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Ups and Downs with AI and Old Data

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Outline of talk

- Introducing the hay yield data
- Explosion of possibilities and opportunities with Artificial Intelligence (AI)
- Revisiting the hay yield data analysis
- Cautions and Conclusions

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Introducing

HAY YIELD DATA

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Hay yields

- Experiments to assess the effects of fertilisers and fertiliser regimes were started in Rothamsted Research Lab in 1856 and Cockle Park farm in 1897.
- Cockle Park farm is owned by Newcastle University.
- The same 14 strips of Palace Leas field have been fertilised in an augmented 2^3 factorial experiment meticulously and continuously every year since 1897.
- A meteorological weather station is cited in the adjacent field and gives co-located readings of wind, rain, temperature, sunlight etc

Hay yield analysis

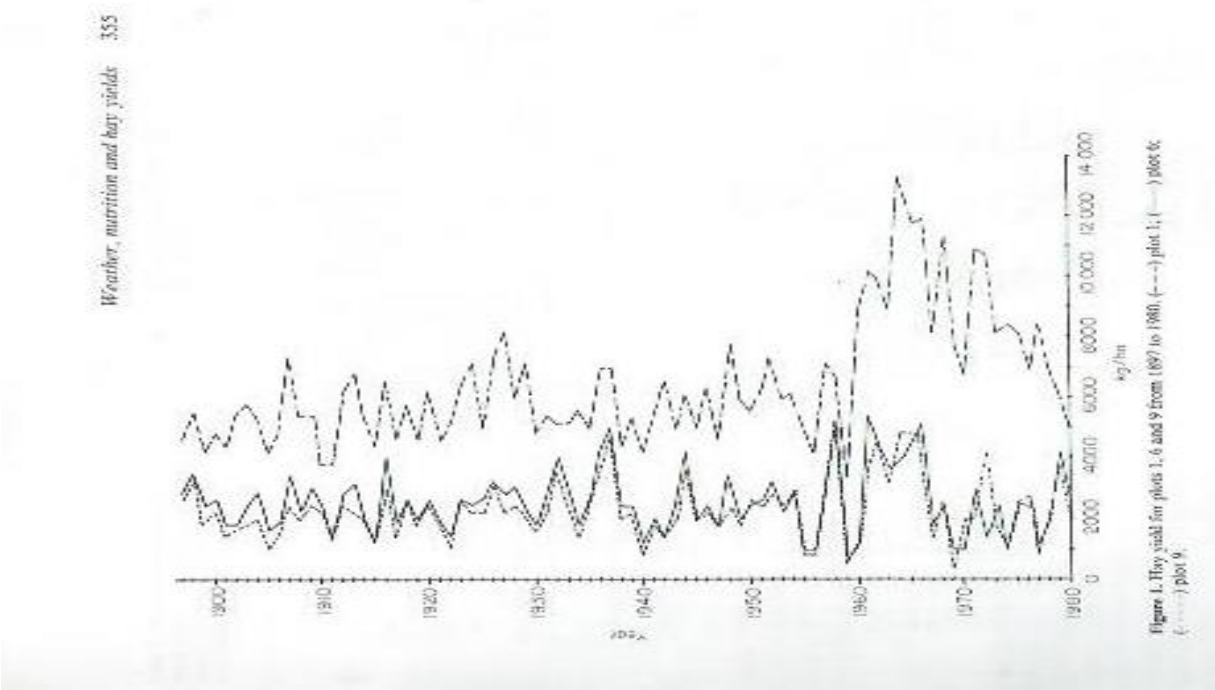
- Hay yields from 1897 were analysed in 1952 by D.G.Bushnell,
- In 1960 by H.C.Pawson,
- then in 1980 by Coleman et al who also looked at the effects of weather,
- Grass and Forage Science (1987) 42, 353-358.

Table 1. Fertilizer and manure treatments applied to Palace Leas meadow hay plots

Plot	Year of cycle	Farmyard manure t ha^{-1}	Fertilizer nutrients kg ha^{-1} N	P_2O_5	K_2O
1	—*	20	17	30	34
2	—	20	0	0	0
3	1	20	0	0	0
	2	0	17	30	34
4	1	20	0	0	0
	2	0	0	0	0
5	1	40	0	0	0
	2	0	17	30	34
	3	0	17	30	34
	4	0	17	30	34
6	—	0	0	0	0
7	—	0	0	0	0
7	—	0	35	0	0
8	—	0	0	60	0
9	—	0	0	0	67
10	—	0	35	60	0
11	—	0	35	0	67
12	—	0	0	60	67
13	—	0	35	60	67

* Same fertilizer applied each year.

Hay yield analysis



- Uncertainty about the location and nature of recent hay yield measurements inhibited further analysis.
- Timely to update the data set, and reanalyse.

Artificial Intelligence to the rescue

- Initially AI was used to convert hand-written figures to spreadsheet, then when other historic spreadsheets were located, AI amalgamated these into a combined updated spreadsheet.
- Similarly, AI attached the experimental design for each year, some meteorological data, and site notes from the researchers.
- So, AI produced data of different levels, types and granulations.

Explosion of possibilities

- AI allows easy transfer of information from any source format into analysable data.
- Allowing AI to look at a photo of data and convert it to spreadsheet is amazing.
- Initial analysis can be carried out with a simple request to an AI tool.
- This is the upside of AI.

Project overview

- Goal: consolidate hay yield data from multiple historical sources into one clean spreadsheet
- Sources: Hay Yields.xlsx (207 historical columns, multiple authors) + Hay Cut 2012–2024.xlsx (13 annual sheets)
- Tool: Claude Code (AI coding assistant) — used to parse, verify, consolidate and analyse

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Revisiting

HAY YIELD DATA

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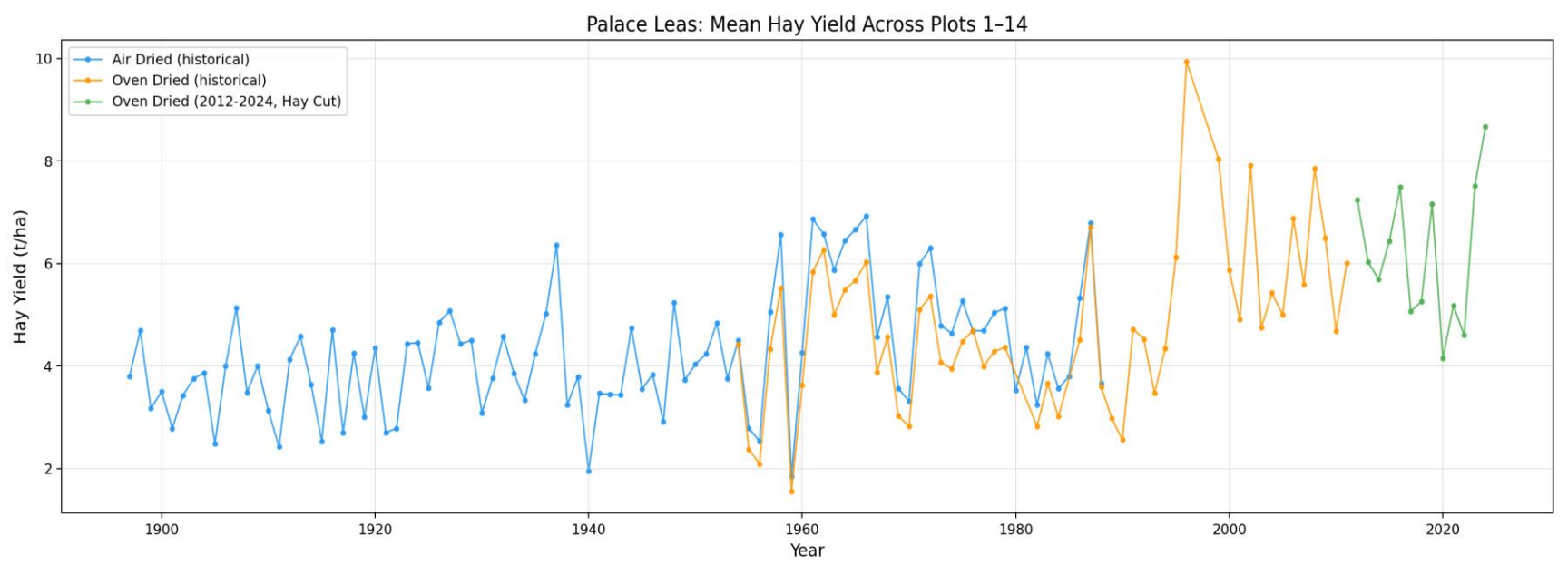
AI vocabulary (attempting to act like a human)

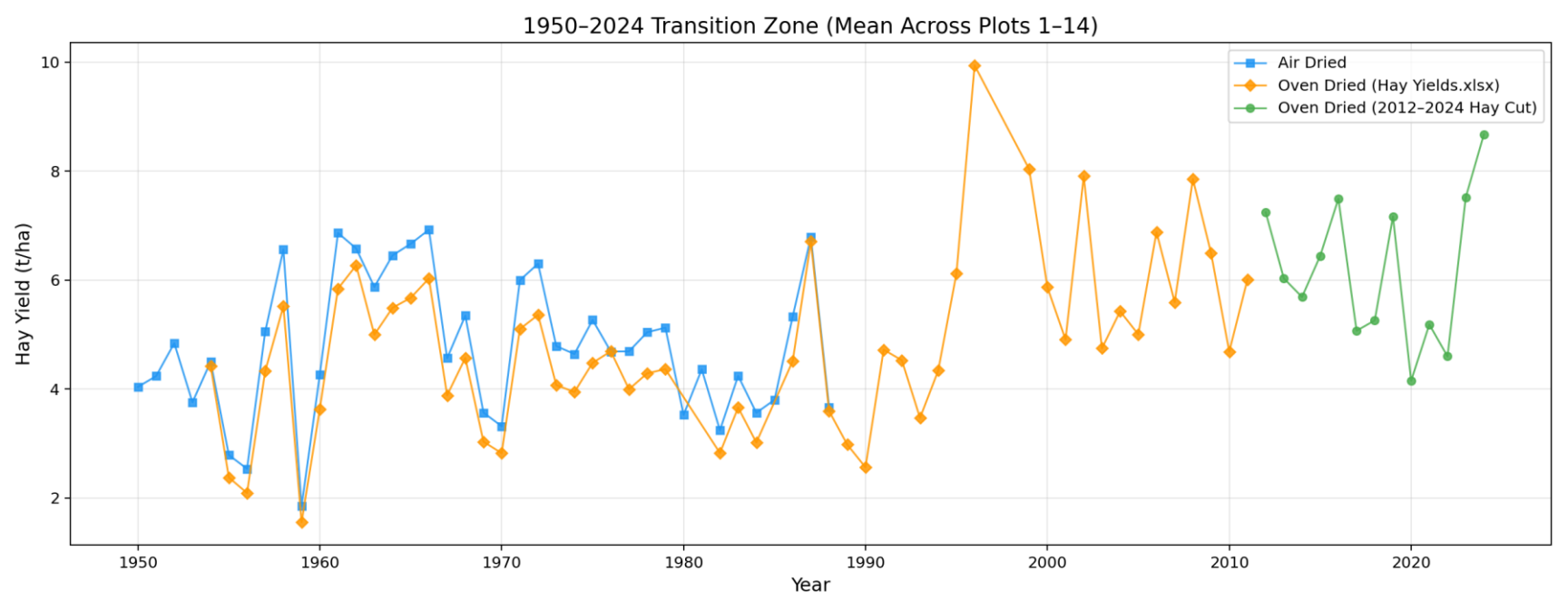
- Burrowing
- Undilating
- Pontificating
- Creating
- Scampering
- Bebopping
- Galivanting
- Osmosing
- Boondoggling
- Herding

Full Time Series: Mean Yield Across All Plots

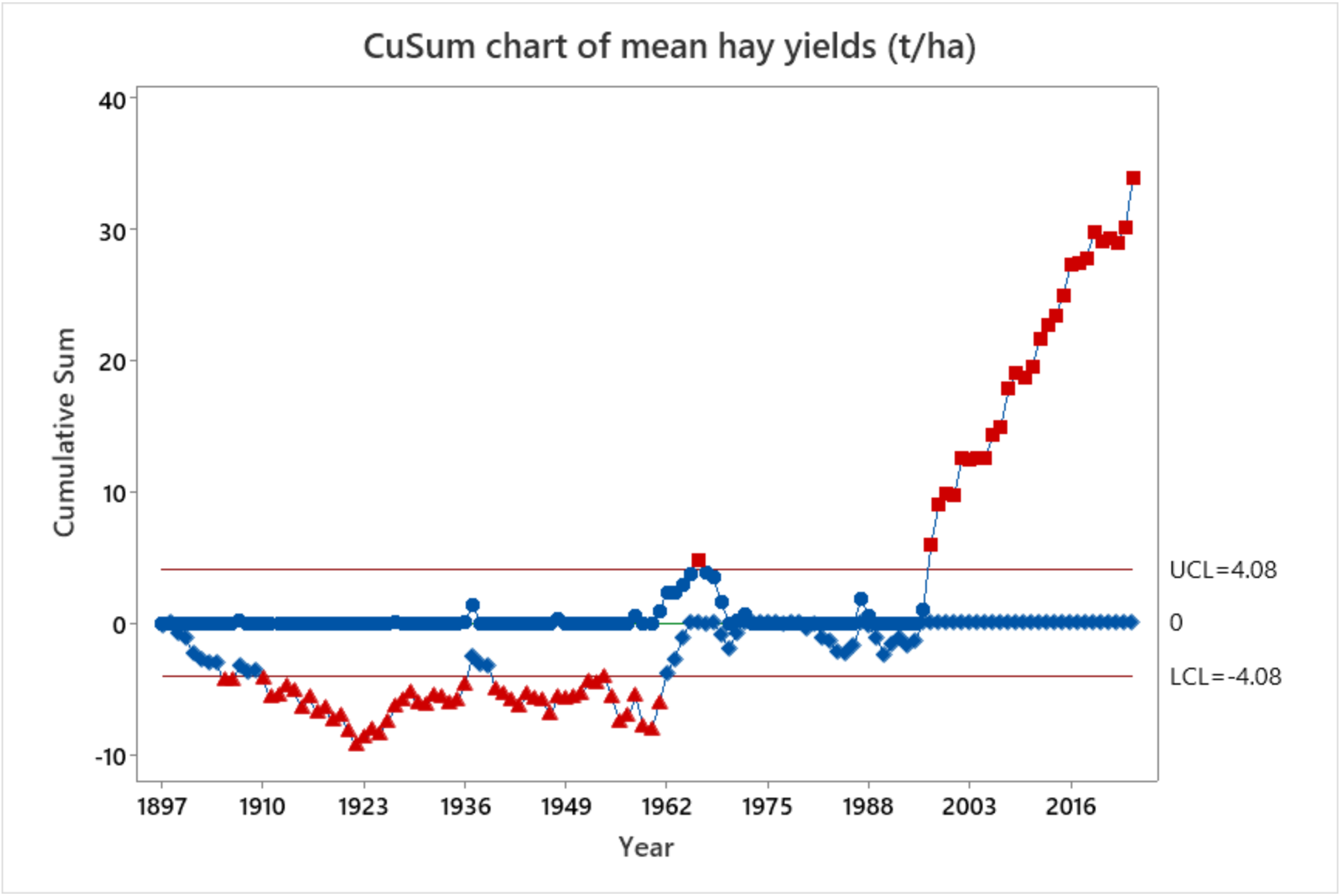


Blue = Air Dried, Orange = Oven Dried (historical), Green = Modern (2012–2024)

Transition Zone: 1950–2024



The oven-dried historical series connects naturally with the modern Hay Cut data


CuSum chart of mean hay yields (t/ha)
Cumulative Sum
40
30
20
10
0
-10
1897
1910
1923
1936
1949
1962
1975
1988
2003
2016
Year
UCL=4.08
0
LCL=-4.08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AI NARRATIVE
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Verification Strategy by AI

1. Used 2013 & 2014 as ground truth — already manually entered in the target sheet
2. Script extracted the same values independently from the source, then compared
   → All 28 values matched perfectly (within floating-point precision)
3. After writing the output, re-read it and verified every cell against the source
4. Cross-checked 2012 by computing sub-plot means manually vs script output
5. Visual inspection: time series plots show no anomalies or discontinuities
6. All code is saved alongside the data — fully reproducible

Final verification Strategy by human

Pros of Using Claude Code

Speed: parsed 207 source columns + 13 annual sheets in seconds

Accuracy: exact floating-point match with manually entered values

Transparency: every step logged, all code saved, fully auditable

Exploratory analysis: generated 6 publication-quality figures on demand

Flexibility: easy to re-run with different parameters or add new years

Documentation: the code IS the documentation of what was done

It made this PowerPoint too (and added a joke, as requested)

Cons / Caveats

Domain knowledge: Claude didn't know which drying method to prefer — it presented options and we chose

Ambiguity: some columns labelled "POSSIBLY OVEN DRY MATTER" — Claude flagged these but a human must decide

Trust but verify: AI can make confident-sounding mistakes; verification steps are essential

Requires oversight: works best as a tool guided by someone who understands the data

Setup: requires Python environment with openpyxl, matplotlib, etc.

Not a replacement for understanding the science behind the measurements

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CAUTIONS AND CONCLUSIONS

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Observations

- The data is still hard to handle.
- Missing data, duplicate measurements, different units.
- Which version to use?

Top down rather than bottom up

- AI leads to a top-down approach rather than bottom up.
- Tempting to take the data at face value rather than look beneath it.
- Allows casual analysis without checking on minor details.
- Still need attention to aim of research and value of outcomes.

Conclusions

- A clean set of annual hay yields for each plot is now available for further extensive analysis:
  - Effects of N, P and K
  - Effects of weather year on year
  - Longer term trends reflecting changes in overall conditions including climate change
- A new open data resource for use by the global research community.

And finally...(the AI joke)

Why did the hay yield data go to therapy?

It had been through too many drying experiences
and couldn't tell if it was air-ing its feelings
or oven-thinking things.

Thank you! 

Each data point is hard won.