

# Production cost of potatoes

## Can it be reduced through saving on fertilizer application?

Although fertilization of potatoes is estimated to be 10 – 17% of the total production cost, it is one of the most important factors affecting tuber yield and quality. For irrigated potatoes, fertilization recommendations are based primarily on yield goal: the higher the expected yield, the higher the amount of fertilizer recommended. The average yield for irrigated potatoes in South Africa is between 30 and 36 t/ha, however some producers yield as high as 70 t/ha. But is it necessary to apply only high rates of nutrients in order to achieve yields higher than 60 – 70 t/ha? Is it not possible to achieve the same or higher yields by better scheduling of fertilization?

Scheduling of fertilization just means what kind of nutrient and how much must be applied at what growth stage. The accepted practice is to apply a fraction of the total amount of nutrients at planting and the rest during the growing season. However, it is a well-known fact that the application time of mobile nutrients, in particular nitrogen, is based on soil texture (clay content). For example, if the clay content of a certain soil is lower than 10%, then 50 – 60% of the total nitrogen is applied before tuber initiation, while 80 – 100% is applied at a clay content of 20% and higher. A three-year trial to investigate the influence of the amount and scheduling of fertilizers was carried out in the Dendron area.

### How was the trial carried out?

BP1 seed potatoes were planted during June of every year (2001, 2002 & 2003) on the farm Zandput of Mr. Mossie Jongbloed. Fertilization of the control treatment was done according to Steyn & Prinsloo (2003) for a 70 t/ha yield. The amount of the macro nutrients (N, P & K) applied at each fertilizer level is presented in TABLE1. Six treatments were applied:

- 1) Hennie du Plessis
- 2) Tielman Roos
- 3) Mossie Jongbloed
- 4) Pierre Fourie

- Daily fertilization at 50% ( $1/2X$ ), 100% (1X) and 200% (2X) of the recommended amount of fertilizer.
- Weekly fertilization at 50% ( $1/2X$ ), 100% (1X) and 200% (2X) of the recom-

and fertilization was done through a drip irrigation system using water-soluble fertilizers. The different solutions for the daily applications were kept in 10 000 liter tanks and fresh solutions were made up

TABLE 1: Fertilizer levels used during the three-year trial.

Fertilizer level	Amount (kg/ha)			
	N	P*	K	Ca
50% ( $1/2X$ )	130	95	85	57.5
100% (1X)	260	190	170	115
200% (2X)	520	340	230	

\* 200% = 1.5X = 150% for P only.

mended amount of fertilizer.

To overcome the technical difficulties in applying the different amounts of fertilizer at weekly or daily intervals, irrigation

once a week. Irrigation scheduling was done by means of the Soil Water Balance simulation model.

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- 1 Hennie du Plessis was employed by ARC-Roodeplaat when the trials were conducted. He currently works at Ag-Chem Africa.
- 2 Tielman Roos is employed by the Limpopo Department of Agriculture (Polokwane).
- 3 Mossie Jongbloed is the farmer on Zandput Farm, Dendron.
- 4 Pierre Fourie (ARC-Roodeplaat) is currently responsible for several field trials on potatoes, soybean and indigenous vegetables.

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## The results

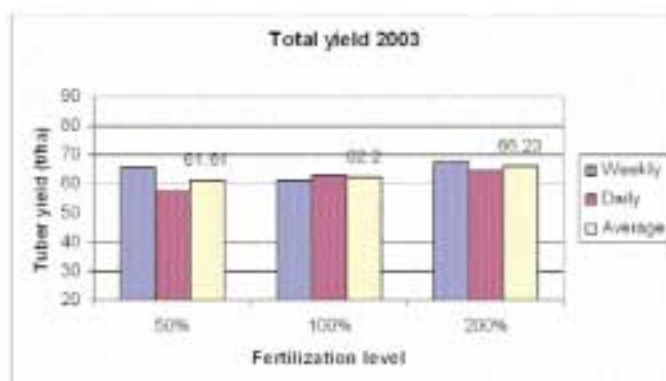
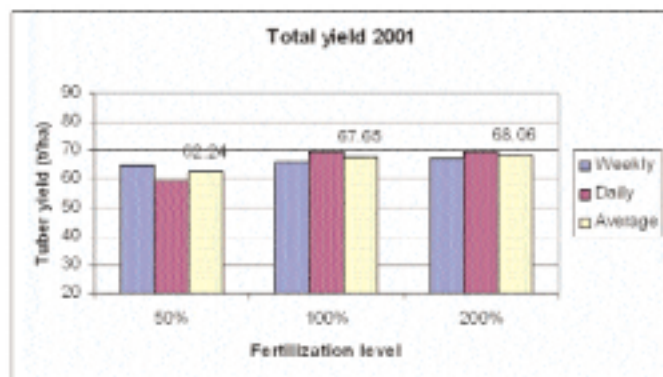
The only significant differences occurred at fertilizer levels (averages across application methods). During the 2001 season total tuber yield at the 50% fertilizer level ( $1/2X$ ) was significantly lower than at the 100% (1X) and 200% (2X) fertilizer levels (Lsd = 3.53) (Figure 2). Although the yield at the 50% fertilizer level treatment was the lowest, it still produced 92% of the tuber yield realized at the recommended fertilizer level (100% level) and 91.5% of the yield recorded at the 200% fertilizer level.

During the 2002 season no significant differences in tuber yield were observed between any of the treatments, indicating



Figure 1. The fertilization solutions were held in 10 000 liter tanks and the solutions were topped up every week.

**Figure 2: The total yield of BP1 as affected by different levels of the recommended fertilizer and applied at a daily or weekly rate.**



that the fertilizer levels used, did not have a significant influence on total tuber yield. The 50% treatment ( $1/2X$ ) produced 92.2% and 95.6% of the yield recorded at the 1X and 2 X treatments respectively.

During the 2003 season the average tuber yields (averages across application methods) at the 200% level was significantly

higher than the averages of the 50% and 100% levels (Lsd = 3.5). The yield at the 50% and 100% fertilizer levels did not differ significantly. As was the case at the 2001 and 2002 seasons, the 50% treatment also yielded relatively high with 99% of the yield realized at the 1X (100% fertilizer level) and 93% of the 2X (200% treatment).

Total tuber yield was

not affected significantly by the fertilizer application method (daily vs. weekly application) (Figure 2). In 2001, the daily fertilization treatment appeared to be more beneficial than that of the weekly fertilization, but these differences were not statistically significant and the same trend was not observed in 2002 and 2003.

Valuable results were obtained as far as fertilizer level is concerned and the same tendency was observed during all three years. The yield at the 50% fertilizer treatment was higher than 91% of the control (100% of the recommended fertilizer) and the 200% fertilizer treatment during all three seasons. That meant that the producer could save on input costs and still obtain relatively good yield.

## Conclusion

No significant differences between daily and weekly fertilisation treatments were obtained which implied that the additional cost of daily fertilisation could not be justified. Results obtained from the different levels of fertilisation showed that when using 50% less than the recommended amount of fertilizers, yields of up to 94% of the recommended rate are possible. Furthermore, production cost could be reduced using this practice. However, before producers are recommended to use less fertilizer to save on production costs, more research needs to be done with regard to scheduling of individual nutrient elements.