

Eastern Free State cultivar trial under irrigation at Bethlehem in 2023/24

By Enrike Verster en Anjé Venter, Potatoes SA

The Eastern Free State is a major potato producing region where 19% of the country's commercial potatoes are produced on approximately 9 522 ha (2023 harvest year). The most prominent

cultivars produced for table usage are Mondial, Panamera and Lanorma.

Bethlehem is located in South Africa's moderate summer rainfall area (Figure 1) and received average rainfall of approximately 684 mm over the past 19 years. The region

experiences warm summers and very cold winters with possible frost from mid-May to early September.

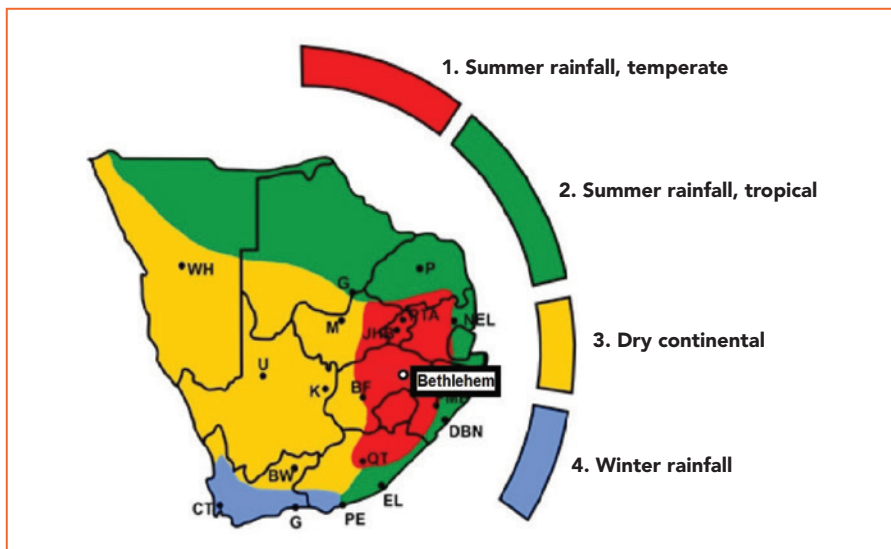
Trial design

The Bethlehem cultivar trial was planted in a randomised block design with three replications per cultivar. Table 1 contains additional technical information relevant to the trial.

Included in the cultivar trial were cultivars with short to long growth periods. Growth periods can, therefore, influence the eventual yield of certain cultivars. Growth period length is subject to the nature of the season, but is regarded as the amount of time that passes from emergence to natural leaf senescence. Soil analyses of the pivot on which the trial was executed are indicated in Table 2. Table 3 provides an outline of how these growth periods vary from one cultivar to the next.

Plant readiness of the seed potatoes at the time of the trial,

Figure 1: Location of Bethlehem in the Eastern Free State production area.



The Eastern Free State is a major potato producing region where 19% of the country's commercial potatoes are produced on approximately 9 522 ha.

Table 1: Summary of technical information regarding the trial site and layout.

Farm	Durabro					
Co-worker	Wessel and Janke du Randt					
Planting date	3 October 2023					
Harvesting date	25 April 2024					
Irrigation/dryland	Irrigation					
Double or single rows	Double rows					
Leaf senescence	Natural					
Interrow spacing	0.9 m					
In-row spacing	46.29 cm					
Plant density	24 000 plants/ha					
Fertiliser programme	Nutritional value					
	N (kg/ha)	P (kg/ha)	K (kg/ha)	Ca (kg/ha)	Mg (kg/ha)	S (kg/ha)
Total	249	110	279	278	30	189

Table 2: Soil nutrient status of trial site before planting.

Density	pH (KCl)							% CEC ¹			
		P (Mehlich3)	K	Ca	Mg	Na	K	Ca	Mg	Na	
		(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	%	%	%	%	
1.2 to 1.3	4.5	35	135	750	70	7.5	9.5	72.5	17.5	<1	

¹CEC: cation exchange capacity.

Table 3: Characteristics relating to growth period, plant readiness, population density (%) and haulm count for relevant cultivars.

Cultivar	Growing period (days) ¹		Plant readiness ²	Population density (%)	Haulms per plant	Haulms per ha
11Z55A5	Medium to long	(100 – 120)	2	90%	3.5	75 600
Amany	Medium to long	(110)	2	90%	3.1	66 960
Foxy	Short to medium	(90 – 100)	2	90%	4.1	88 560
Lanorma	Short	(80 – 90)	2	80%	3.4	65 280
Lilly	Medium	(100)	2	96.7%	5.1	118 320
Markies	Medium to long	(110)	1	90%	3.2	69 120
Mondial	Medium to long	(110 – 115)	3	88.3%	4.9	103 880
Noya	Short	(80 – 90)	3	91.7%	3.7	81 400
Palace	Long	(110 – 115)	1	96.7%	3.3	76 560
Prince	Long	(110 – 115)	1	71.7%	2.5	43 000
Sound	Medium	(95 – 100)	1	93.3%	4.3	96 320

¹General guidelines and categories (days from emergence to natural leaf senescence, depending on the season): short = 70 to 90 days; short to medium = 80 to 100 days; medium = 90 to 110 days; medium to long = 90 to 120 days; long = 90 to 140 days.

²Plant readiness of seed potatoes: 1 = fresh; 2 = slightly fresh; 3 = ready for planting; 4 = slightly old; 5 = old.

as well as plant density and haulm count observed later on in the growing period, are also indicated in Table 3.

Classing and sorting

The evaluation of new cultivars in the Bethlehem trial delivered results regarding, among others, yield and marketing index. The marketing index of the relevant cultivars is calculated by classing and sorting each cultivar according to quality and size distribution, for example, Class 1 Large or Class 2 Large-medium. Price comparisons were then made to market prices at harvesting time.

The performance of new cultivars cannot be based on the results of one particular season only, since climate and seed potato quality can vary from one year to the next. It is for this very reason that cultivars are preferably tested across several seasons.

Temperatures and water

As with any crop, temperature, availability of water (good irrigation schedules or rainfall), as well as heat units are important factors with a significant influence on the potato

Figure 2: Rainfall during the 2023/24 season as well as the long-term average rainfall.

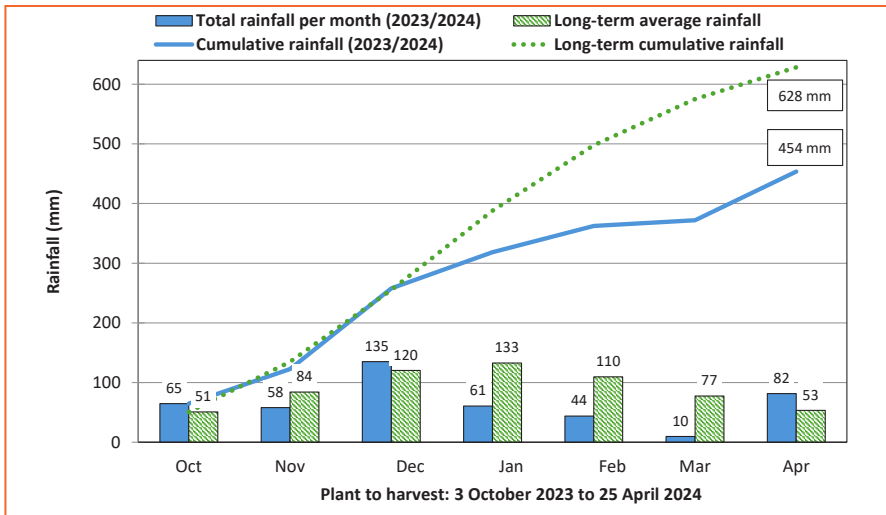


Figure 3: Minimum and maximum temperatures during the 2023/24 season as well as long-term average temperatures.

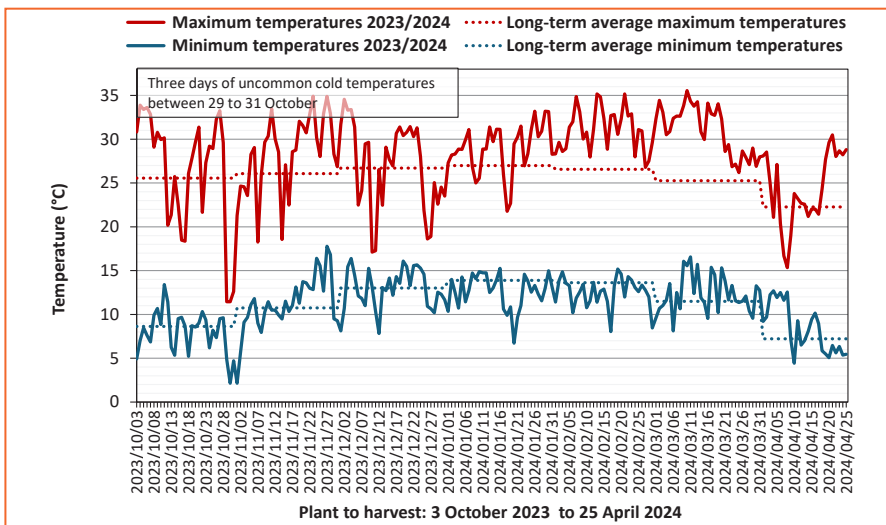
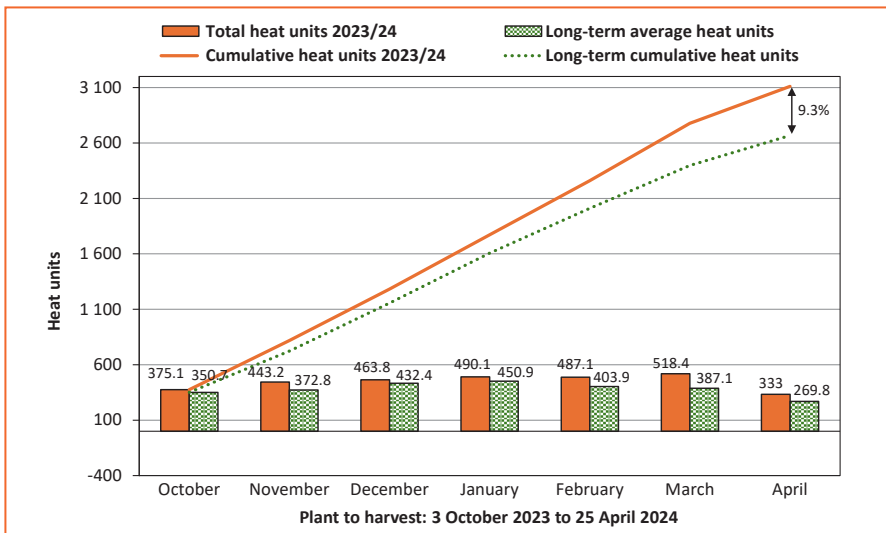


Figure 4: Heat units (2023/24 season) as well as long-term average heat units.



*Total heat units determined specifically for potatoes as a crop (temperature threshold = 5°C). Calculated using hourly data.

plant’s growth period. These factors are therefore taken into consideration when evaluating cultivar performance. Relevant daily and long-term weather data is obtained from a selected Agricultural Research Council (ARC) weather station that is as close as possible to the trial site.

Rainfall figures in the 2023/24 season (Figure 2) were generally similar to the long-term average recorded per month at the start. However, since January, less rainfall (close to the end of the growth period) was recorded. Overall, less rainfall was ultimately recorded for the duration of the trial.

Influence of heat units

Figure 3 illustrates minimum and maximum temperatures. This particular season was characterised by particularly significant fluctuations in maximum temperatures. Far-above average temperatures were recorded for a period of three months in the last months before harvesting.

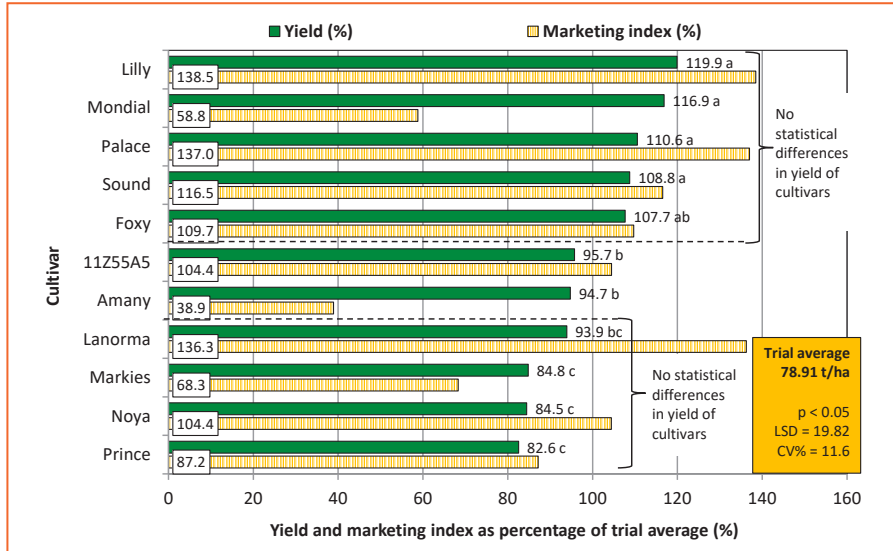
Heat units are another important factor to consider, as the development of the plant is mainly based on the collection of heat units during a growth period. The trend of available heat units for this cultivar trial at Bethlehem was higher throughout in respect of the cumulative long-term data of heat units (Figure 4).

The yield index

Yield data collected during harvest day is statistically processed using the GenStat® program. The mean was separated using the Tukey test of least significant differences (LSD). The cultivar effect during this trial (Figure 5) was statistically significant (p<0.05) in terms of yield while the coefficient of variation (CV) was low (11.6%). These factors indicate that the trial was well executed, and the results are therefore reliable.

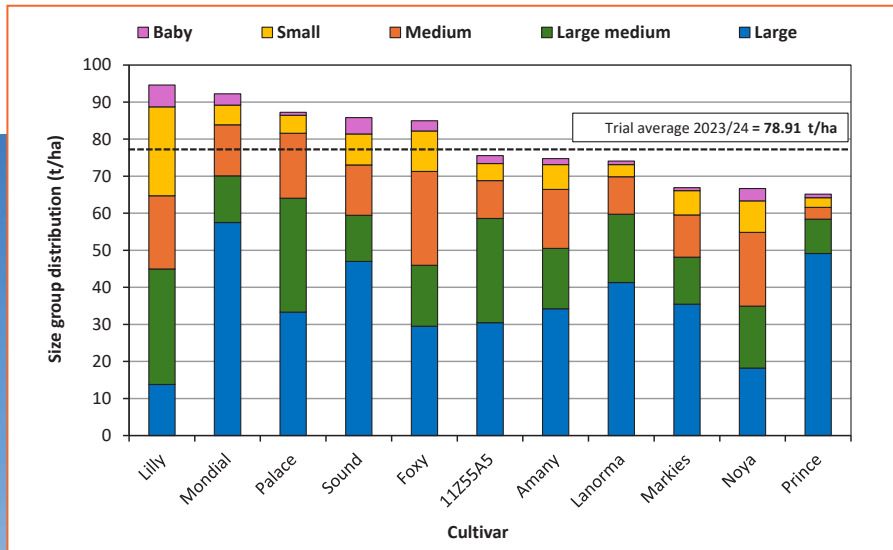
The yield of each cultivar is divided by the trial average (the average of all the cultivars is accepted as 100%). This creates a yield index and each cultivar’s performance in terms of yield is read as a percentage of the trial average.

Figure 5: Total yield and marketing indices per cultivar as a percentage of the trial average.



*Values followed by the same letter do not differ significantly.

Figure 6: Size distribution of all cultivars in the trial.



Size distribution and grading are indispensable evaluations when studying a cultivar's marketability.



Table 4: Main reasons for downgrading.

Cultivar	Malformation	Moth	Growth cracks	Rot	Fusarium	Silver scab
11Z55A5	x	x		x		x
Amany	x	x	x		x	
Foxy		x		x		x
Lanorma		x				
Lilly		x		x		x
Markies		x		x		
Mondial	x	x	x	x		x
Noya		x				x
Palace		x		x		x
Prince		x		x		
Sound		x	x	x		x

Table 5: Processing characteristics of cultivars. (Carried out by ARC-Roodeplaat.)

Cultivar	Chip colour ¹	SG ²	DM ³
11Z55A5	54	1.100	25
Amany	62	1.069	18
Foxy	47	1.066	17
Lanorma	55	1.046	13
Lilly	49	1.064	17
Markies	53	1.074	19
Mondial	49	1.070	18
Noya	55	1.078	20
Palace	55	1.083	21
Prince	55	1.077	20
Sound	56	1.069	18

¹Chip colour with value >50 and without defects is acceptable for the dry chip industry.

²Specific gravity (SG) of ≥1.075 is acceptable to the processing industry.

³The percentage of dry matter is a calculated value:

DM% = 24.182 + 211.04 * (SG-1.0988). From this calculation value, the actual percentage value will differ slightly among cultivars.

Trial yields

The average yield of the cultivar trial for the 2023/24 season was 78.91 t/ha. Lilly, Mondial, Palace, Sound and Foxy delivered the highest yield with no statistical differences in yield.

Lanorma, Palace and Lilly achieved the best marketing indices of Large potatoes and/or the highest number of good-quality potatoes.

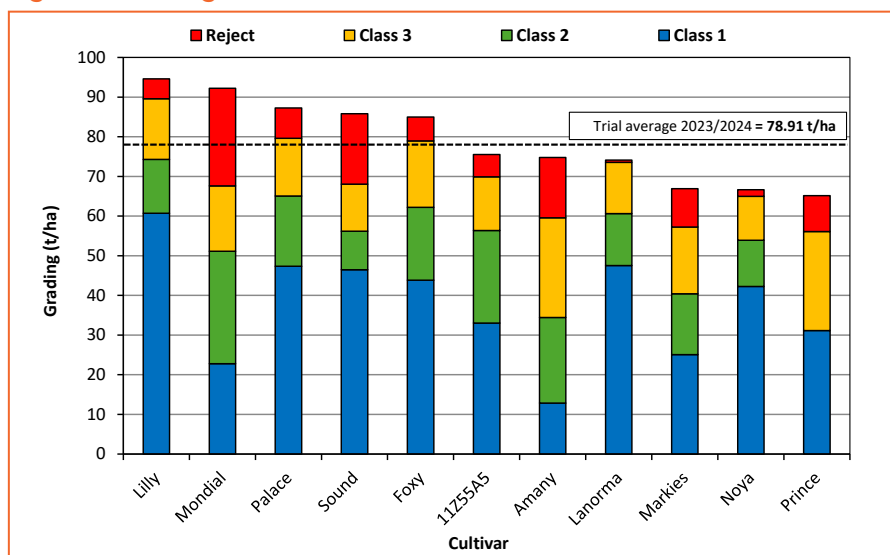
Size distribution and grading are indispensable evaluations when

studying a cultivar’s marketability (Figures 6 and 7). Reasons for downgrading are indicated in Table 4. The main reasons for downgrading the quality of cultivars in this trial were moths, rot, and silver scab.

As seasons tend to fluctuate, the performance of cultivars changes from one season to the next. This is simply because the climate is never the same from one season to another. This was the first year that this trial was conducted, hence such a comparison was not possible.

Finally, when observing the internal quality of potatoes, processing characteristics can also be evaluated. To comply with processing requirements, cultivars have to comply with a chip colour norm of >50 and a specific gravity (SG) of ≥1.075 (Table 5). The cultivars 11Z55A5, Noya, Palace and Prince met the chip colour and SG requirements. 🍅

Figure 7: Grading of all cultivars in the trial.

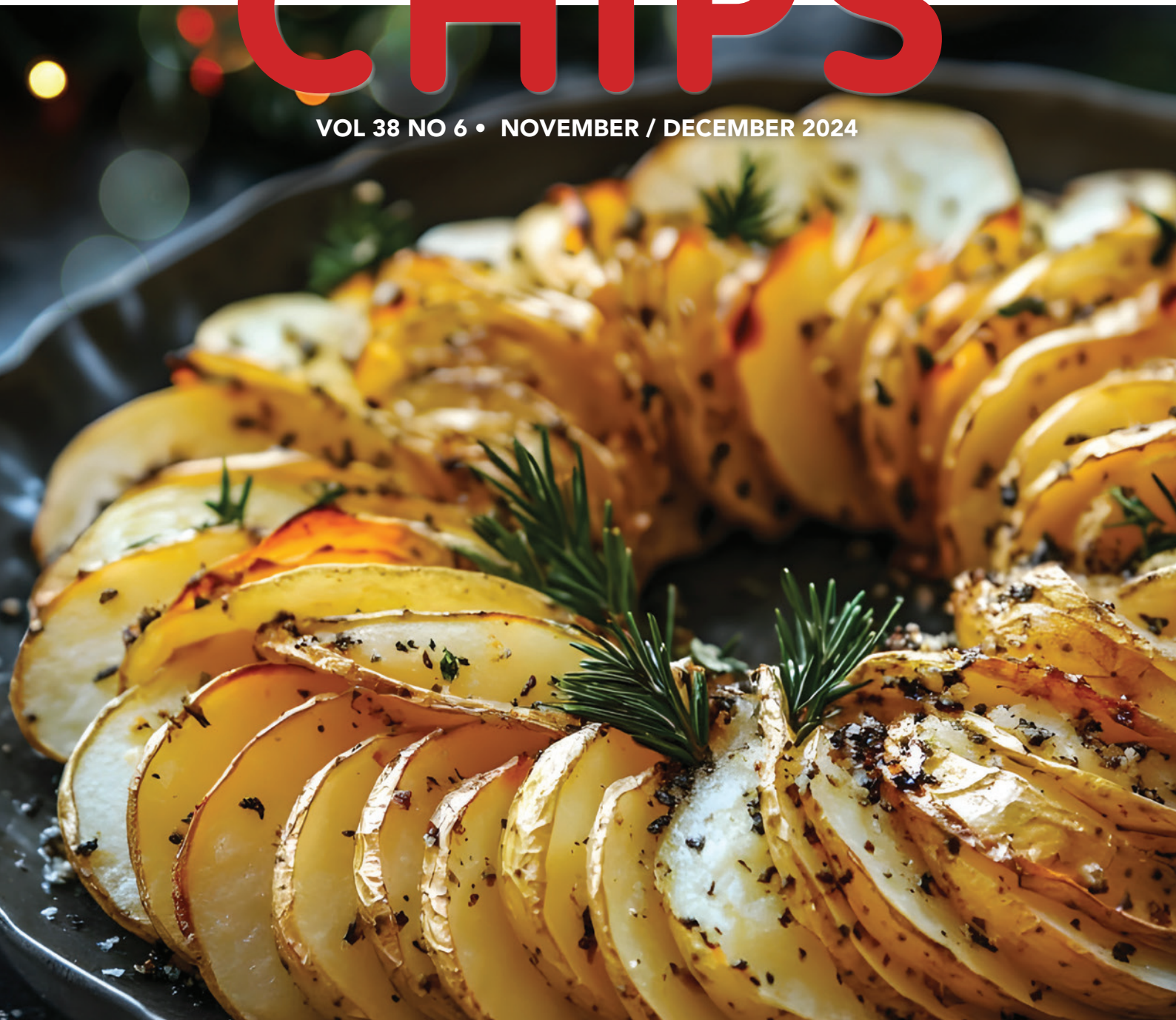


Special thanks to the farm and co-worker, Durabro Boerdery, the Eastern Free State Potato working group as well as the contributors FPD, GWK and RSA. For more information, contact Enrike Verster at enrike@potatoes.co.za.

Mondstuk van die Suid-Afrikaanse aartappelbedryf • Mouthpiece of the South African potato industry

CHIPS

VOL 38 NO 6 • NOVEMBER / DECEMBER 2024



**HP SMIT EN SEUNS BOERDERY:
SPANDINAMIKA ONDRSKEI
DIË BOERDERY VAN ANDER**

**EFFECT OF FUNGICIDE APPLICATION
ON POTATO CULTIVARS AT CEDARA
IN THE 2023/24 GROWING SEASON**

**Soil health:
Bedrock of potato farming**

**Ontwikkeling van streekspesifieke
wisselbouprogramme: Oos-Vrystaat**

**The Soweto Kota Festival:
Celebrating potato versatility**

