	4,92	4,5	0,42	8,5
	4	1,66	1,3	0,36	21,48
	5	4,06	3,3	0,76	18,65
2	1	4,23	3,65	0,58	13,64
	2	3,73	3,3	0,43	11,5
	3	2,99	2,39	0,6	20,04
	4	4,01	3,4	0,61	15,29
	5	3,34	2,94	0,4	11,99
3	1	3,85	3,76	0,09	2,28
	2	3,31	3,12	0,19	5,83
	3	3,39	2,97	0,42	12,49
	4	2,18	2,00	0,18	8,16
	5	3,27	3,12	0,15	4,70
Average		3,52	3,09	0,43	12,58

R Square: 0,99

Coefficient: 0,88

Table 2: Comparison of measured and final yield for the Free State dryland.

Year	Field	Yield (ton/ha)	Producer yield	Difference (ton/ha)	Difference (%)
1	1	2,11	2,10	0,01	0,53
	2	4,53	4,30	0,23	5,12
	3	2,49	2,34	0,15	5,85
	4	1,85	1,90	-0,05	-2,63
	5	2,12	2,10	0,02	1,05
2	1	1,82	1,80	0,02	1,23
	2	5,12	4,83	0,29	5,64
	3	3,85	4,00	-0,15	-3,87
	4	3,66	3,60	0,06	1,74
	5	3,86	3,75	0,11	2,86
3	1	3,06	2,95	0,11	3,49
	2	0,31	0,30	0,01	4,14
	3	1,28	1,17	0,11	8,27
	4	0,63	0,60	0,03	4,93
	5	1,63	1,55	0,08	4,72
Average		2,55	2,49	0,07	2,87

R Square: 0,99

Coefficient: 0,97

Table 3: Comparison of measured and final yield for the Northern Cape.

Year	Field	Yield (ton/ha)	Producer yield	Difference (ton/ha)	Difference (%)
1	1	7,06	6,61	0,45	6,33
	2	6,08	5,3	0,78	12,88
	3	6,73	6,15	0,57	8,55
	4	5,04	5,3	-0,26	-5,23
	5	7,18	6,97	0,21	2,87
2	1	5,99	5,9	0,09	1,58
	2	7,8	7,4	0,4	5,13
	3	7,96	7,1	0,86	10,81
	4	8,81	8,7	0,11	1,26
	5	6,71	6,5	0,21	3,14
3	1	7,01	6,78	0,23	3,22
	2	7,86	7,40	0,46	5,85
	3	7,81	7,60	0,21	2,69
	4	6,36	6,00	0,36	5,73
	5	8,41	8,20	0,21	2,46
Average		7,12	6,79	0,33	4,48

R Square: 0,99

Coefficient: 0,95