

Utilisation of LDR Seeds using 4D Brachytherapy Technique

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Purpose

Our centre uses the '4D brachytherapy' technique [1]. Seeds are ordered in advance based on prostate dimensions and plans optimised real-time during the implant to determine number and placement of seeds. At least 7 additional seeds per patient are ordered to account for variation between ordering and implant. This work examines the utilisation of delivered seeds using this technique.

Results

Annual Utilisation

Over 10 years, almost 250,000 I-125 seeds were delivered. The greatest number delivered was in 2019, being 29878, and fewest delivered was in 2021 totalling 16943.

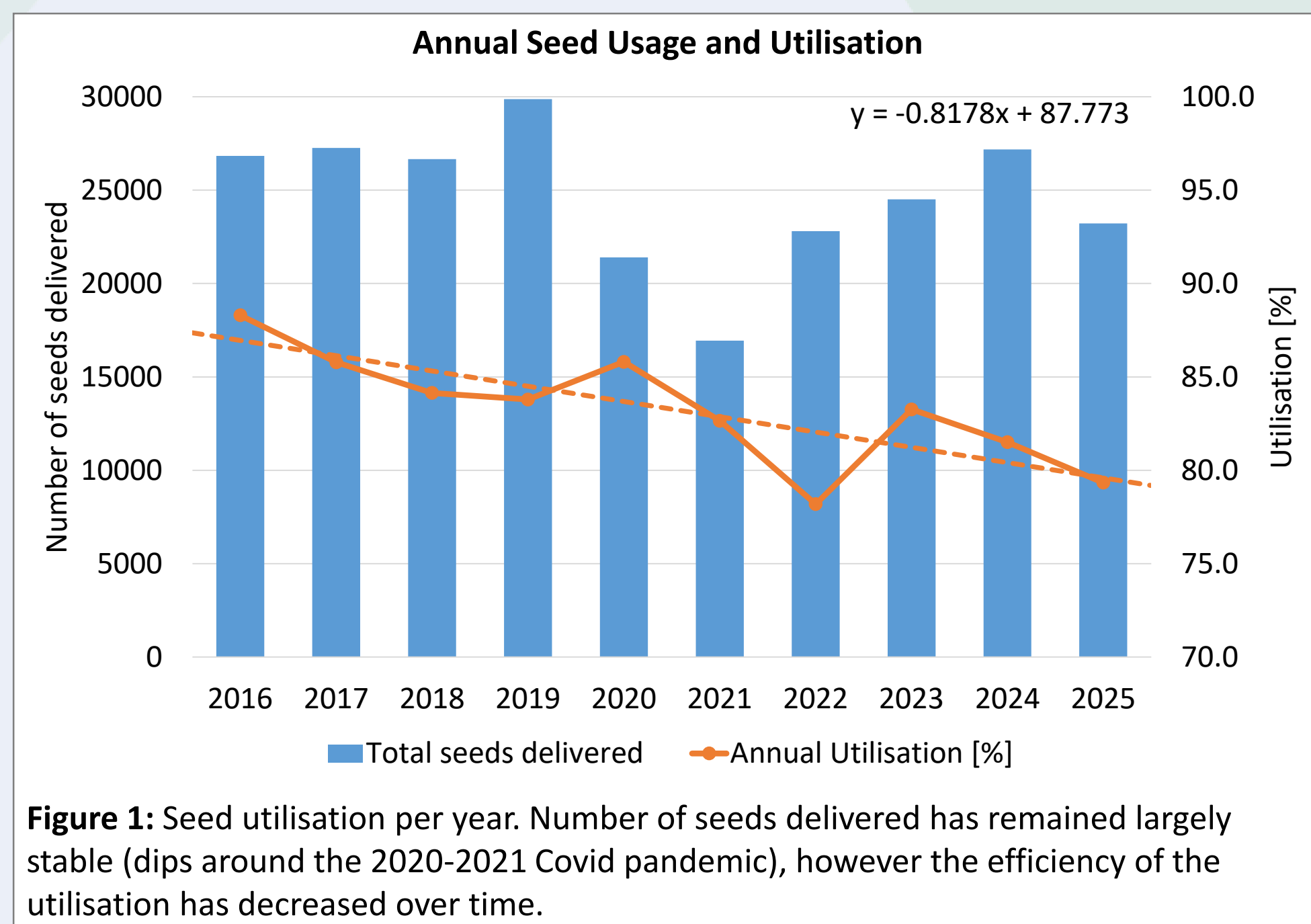


Figure 1: Seed utilisation per year. Number of seeds delivered has remained largely stable (dips around the 2020-2021 Covid pandemic), however the efficiency of the utilisation has decreased over time.

Annual seed utilisation ranged from a maximum of 88.3% in 2016 to minimum of 78.2% in 2022 (Figure 1).

A linear fit shows an 0.8% reduction in utilisation per year. Utilisation in 2025 was 79.3%.

Post-2022 the utilisation and number of seed orders was reasonably stable (Figure 1&2) and this period was used for baseline determination for future monitoring.



Figure 2: Number of LDR seed orders placed annually between 2016-2025. No significant trend observed over time other than dip in 2020-2021 during pandemic.

Methods

Data from 2015-2025 was collated for approximately 2500 I-125 LDR implants. For each month, the total number of seeds delivered and implanted was recorded and the ratio of the number of seeds delivered and implanted for each month, quarter, and year calculated.

Data was assessed to identify trends, and outliers to enable a suitable time period to be defined to then determine a baseline utilisation percentage for future monitoring and audit. A baseline for ongoing monitoring is set as Mean-(2xSD).

Monthly Utilisation

July had the lowest average utilisation and December had the lowest mean number of delivered seeds (Figure 3).

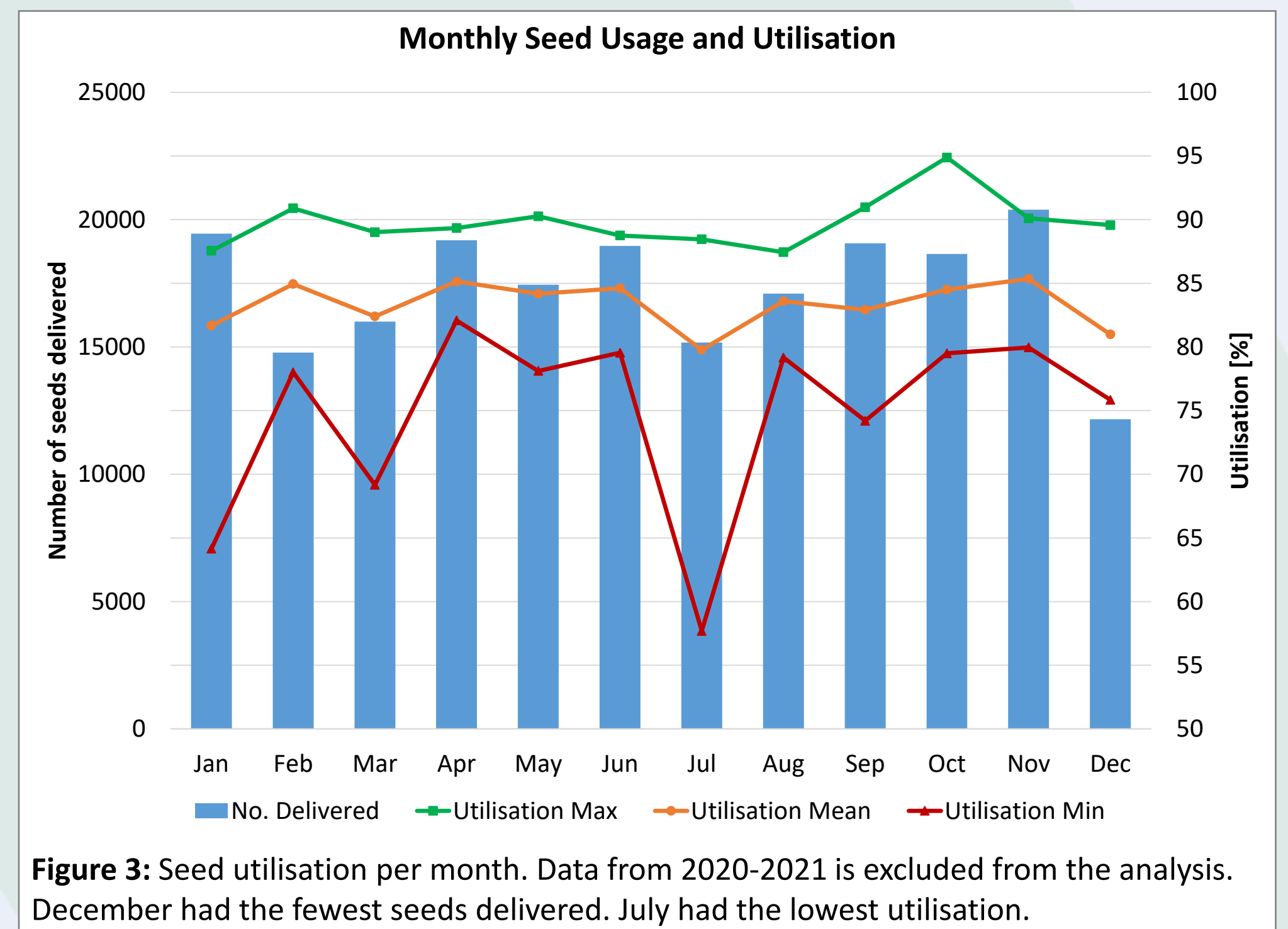


Figure 3: Seed utilisation per month. Data from 2020-2021 is excluded from the analysis. December had the fewest seeds delivered. July had the lowest utilisation.

Baseline determination

Mean annual utilisation between 2022-2025 was 80.6% (range 78.2% - 83.3%) with standard deviation of 2.0%, this gives a baseline of 76.6%.

For monthly utilisation the standard deviation was 4.8%, giving monthly baseline of 71.0%.

Conclusion

Utilisation appears stable post-2022 at ~80%.

Efficiency should be considered if altering practice, as this may alter purchasing costs, as well as staffing costs which are not considered here.

Baselines for regular monitoring are set as:

- Annual utilisation > 76.6%
- Monthly utilisation > 71.0%

References

[1] Langley, S. E. M., & Laing, R. W. (2012). 4D Brachytherapy, a novel real-time prostate brachytherapy technique using stranded and loose seeds. *BJU International*, 109(SUPPL. 1), 1–6. <https://doi.org/10.1111/j.1464-410X.2011.10824.x>