Lessons we are learning

- A small world tour,
  - From relevant projects
    - SIAC to 2011 including for WI
    - Kenya 2011
    - Barbados 2011
    - Zimbabwe 2012
    - Tanzania 2012
- Then analysis for agriculture - Tanzania
- With some analyses also from Husbands

SIAC lesson

- Developed for NMSs
- So their staff develop skills
  - To add value to their data
  - Rather than simply trying to sell the raw data
- Over 300 NMS staff trained
  - But little has changed
- Why not?

Kenya lesson 2011

- Workshop mainly for users
  - With some from NMSs
- Data from Kenya provided
  - Showed quality problems
  - Both in rainfall
  - And also in temperature data
- Lesson – Kenya pays a big “price” for their data policy!

Barbados – this project

- Climate analysis for Agriculture
- Last chance – Adrian Trotman
- Most services have a special Ag Met Section
- But still with little visibility
  - 10-day bulletins
  - Seasonal forecast
- **Surely there is more they can contribute?**

Zimbabwe lesson - 2012

- Workshop for agric extension service
- Met Service with “usual” complaint
  - Involve them at the start!
  - Data at enormous “price” - $540,000
- **Agric Extension service made big demands – hard for NMS to resist**
- In second course – in Zim Met
  - Data quality again had problems
- **There is a serious data quality issue!**

Seasonal forecast in perspective

- NMS provides services to farmers
- **Obsessed with the seasonal forecast**
- ***Lesson – put it into perspective***
- **Time-line?**
  - Short term – 7 to 10 days
  - Medium term – one to 3 months ahead
  - Long term – further ahead
- **Long-term can provide the "baseline"**
  - **Improved using medium and short-term**

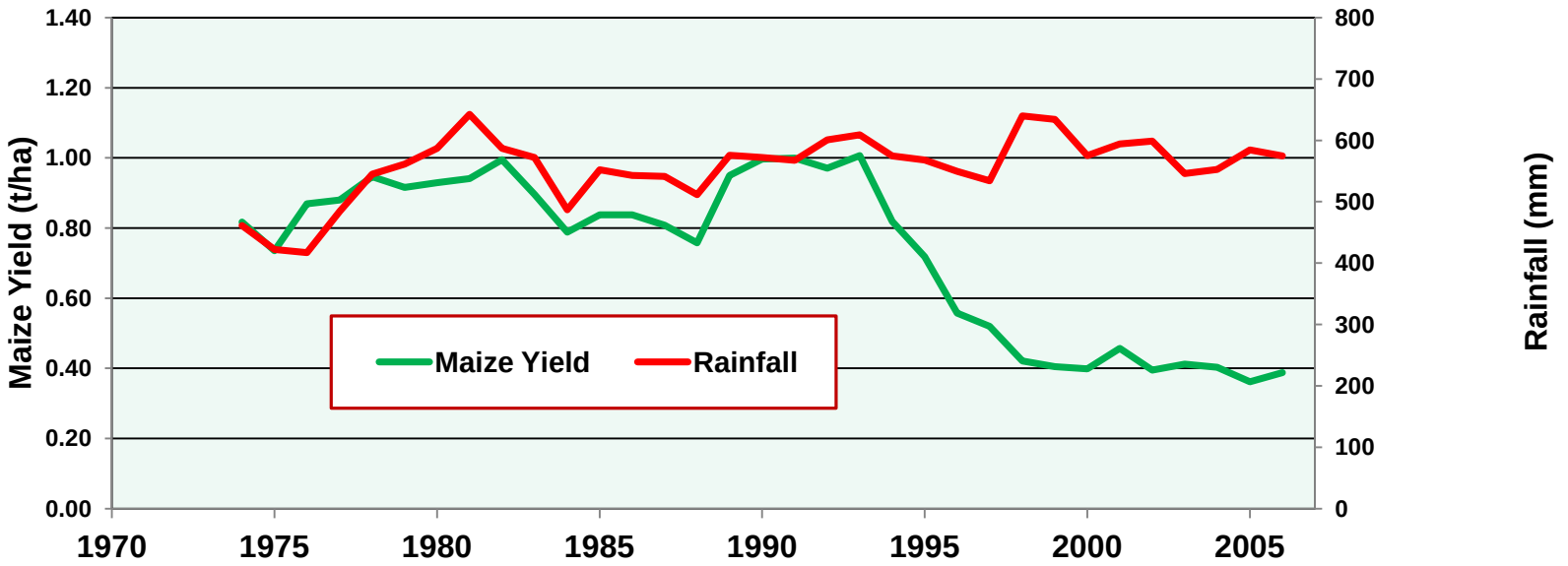
Climate change and rainfall

- Climate change is real
- For some in the tropics: climate = rainfall

- Hence climate change = rainfall change
- We do not always find this!

- **Hence crucial to analyse temperatures also**

An example from Machakos Kenya



- Across SSA, farmers believe the climate has changed.
- Most say that rainfall has become less favorable (totals / start / end /distribution patterns)
- Few studies compare farmers' perceptions with climate data analysis.
- **Rao *et al* (2011, Kenya) and Osbahr *et al* (2011, Uganda) *did* so.**

Tanzania lesson: October 2012

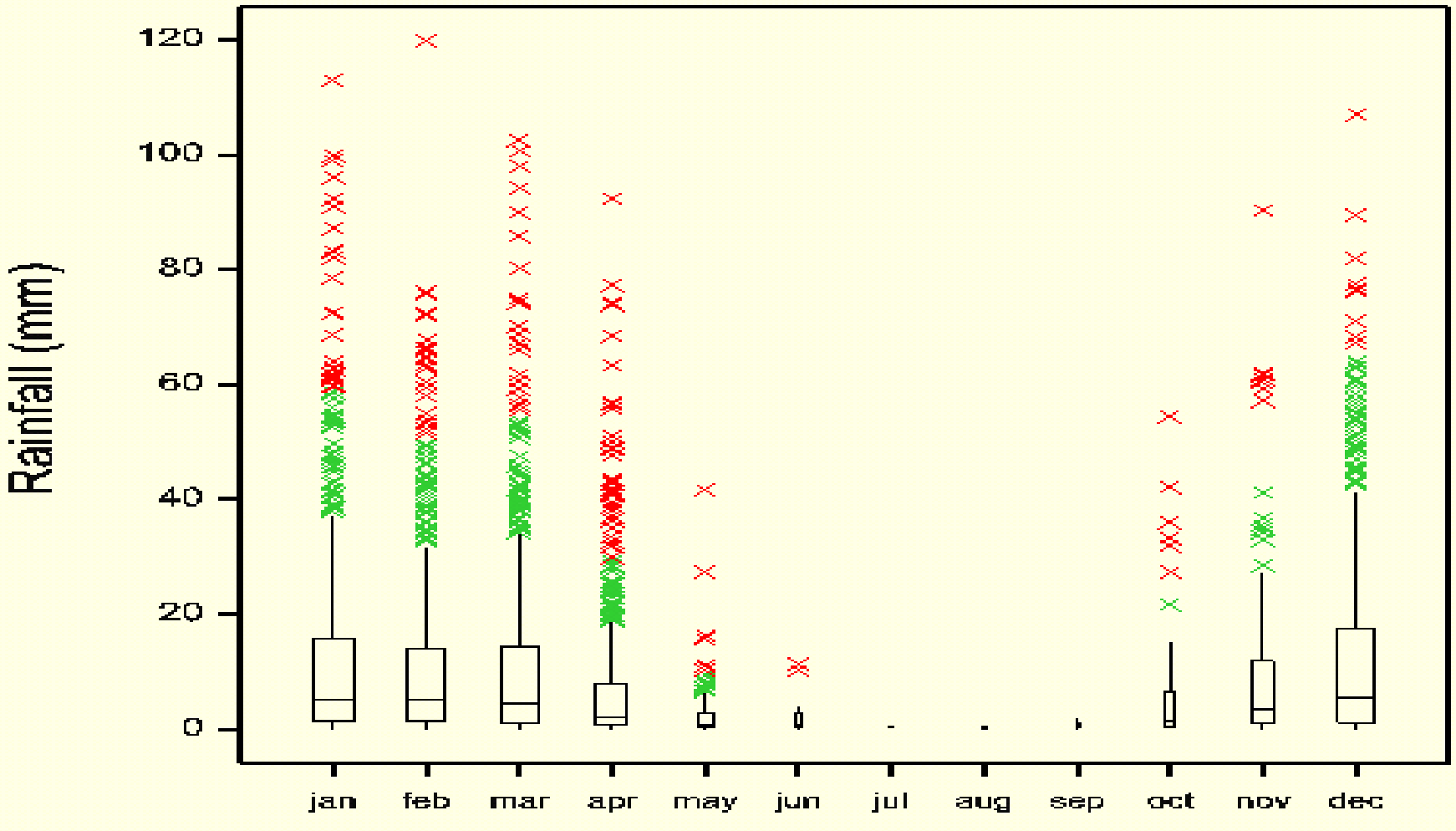
- Built on experience from Zimbabwe
- Start with possible farmer's questions
- Analyse the historical data
  - To calculate the risks
- Share results with extension service
  - Examples shown later
- And with farmers
- **Then analyse again**
- **More participatory approach!**

Data – from Tanzania

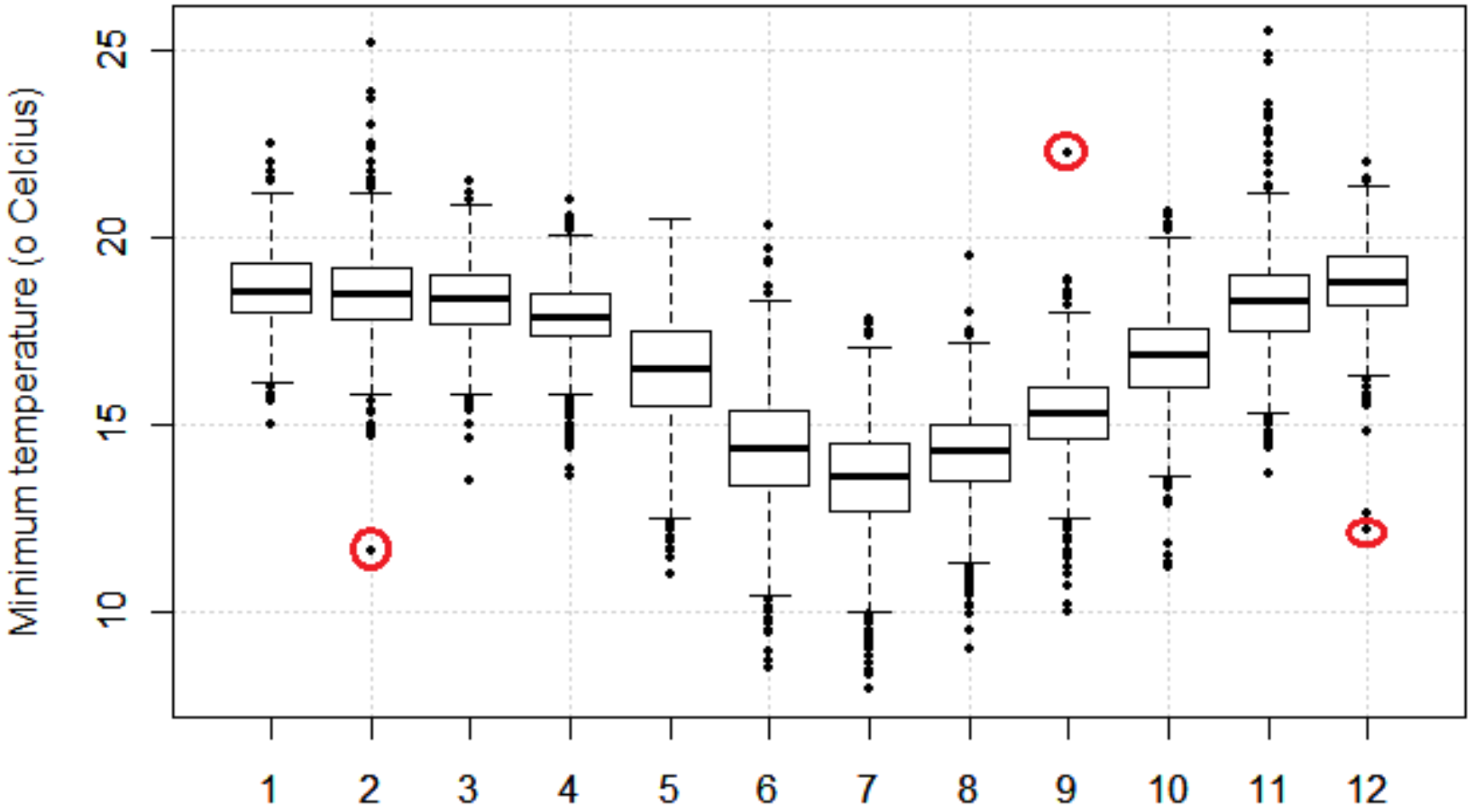
- Supplied by Tanzania Met Agency (TMA)
  - We acknowledge gratefully the provision of these data.
- Daily rainfall from 1935 to early 2011
- Daily max and min temperatures from 1958

- Imported easily
- Look to be of good quality

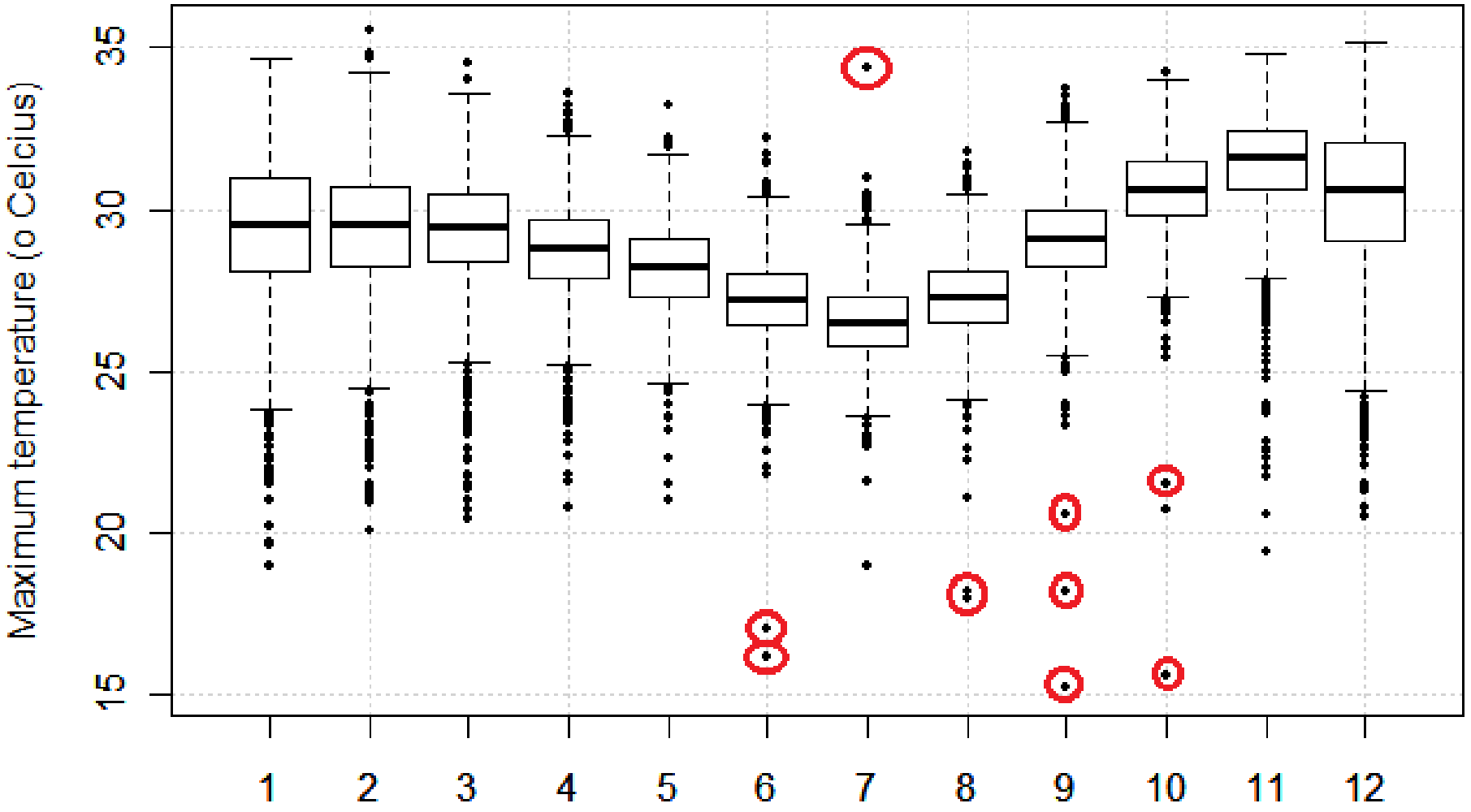
Rainfall – checking the data



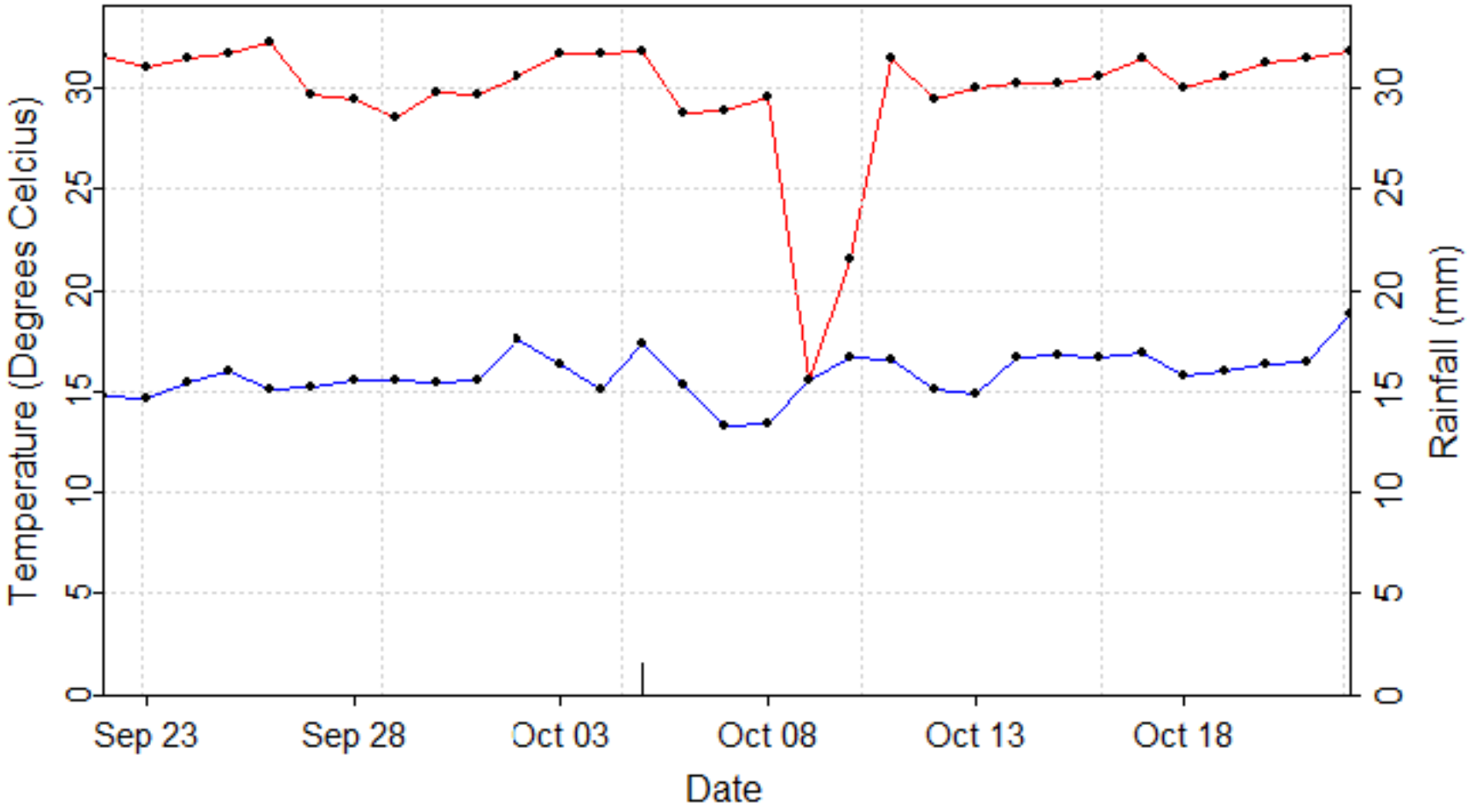
Minimum temperatures



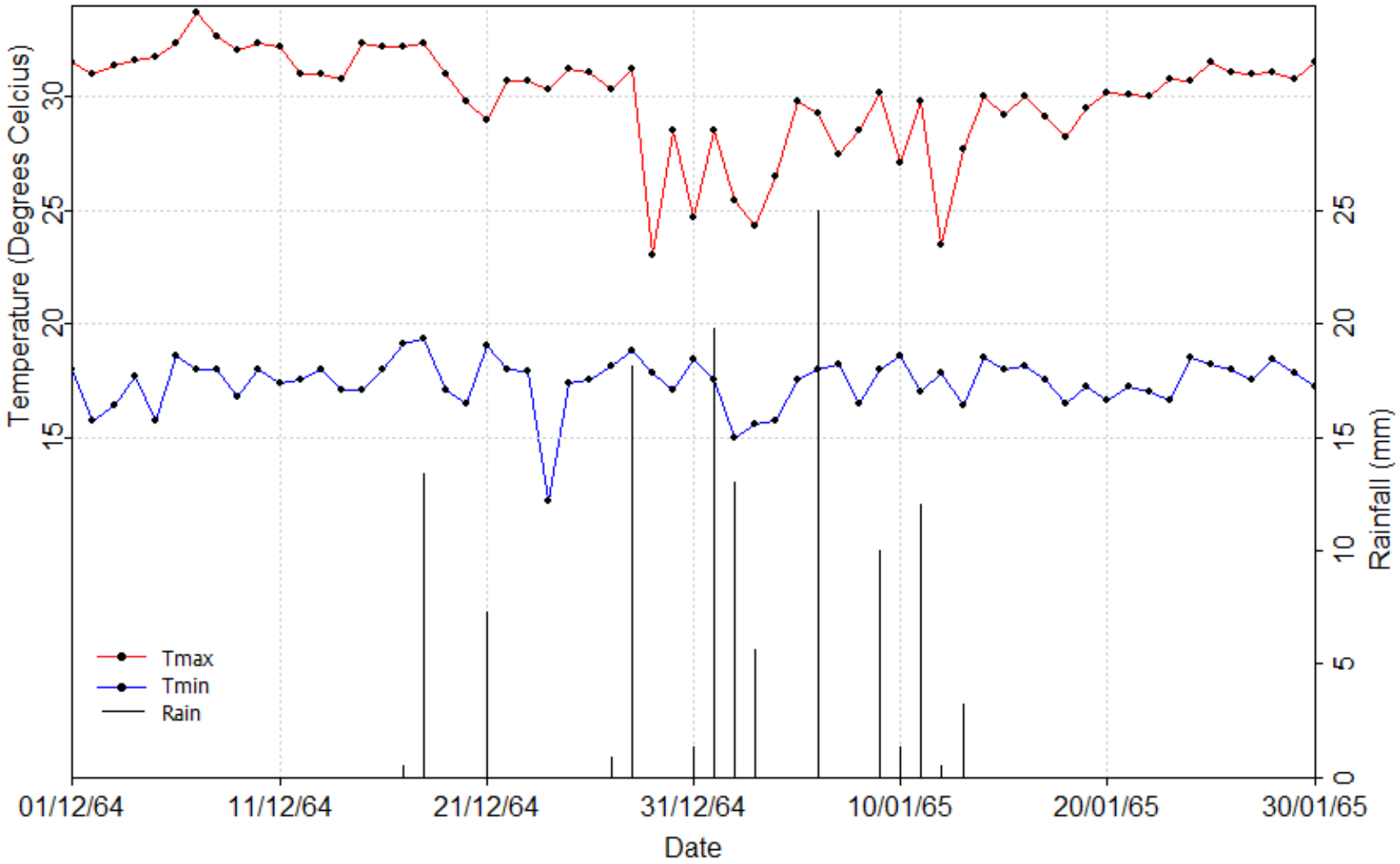
Maximum temperatures



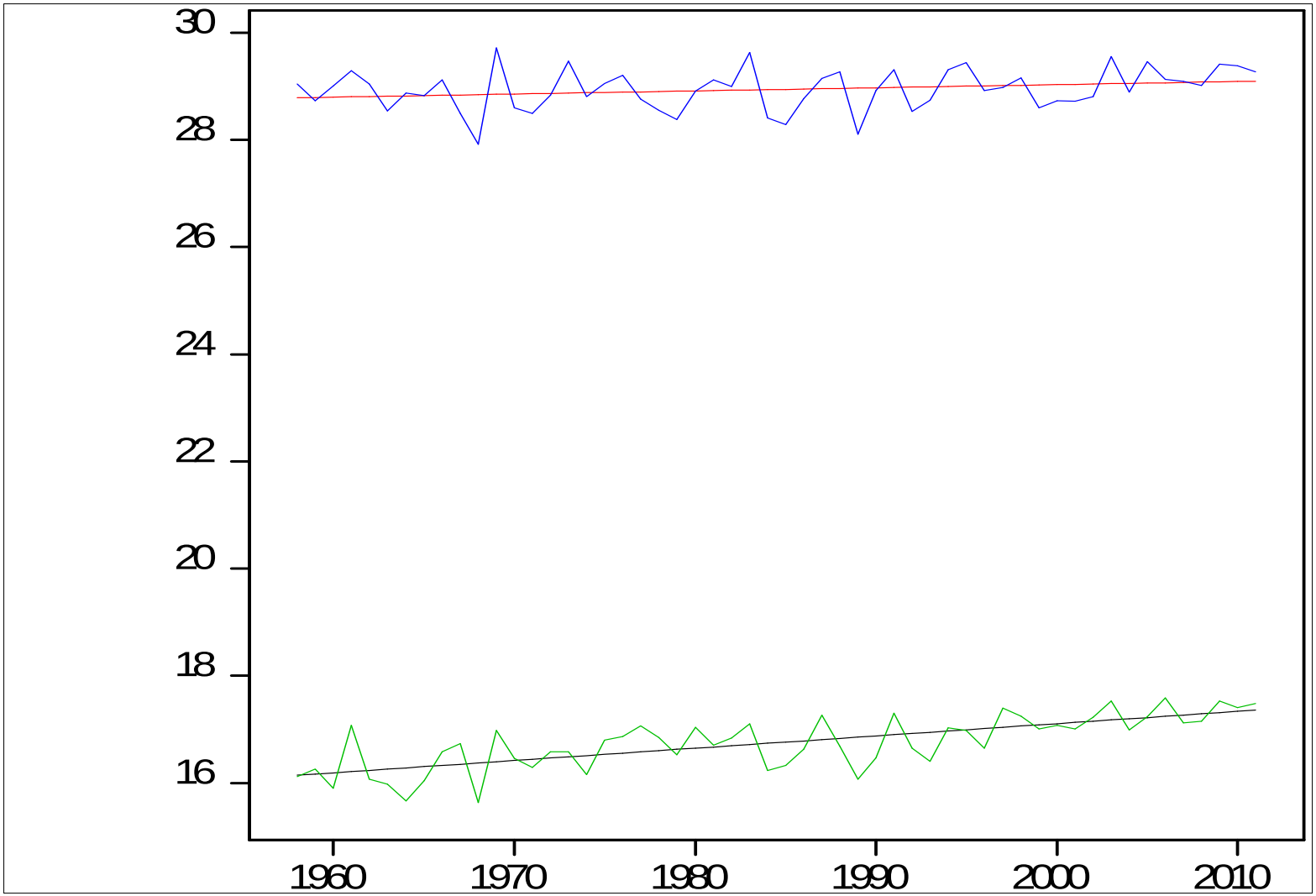
One outlier situation - 1989



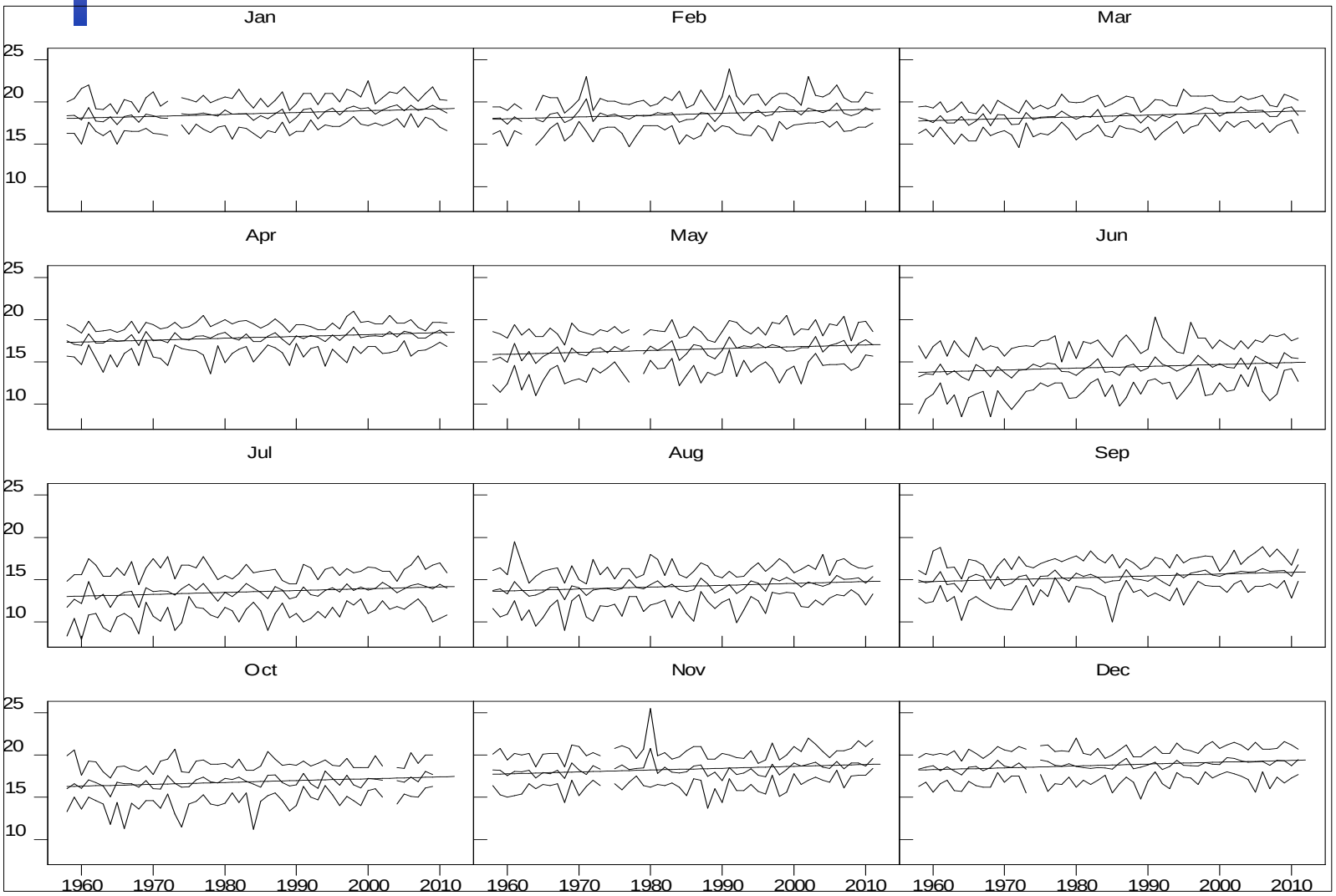
Another possible problem?



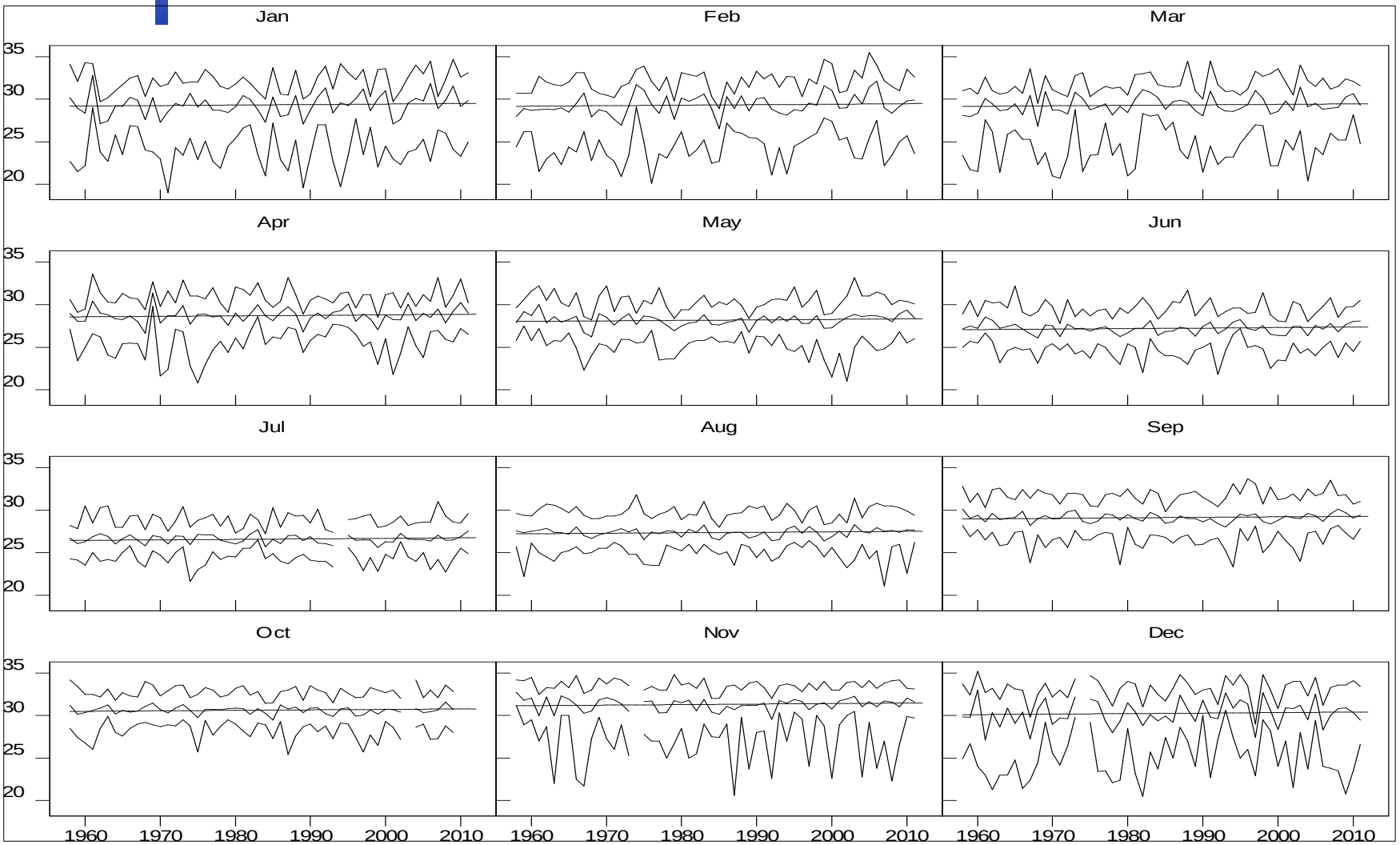
Mean annual temperatures



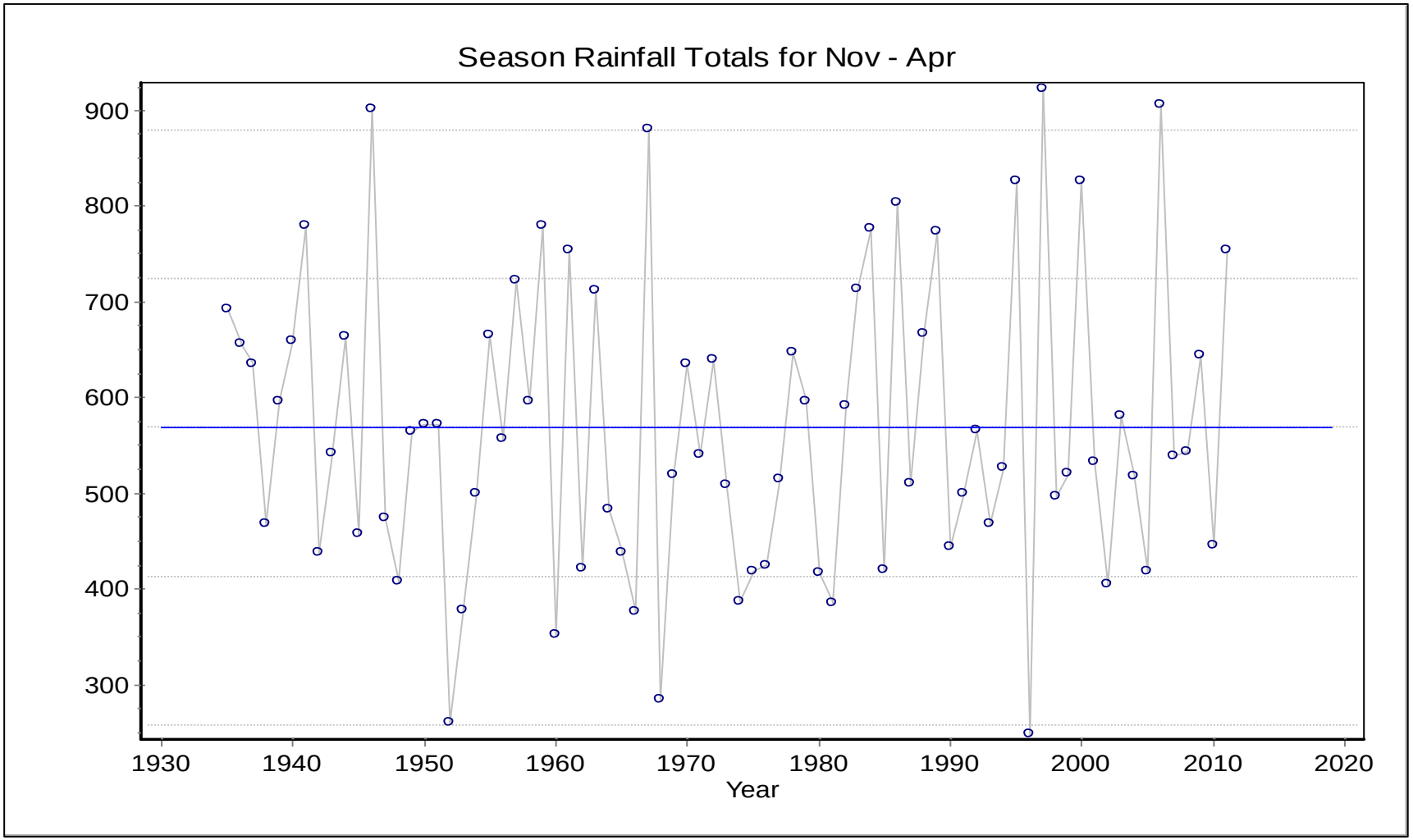
Minimum temperatures



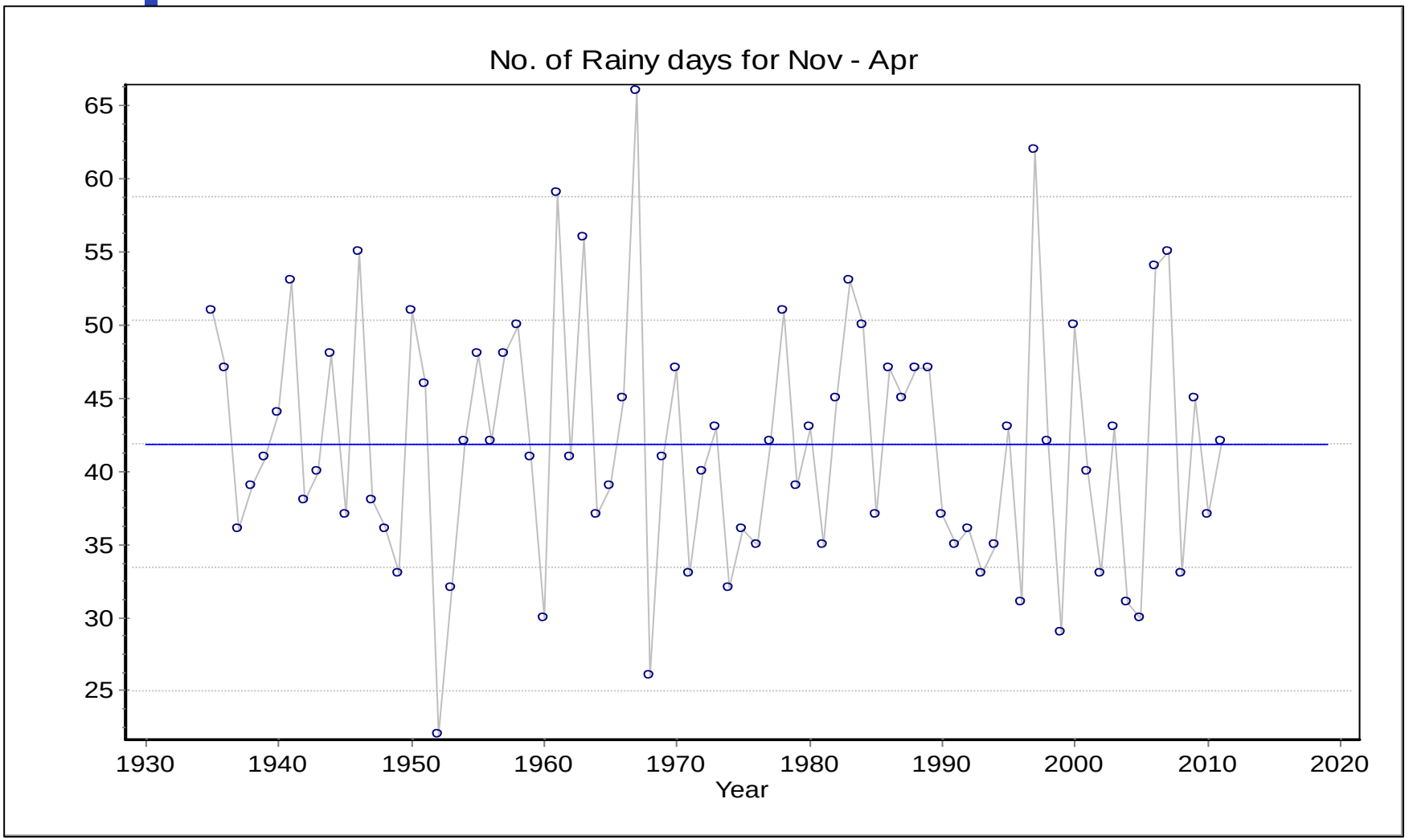
Maximum temperatures



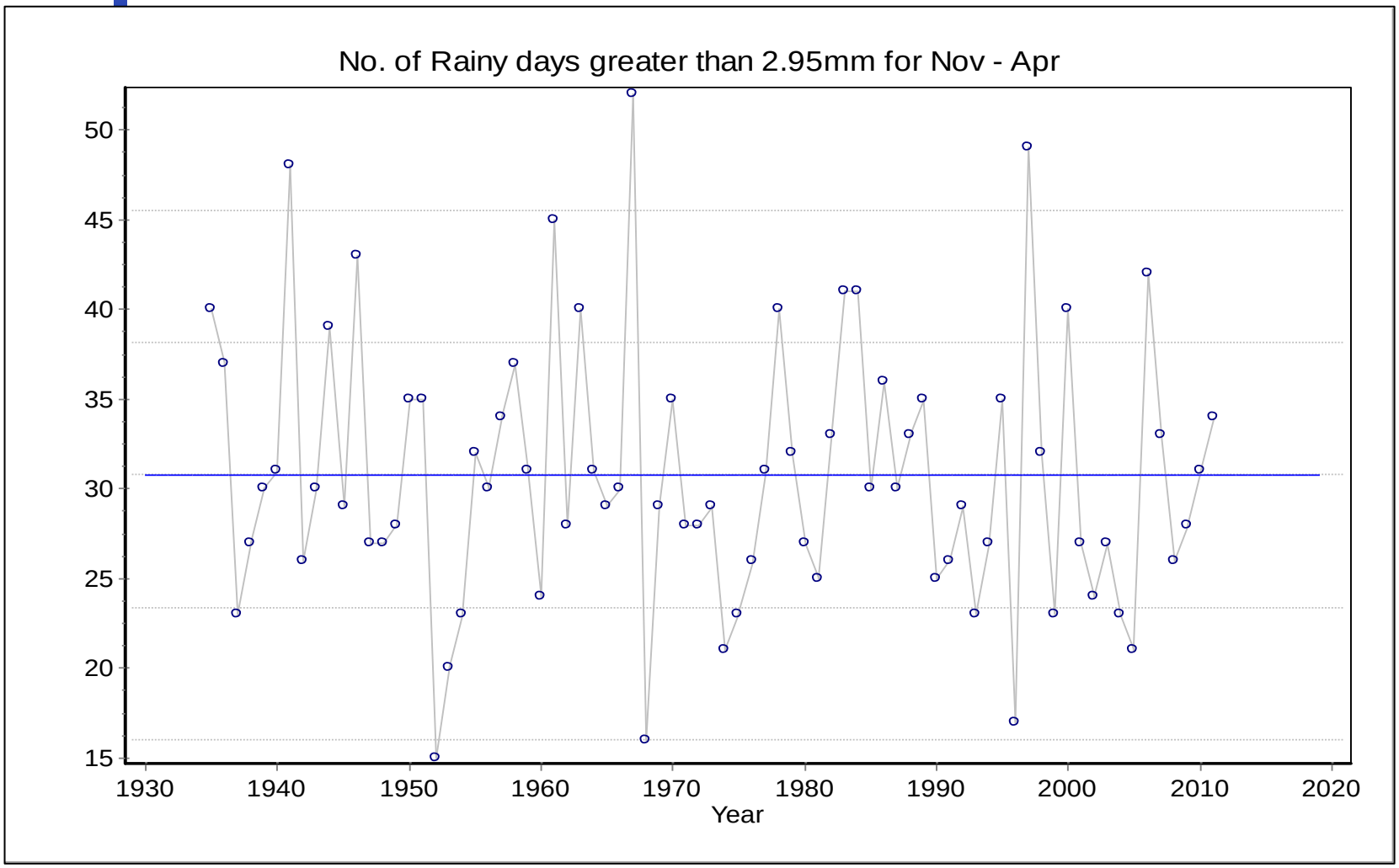
Seasonal rainfall totals



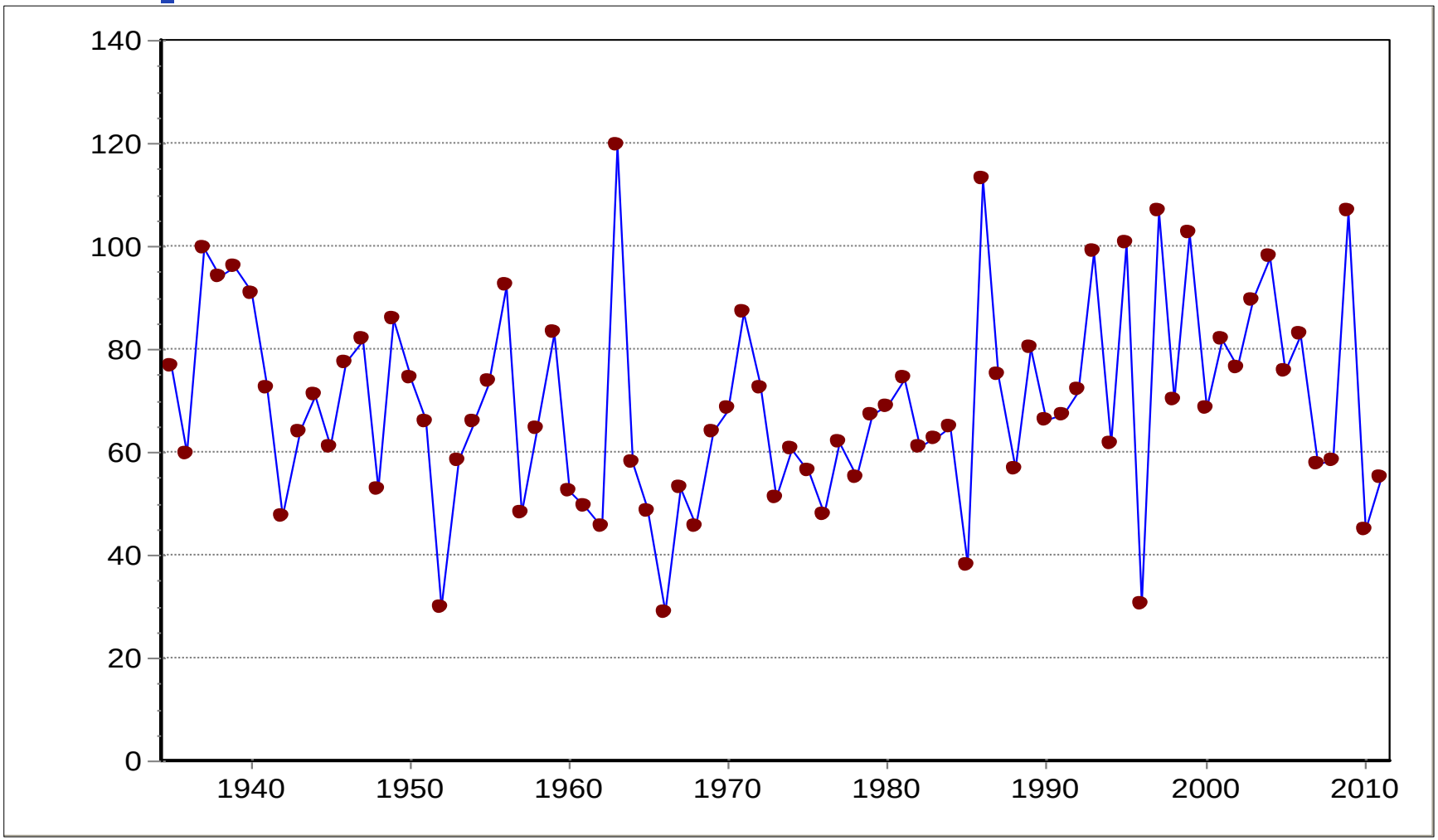
Number of rain days (1mm)



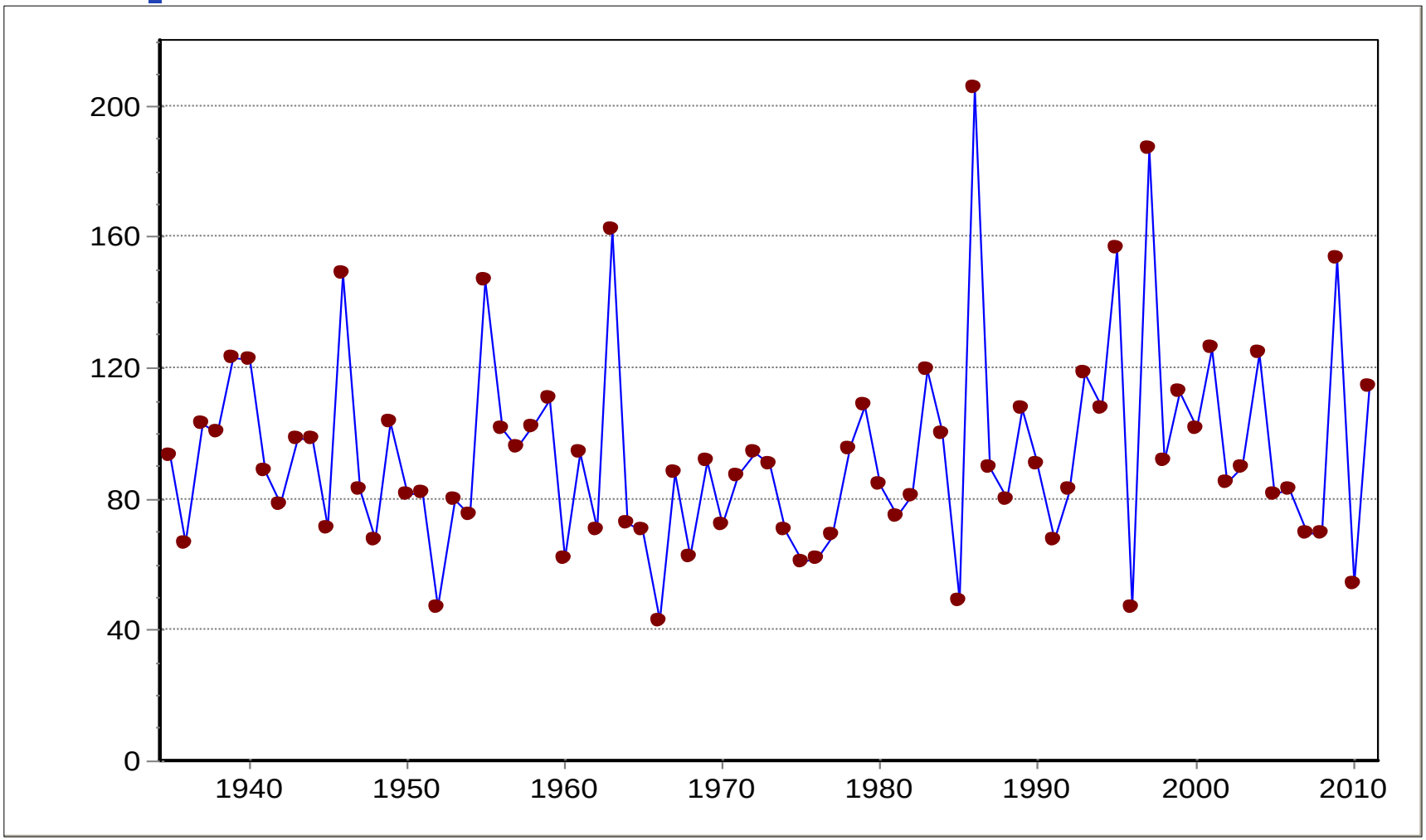
And with 3mm threshold



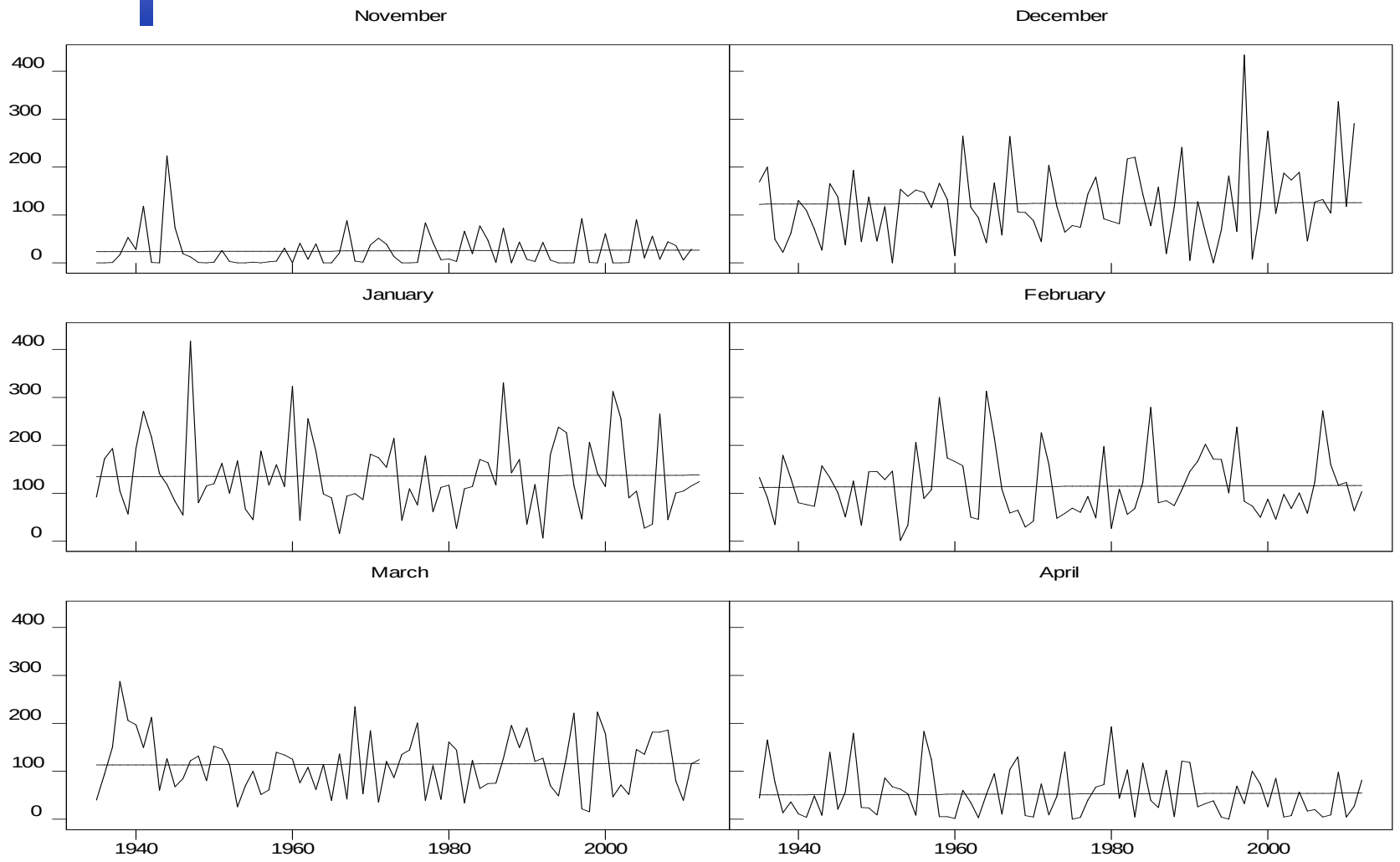
Extreme rainfall totals



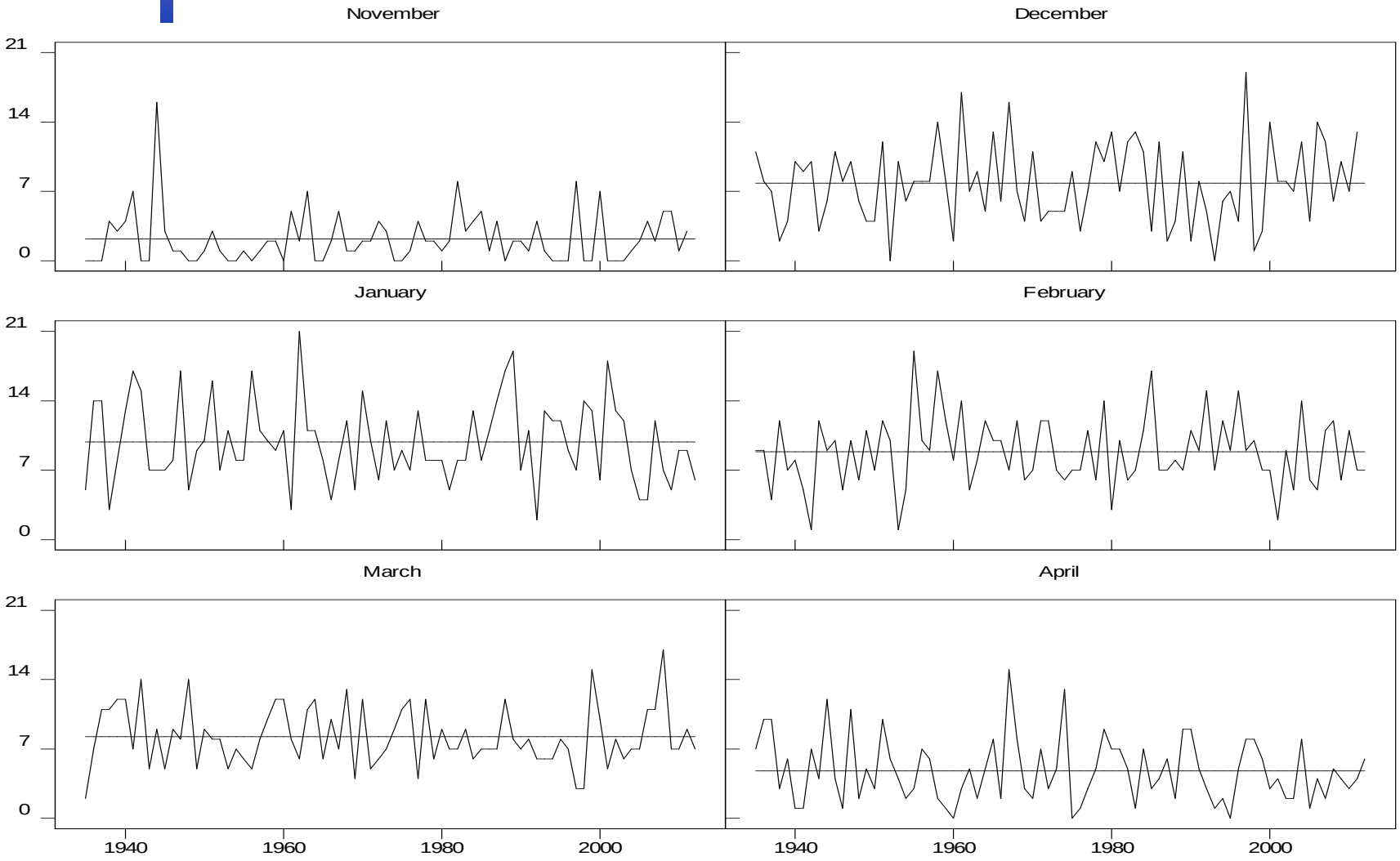
Extreme 3 day (running) totals



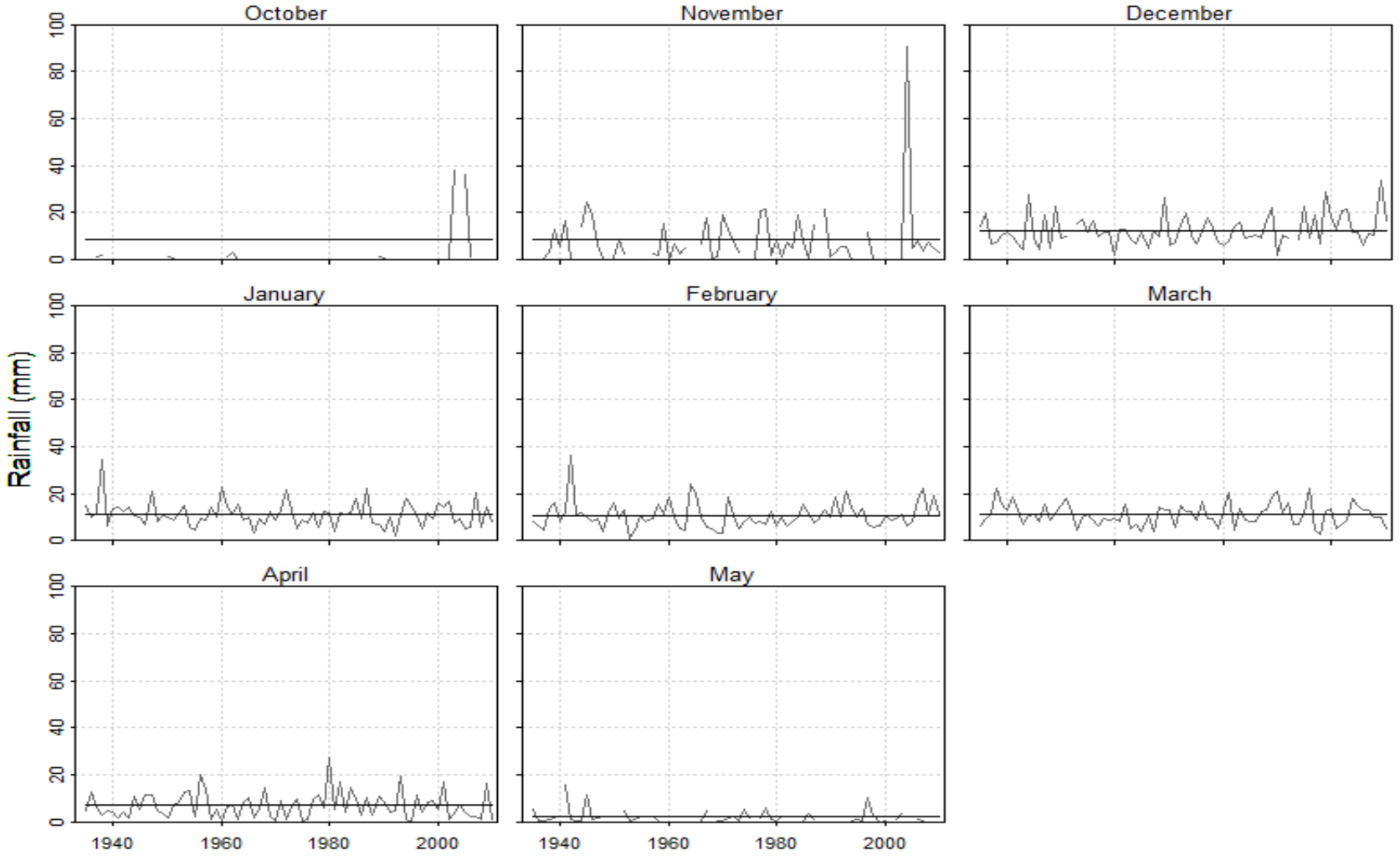
Monthly rainfall totals



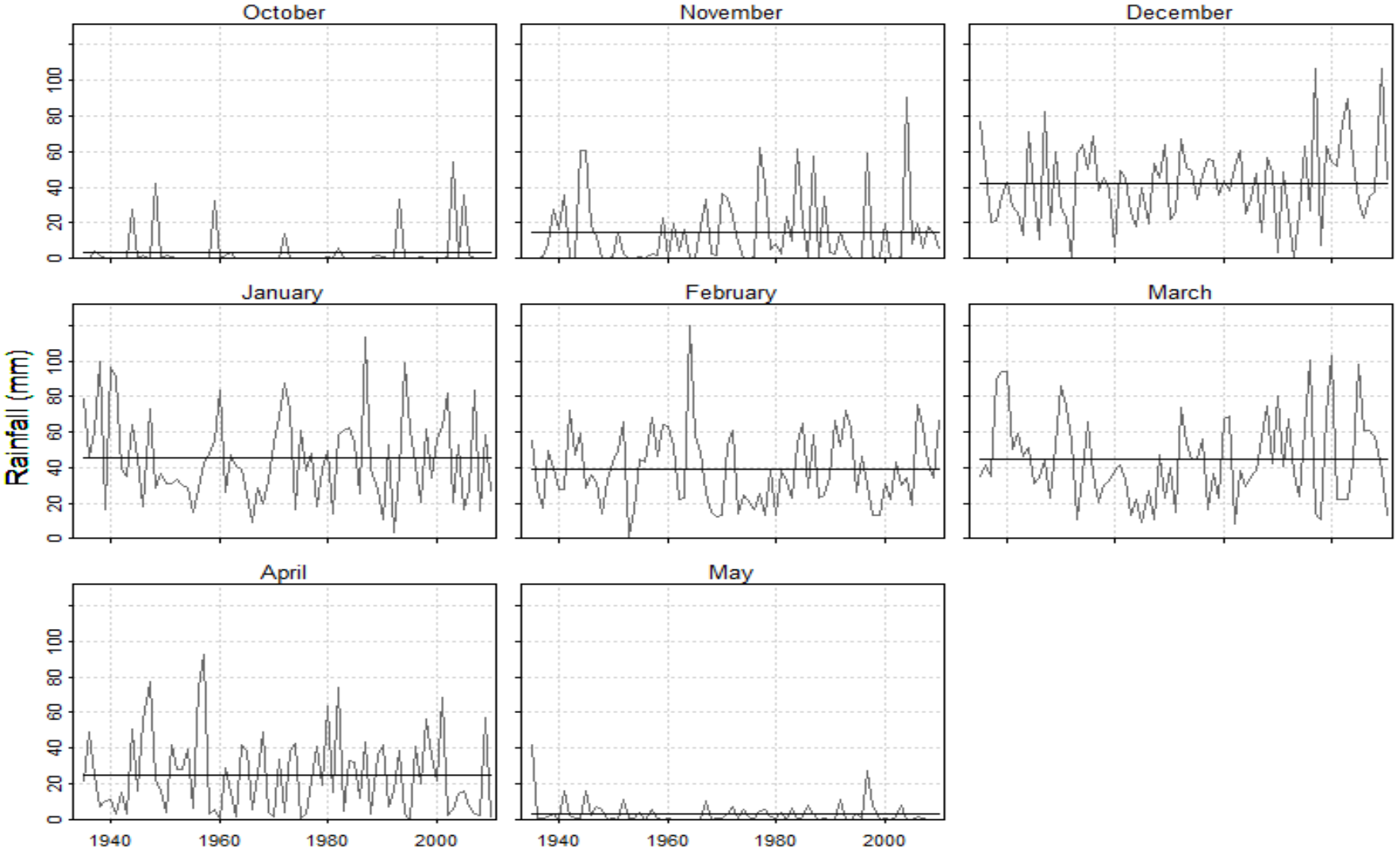
Number of rain days



Mean rain per rain day (mm)

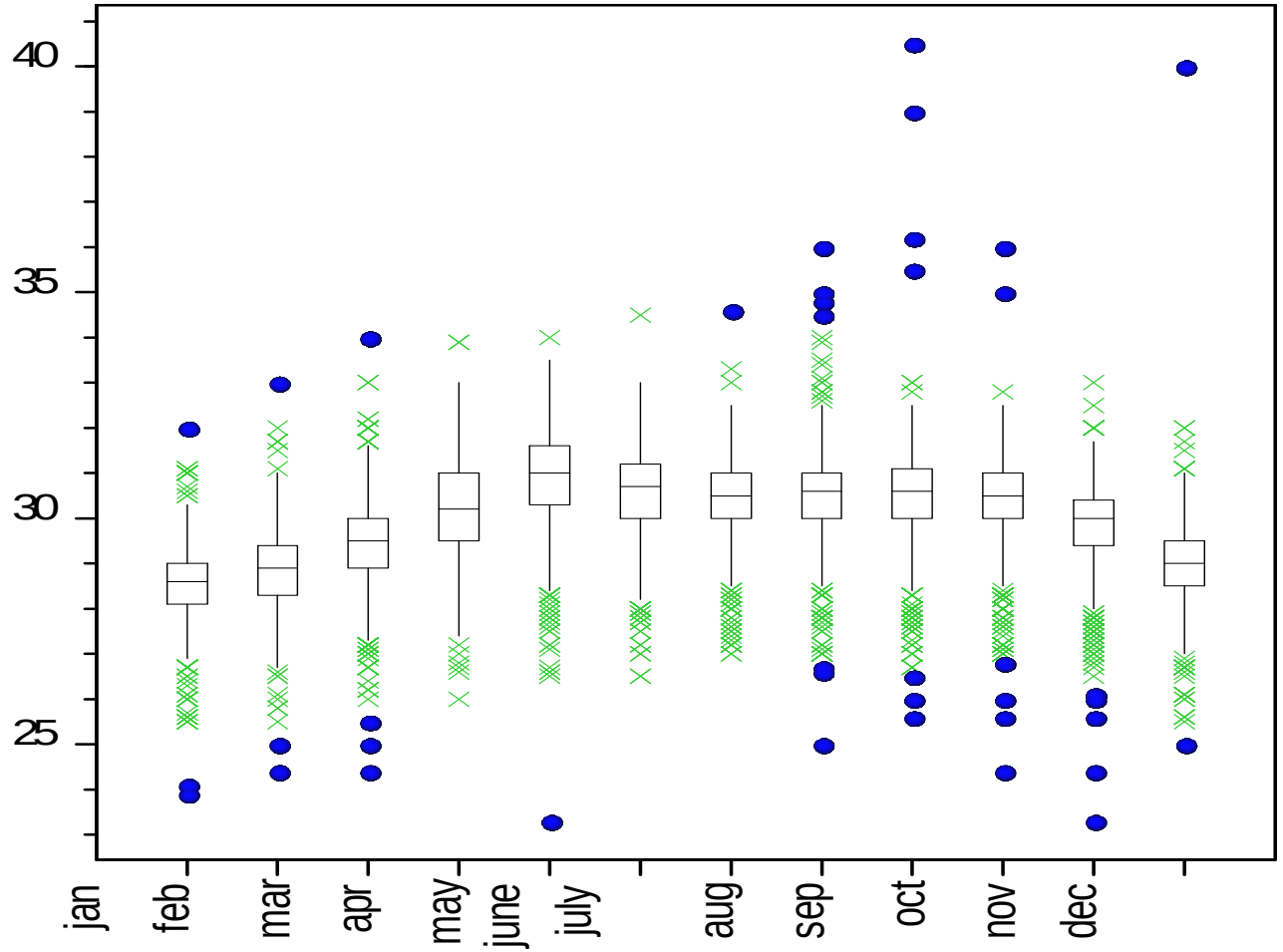


Extremes in each month



MOVING TO BARBADOS

Maximum temperatures



Values made temporarily missing

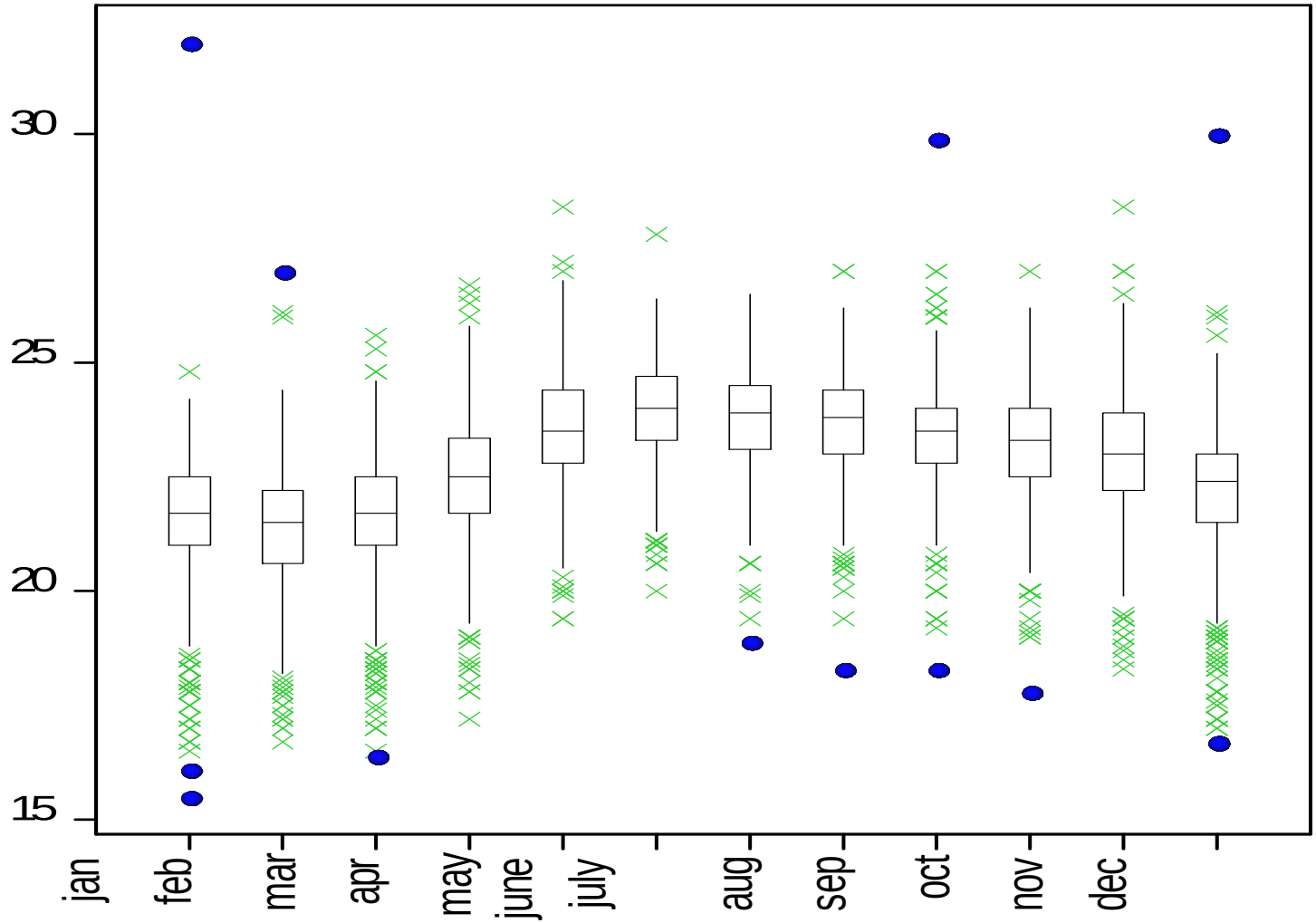
Date	Row in data	Value (degrees C)
7/9/1980	4268	39
3/12/1980	4355	40
18/5/1987	6712	23.3
8/9/1995	9747	40.5

Changes made and not made

Row	Date	Year	Month	Tmax	Tmin	Rain
4348	26/11/80	1980	nov	29	24	5.6
4349	27/11/80	1980	nov	30	23	11.9
4350	28/11/80	1980	nov	30	24	0
4351	29/11/80	1980	nov	30	23	0
4352	30/11/80	1980	nov	30	25	0
4353	01/12/80	1980	dec	30	22	7.4
4354	02/12/80	1980	dec	30	22	1
4355	03/12/80	1980	dec	40*	23	0
4356	04/12/80	1980	dec	30	22	0.3
4357	05/12/80	1980	dec	30	22	0
4358	06/12/80	1980	dec	30	21	0
4359	07/12/80	1980	dec	29	23	37.3
4360	08/12/80	1980	dec	32	22	2.8

Row	Date	Year	Month	Tmax	Tmin	Rain
5767	15/10/84	1984	oct	30.7	23.9	0
5768	16/10/84	1984	oct	30.5	23.3	0
5769	17/10/84	1984	oct	30	23.5	4.8
5770	18/10/84	1984	oct	30	23	5.1
5771	19/10/84	1984	oct	26.8	23	0
5772	20/10/84	1984	oct	29.7	22.8	7.5
5773	21/10/84	1984	oct	35	21	0
5774	22/10/84	1984	oct	31.1	23.8	0
5775	23/10/84	1984	oct	36	22.5	22
5776	24/10/84	1984	oct	29.6	22.8	0.7
5777	25/10/84	1984	oct	30.2	22.5	10
5778	26/10/84	1984	oct	31.5	21	6.2

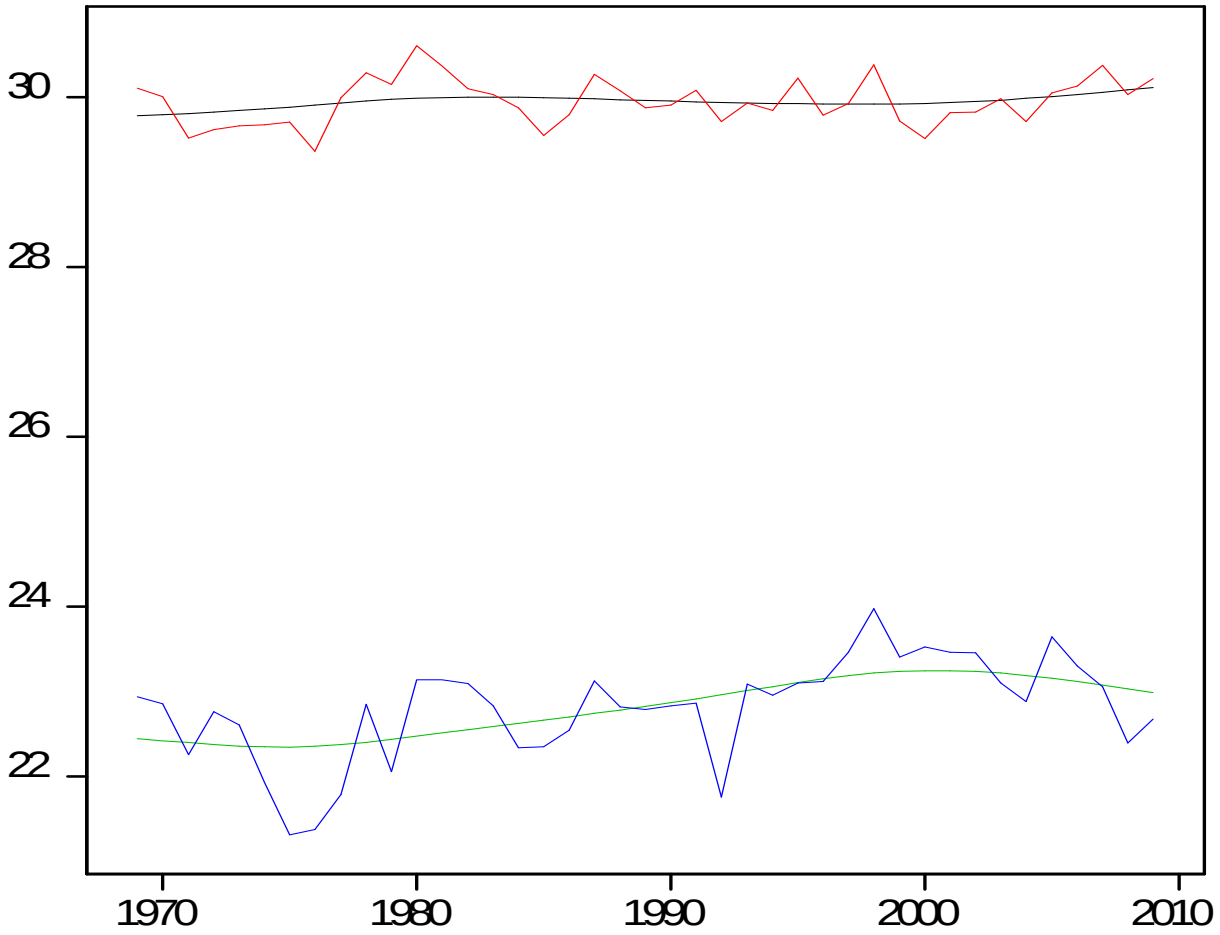
Minimum temperatures



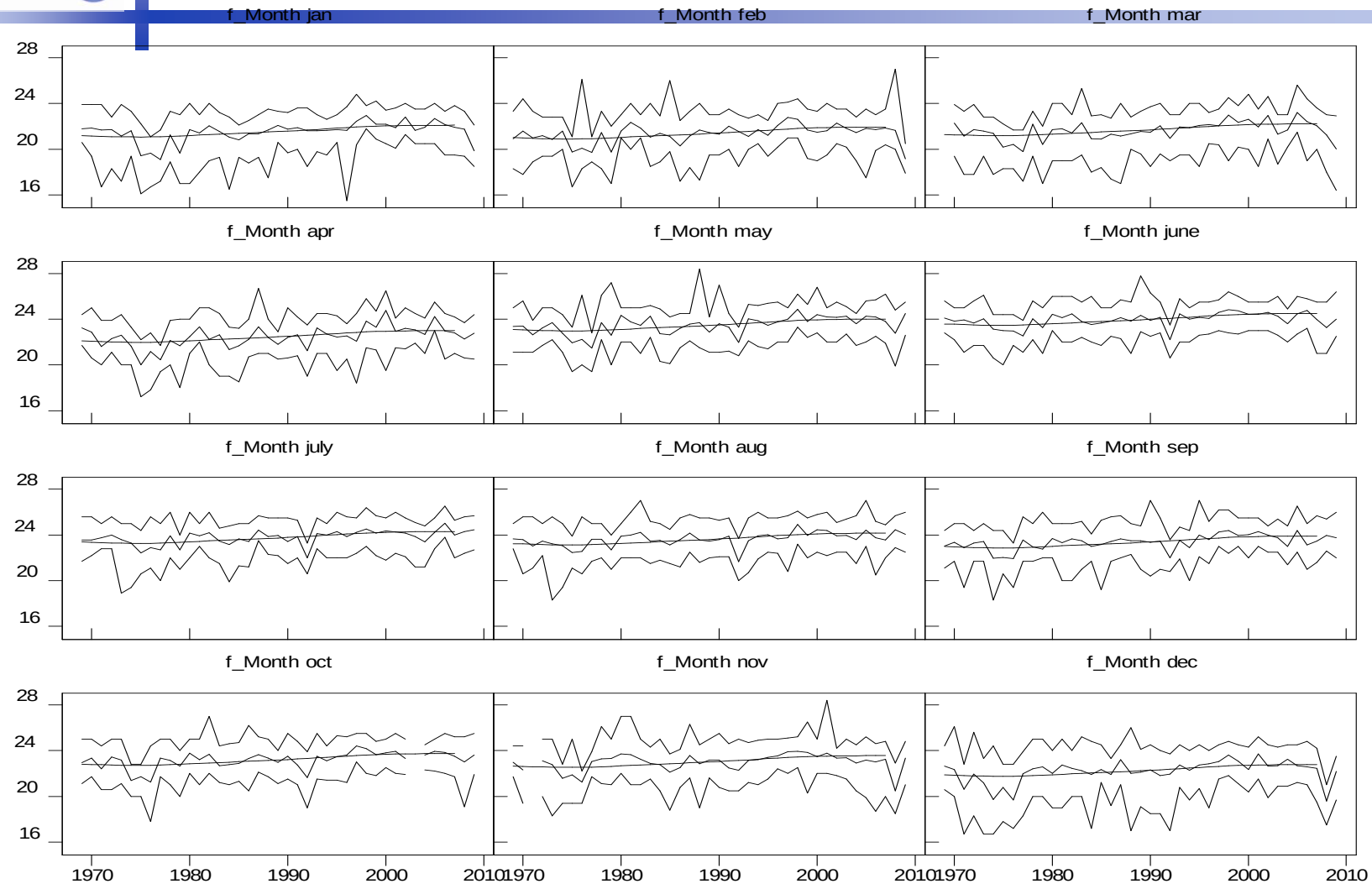
Example of a change made

Row	Date	Year	Month	Tmax	Tmin	Rain
13509	26/12/05	2005	dec	28.7	22.4	0.3
13510	27/12/05	2005	dec	28.5	22	1.3
13511	28/12/05	2005	dec	28.8	22	0
13512	29/12/05	2005	dec	27.9	21.2	3.1
13513	30/12/05	2005	dec	28.2	21.6	0.6
13514	31/12/05	2005	dec	28.6	22.5	0.6
13515	01/01/06	2006	jan	28.2	32*	1.8
13516	02/01/06	2006	jan	27.5	23.3	5.8
13517	03/01/06	2006	jan	28	22.5	20.6
13518	04/01/06	2006	jan	28.4	22.5	0
13519	05/01/06	2006	jan	28.7	21	0.1
13520	06/01/06	2006	jan	28.2	21.4	0

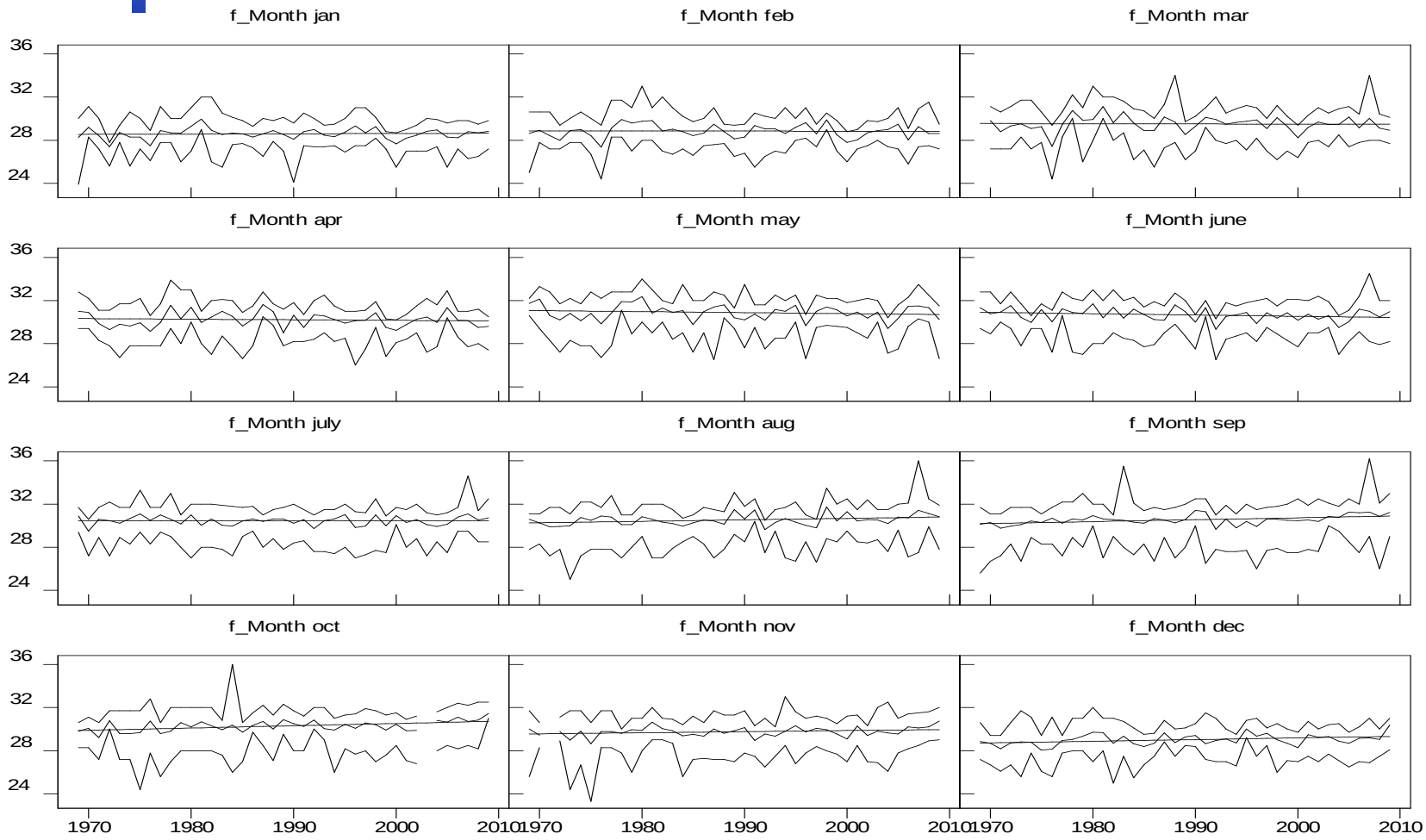
Annual temperature means



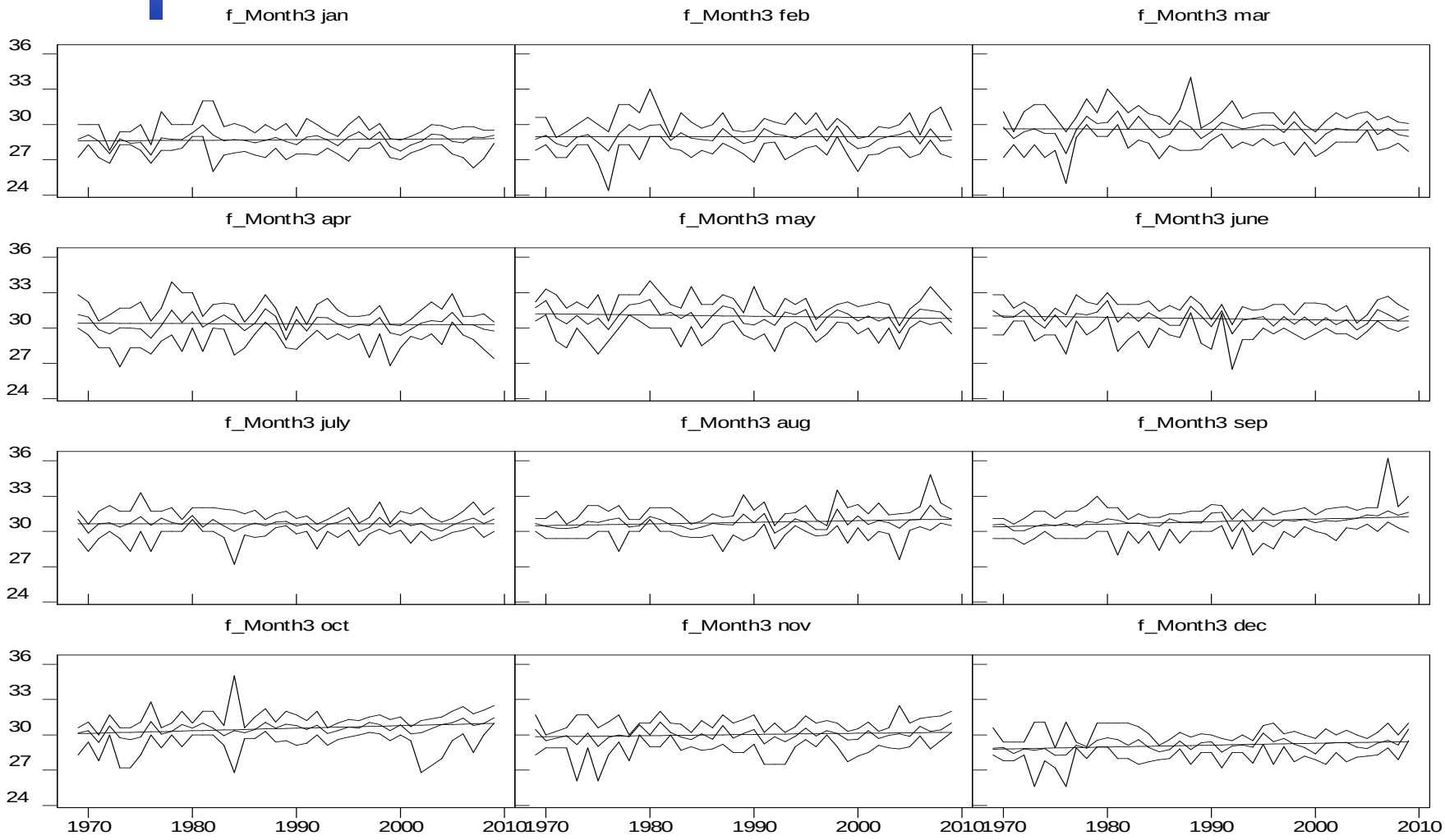
Trends in minimum temperatures



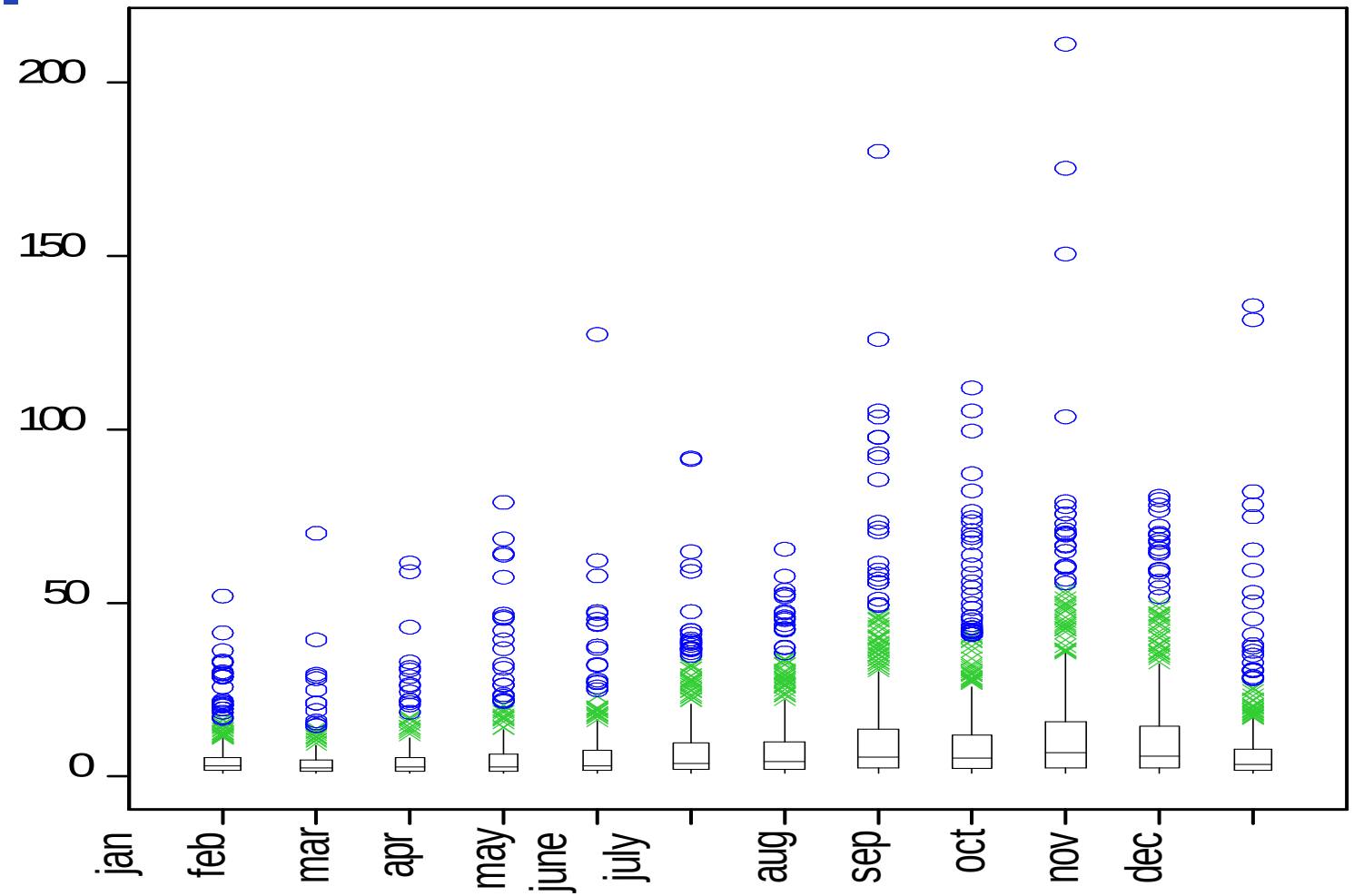
Maximum temperatures



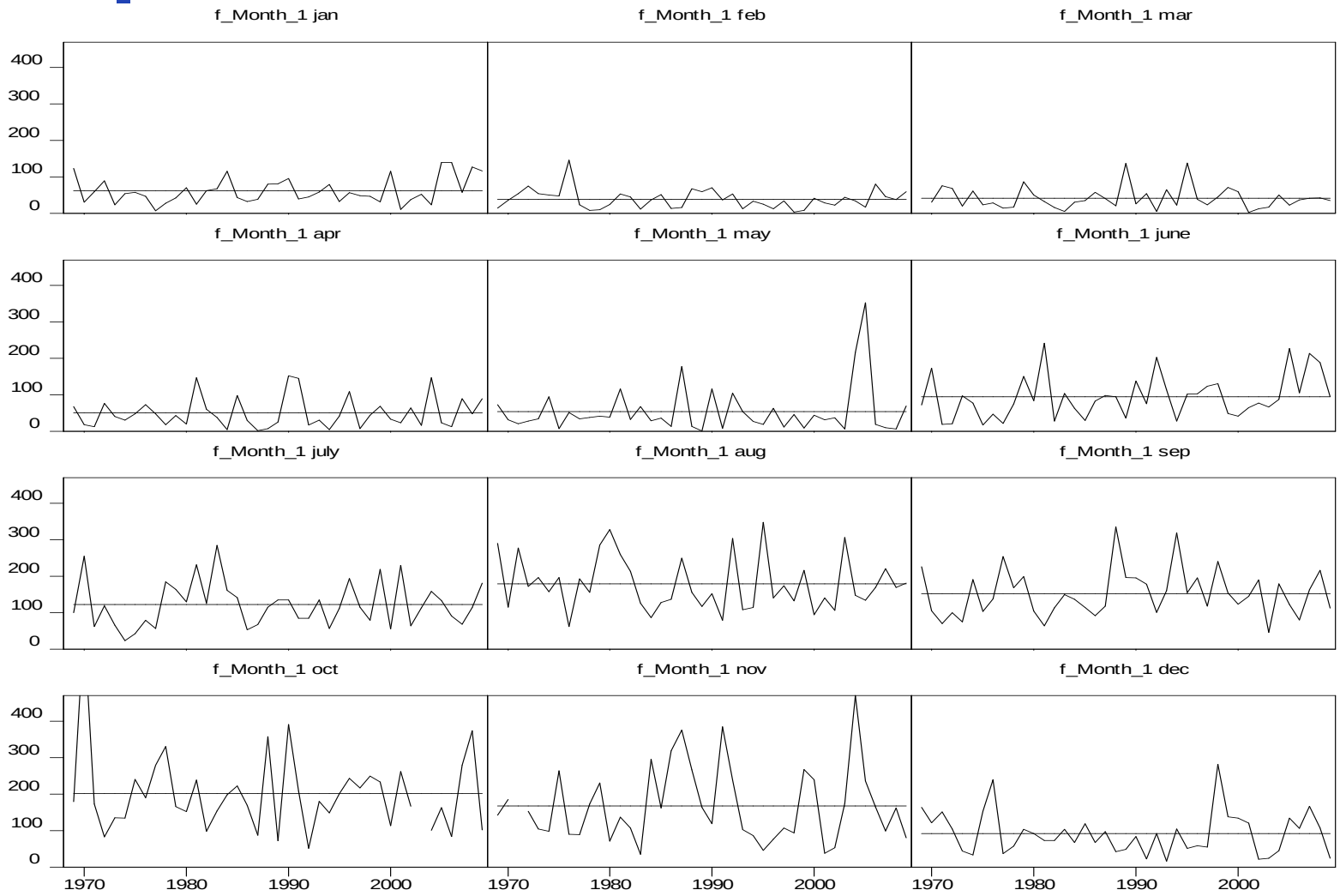
Max temp on dry days only



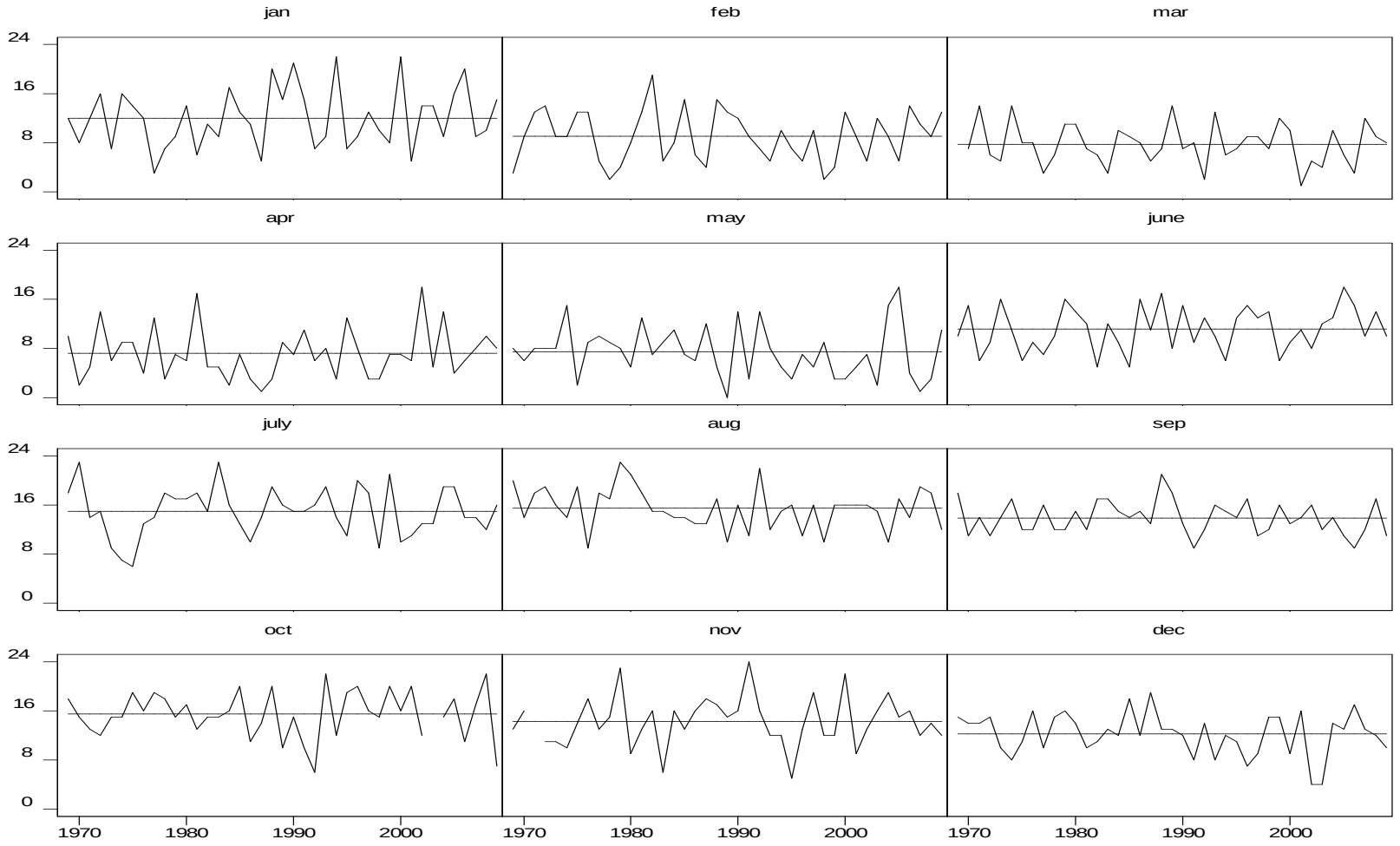
Rainfall


200
150
100
50
0
jan
feb
mar
apr
may
june
july
aug
sep
oct
nov
dec

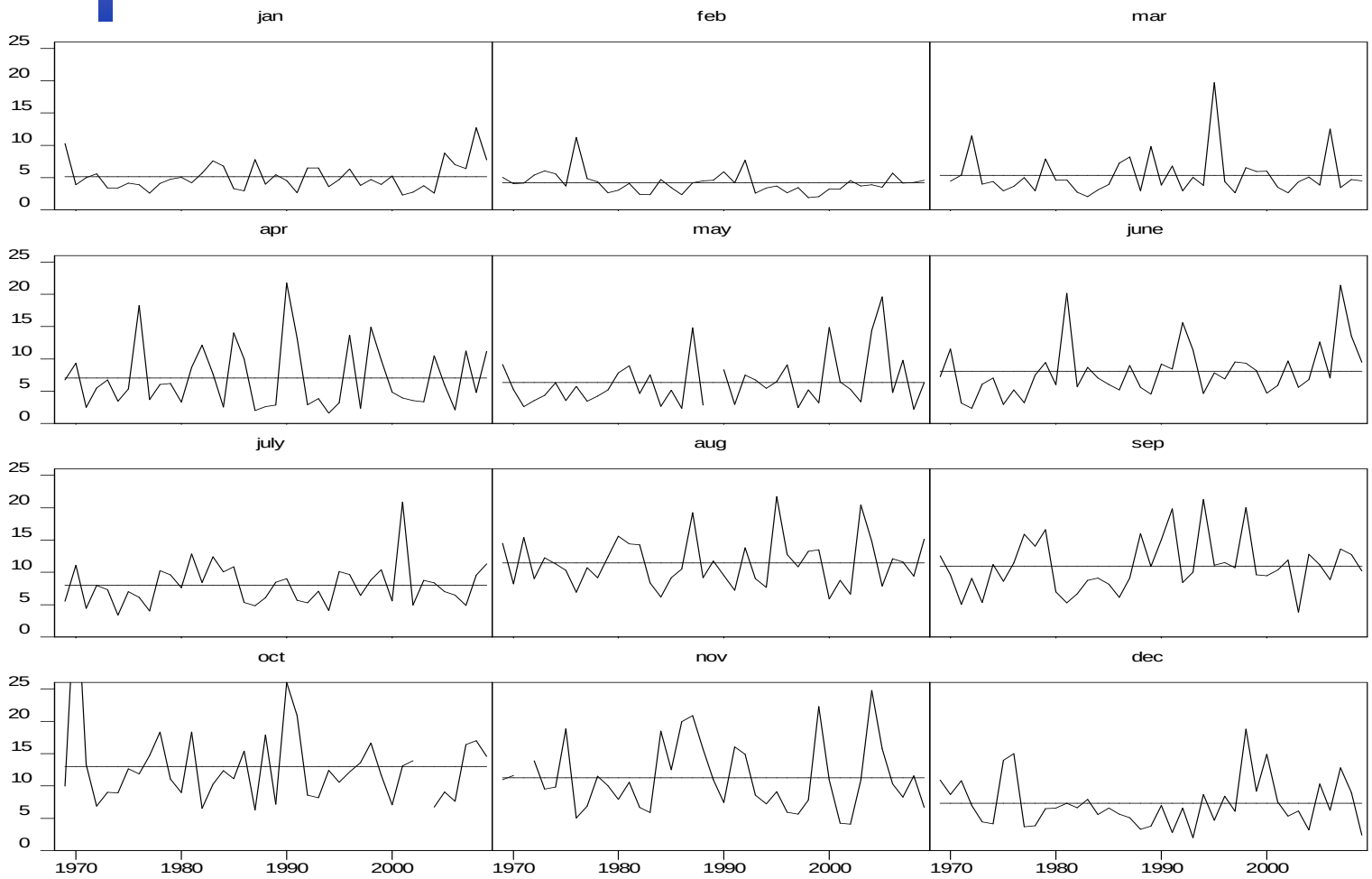
Rainfall totals



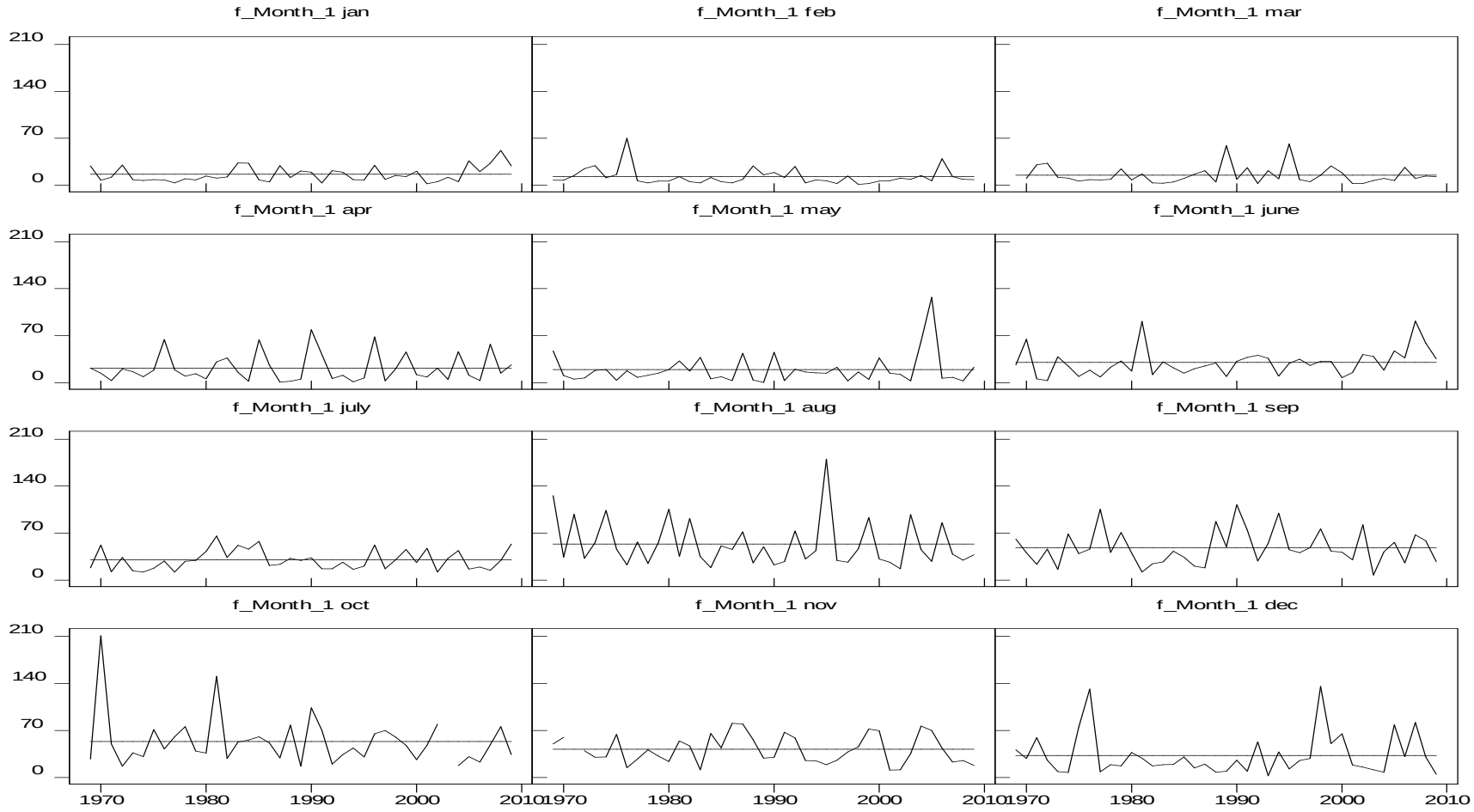
Number of rain days



Mean rain per rain day



Rainfall extremes



Tropical storms - 1970

Row	Date	Year	Month	Tmax	Tmin	Rain
632	24/09/70	1970	sep	30.6	21.7	0
633	25/09/70	1970	sep	30.6	25	0
634	26/09/70	1970	sep	30.6	23.9	0
635	27/09/70	1970	sep	28.9	22.8	13.2
636	28/09/70	1970	sep	29.4	23.3	1.5
637	29/09/70	1970	sep	29.4	23.3	8.1
638	30/09/70	1970	sep	29.4	22.8	8.9
639	01/10/70	1970	oct	*	*	175.3
640	02/10/70	1970	oct	*	*	211.1
641	03/10/70	1970	oct	28.9	*	36.1
642	04/10/70	1970	oct	*	23.3	72.9
643	05/10/70	1970	oct	28.3	*	25.6
644	06/10/70	1970	oct	*	23.3	26.4
645	07/10/70	1970	oct	29.4	*	0.8
646	08/10/70	1970	oct	29.4	23.9	4.3

Tailored products – for agriculture

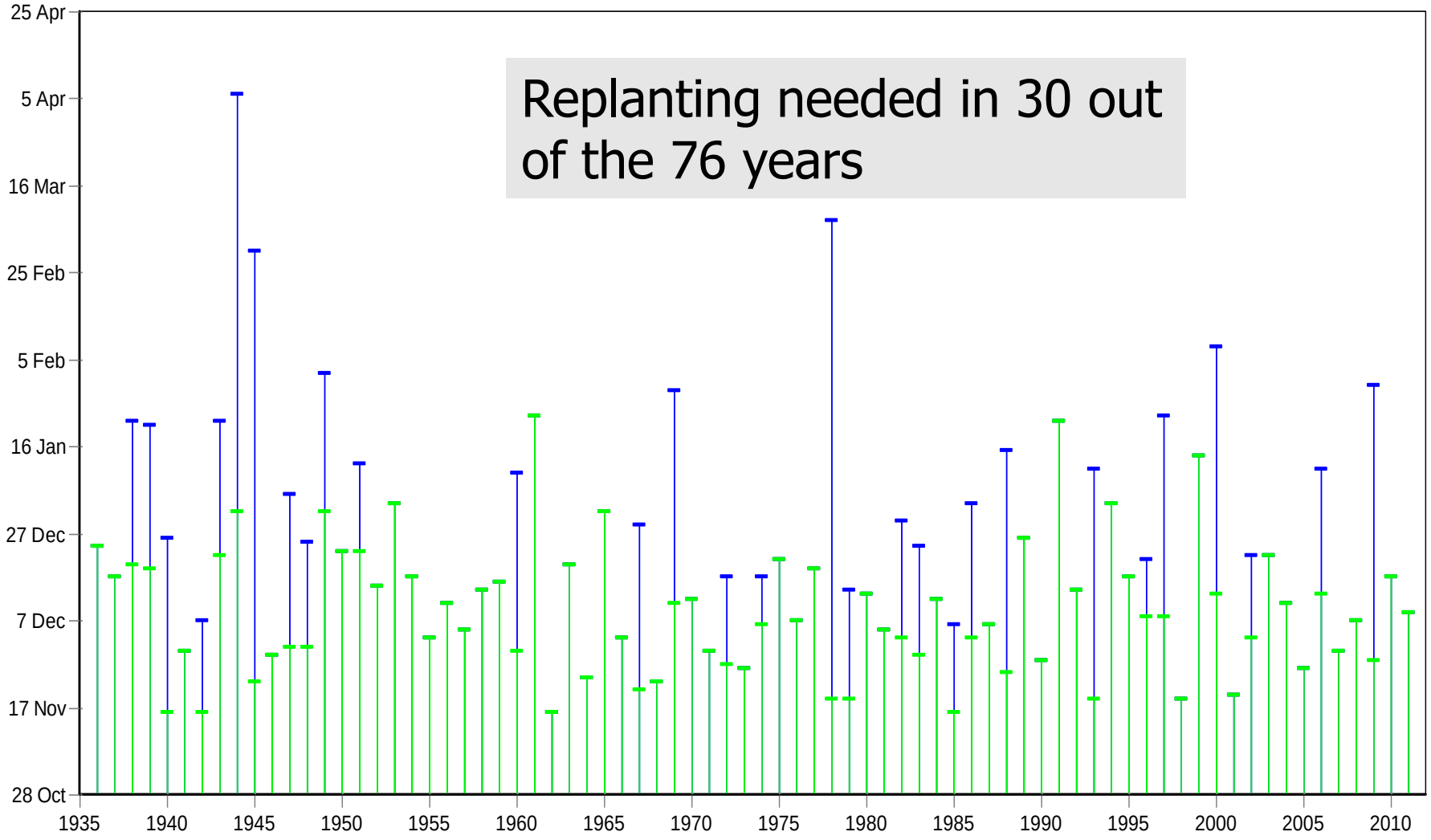
BACK TO TANZANIA

Tailored product – start of the rains

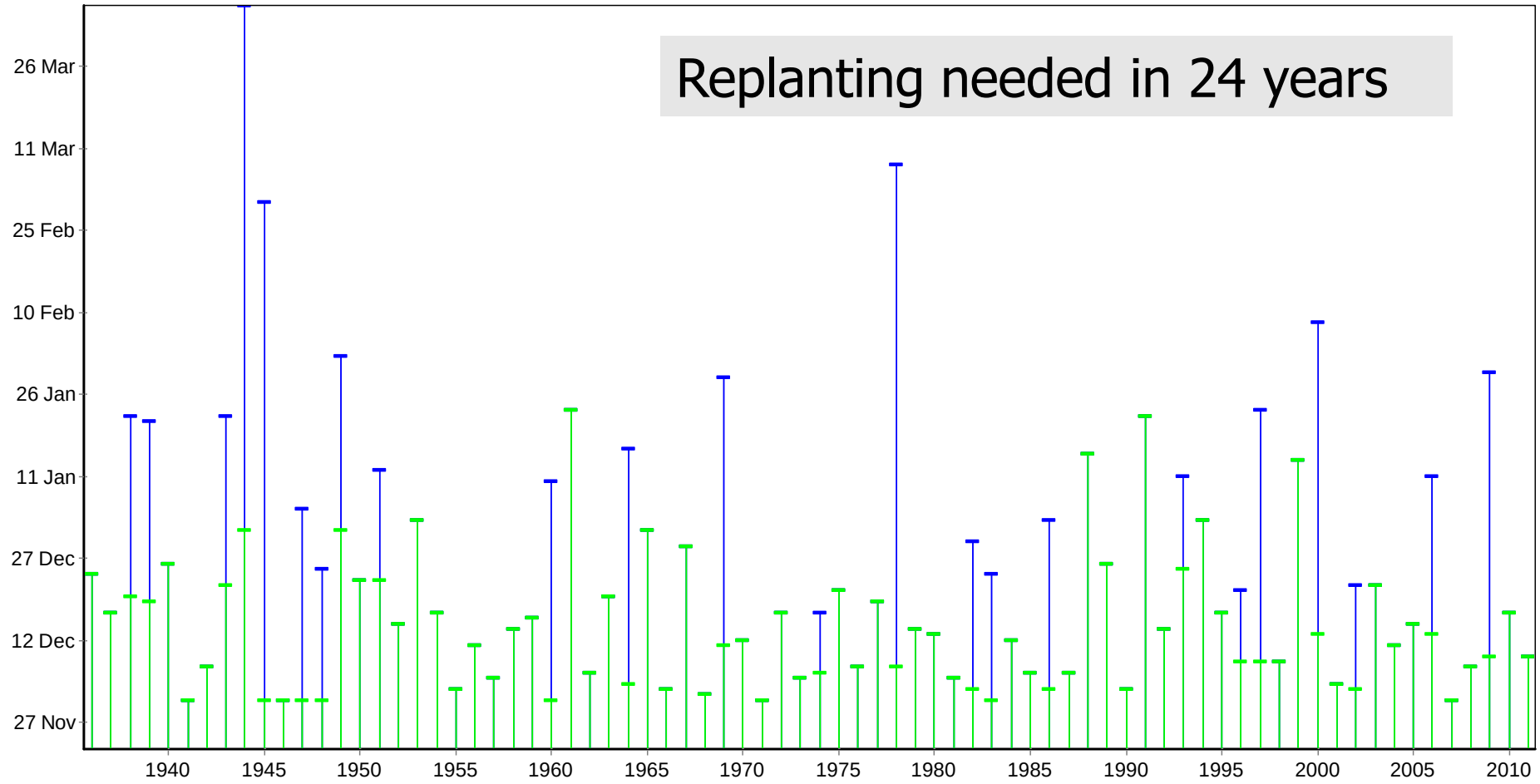
- Defined as first time from 16 November that 3-day total exceeds 20mm
- That defines a planting opportunity

- Also as above but additionally
- No dry spell exceeding 9 days in the following 21 days
- That defines the successful opportunity

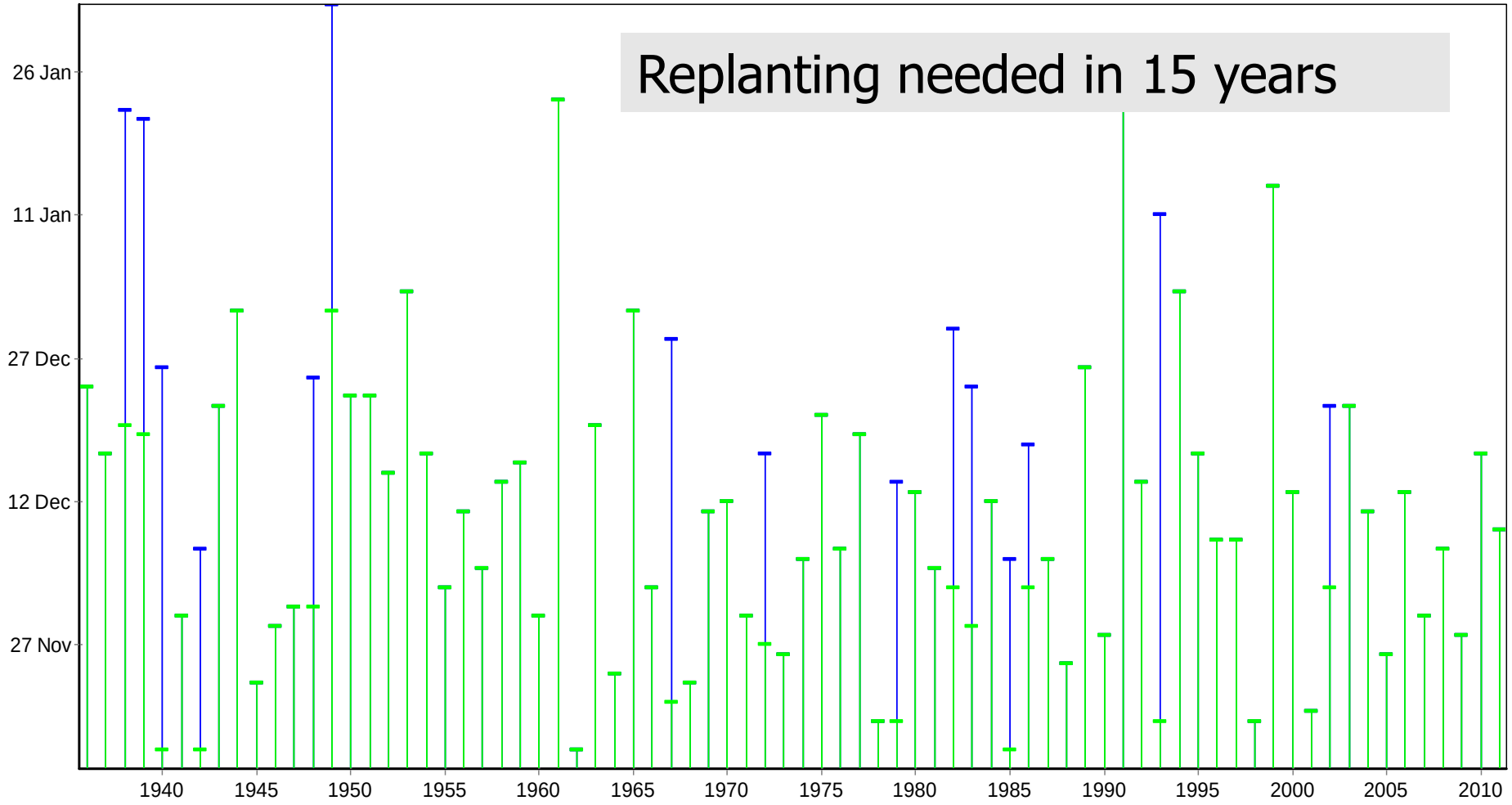
Start of rains 1935-6 to 2010-11



Change earliest start to 1 Dec



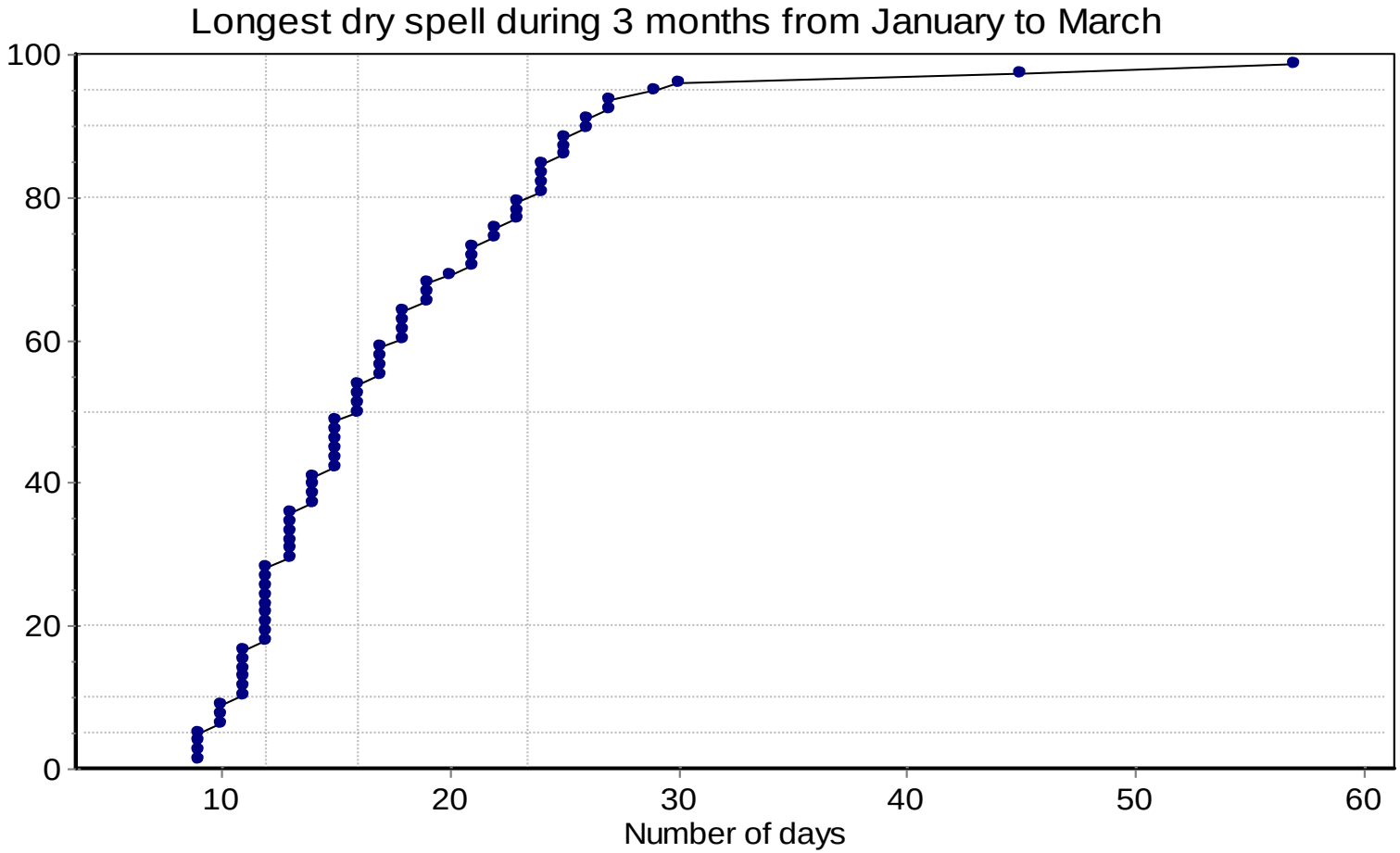
Change spell by 3 days



Further analyses

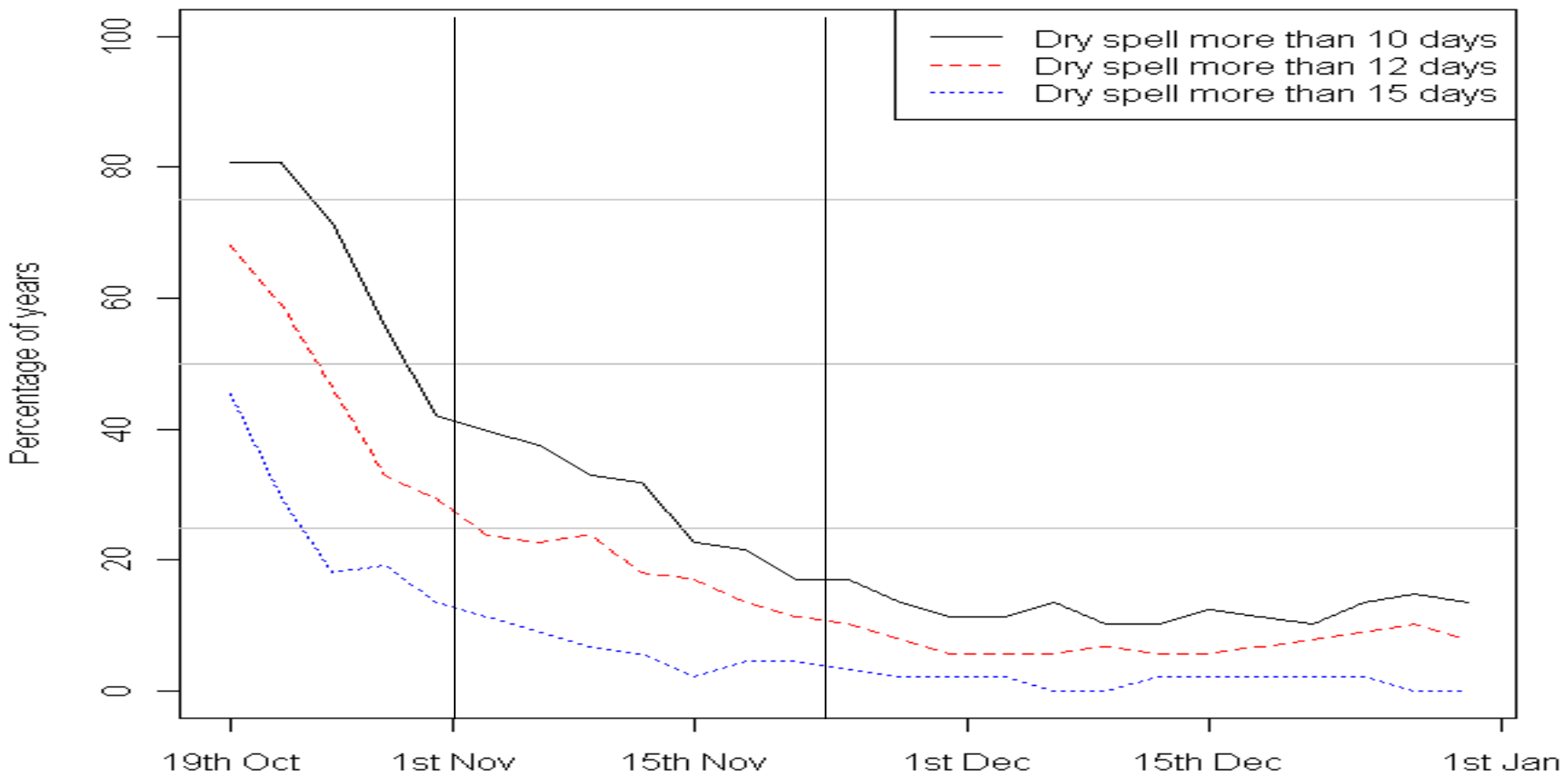
- This is just the start!
- Other tailored products are on:
  - Dry spells through the season
  - Dry spells round flowering
  - Rain amounts and rain days in the season
  - End and length of the season
  - Etc
- In each case to find the relevant risks
- All depending on the objectives

Dry spell risk during the season

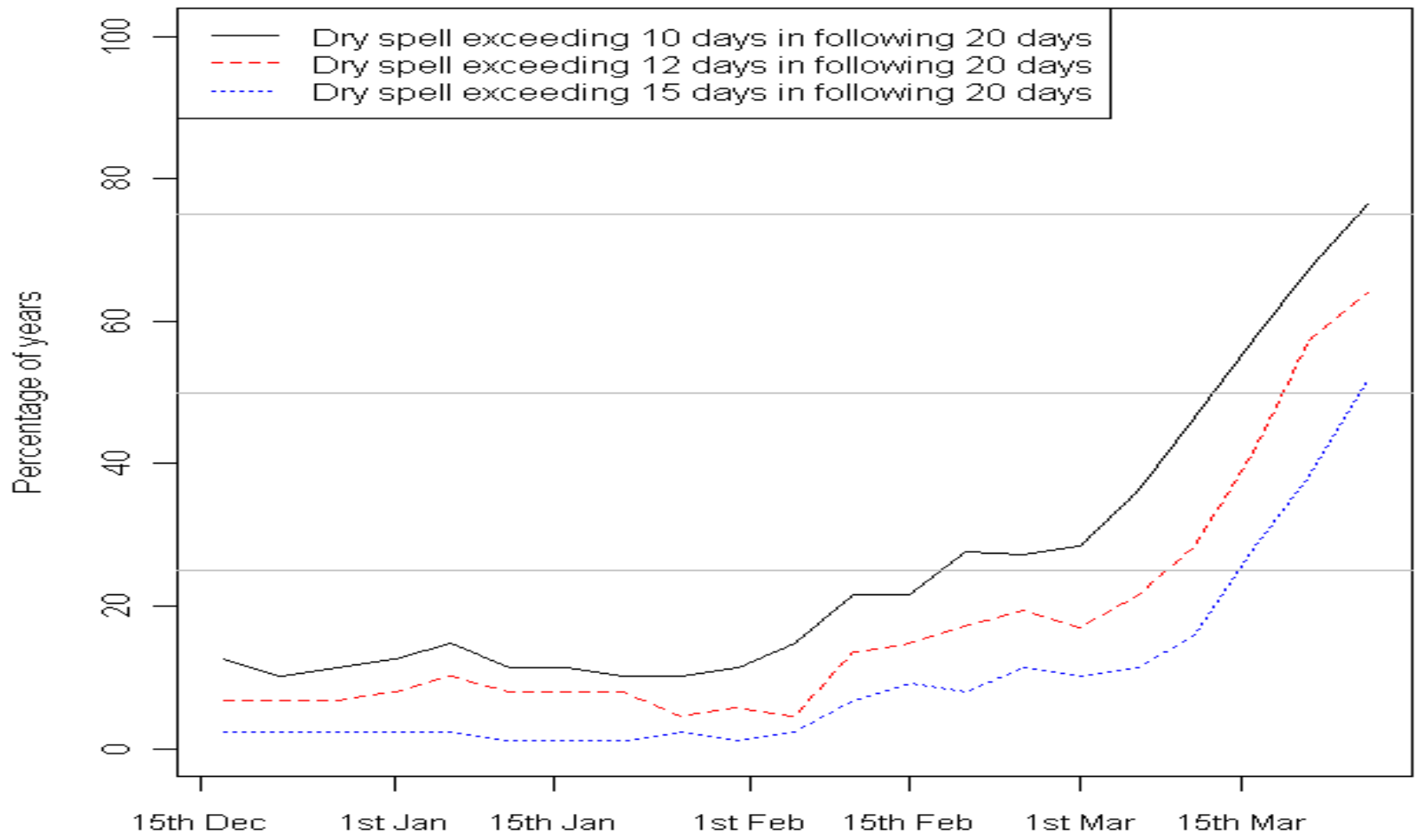


Risk of a long dry spell

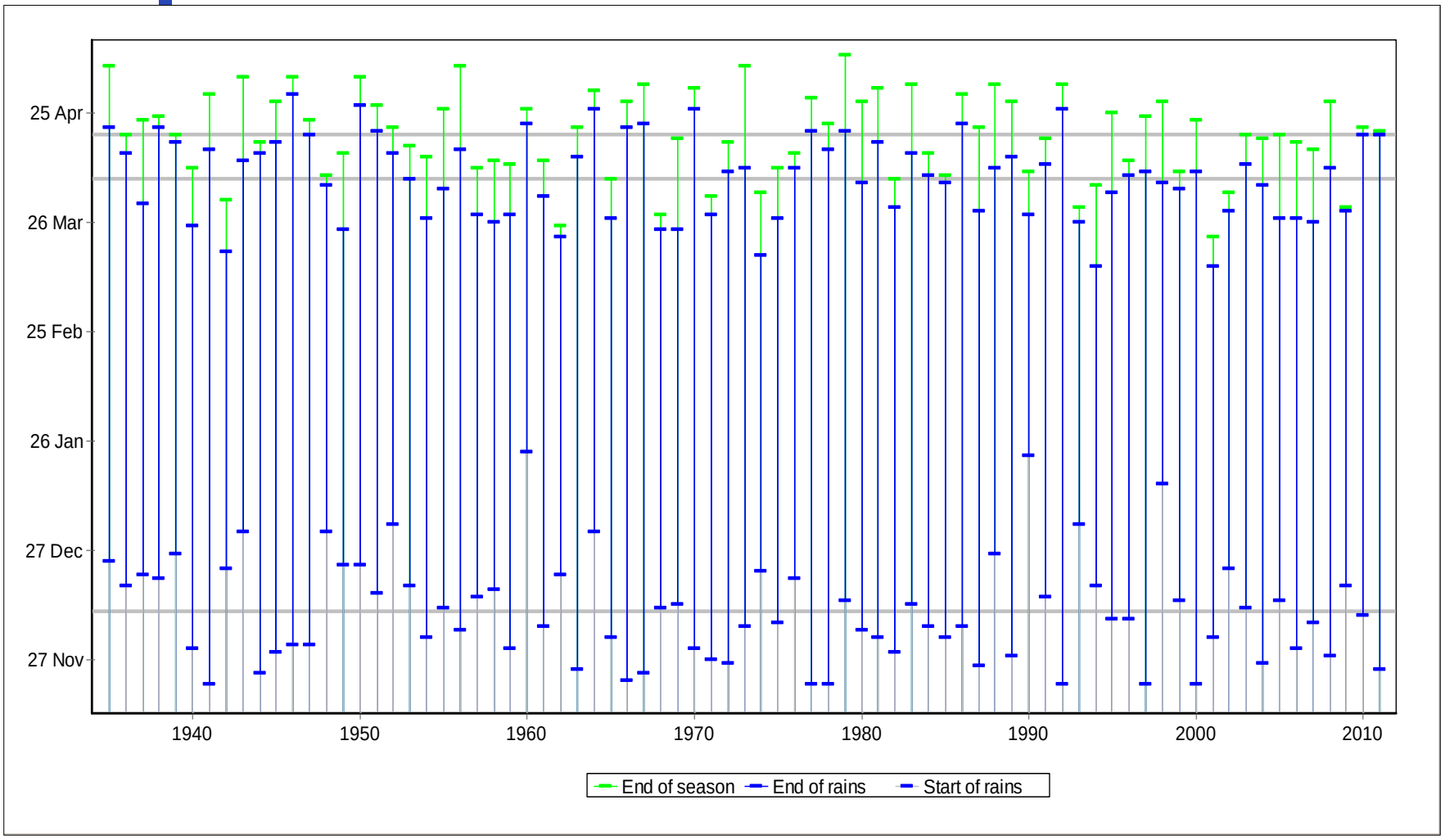
Possible example for extension service



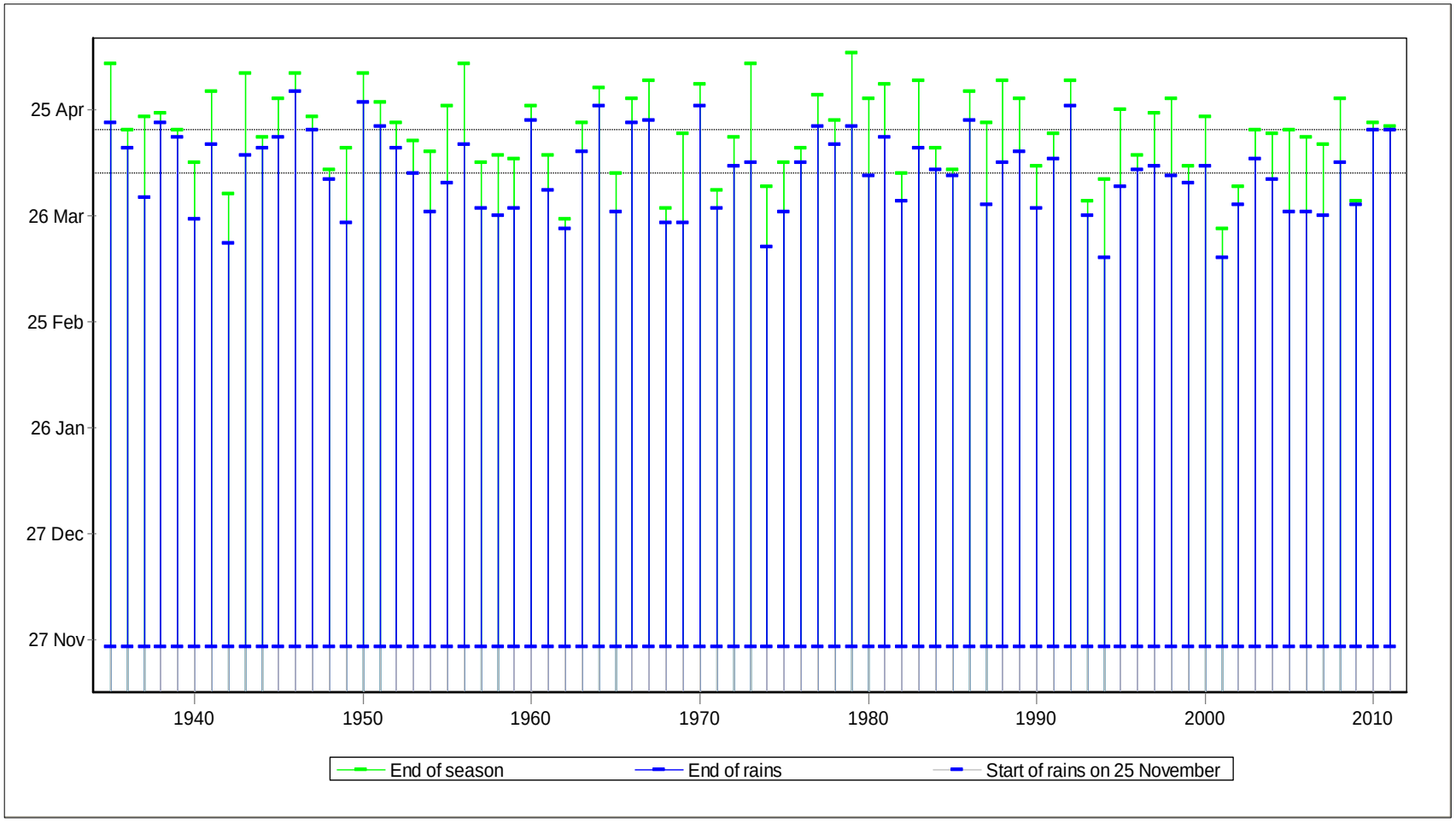
Dry spells round flowering



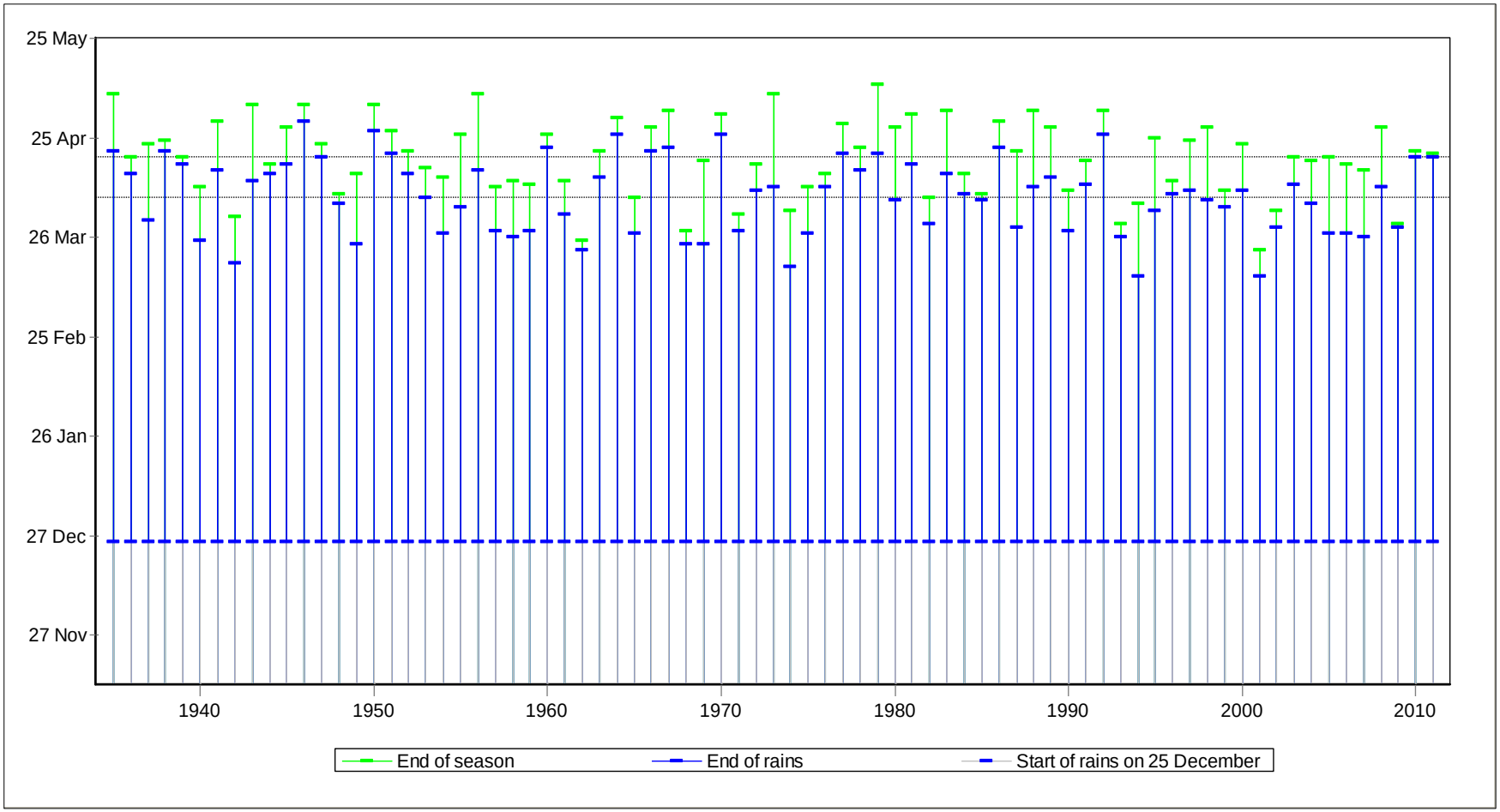
End of the season – and length



Conditional on early planting



Or a month later

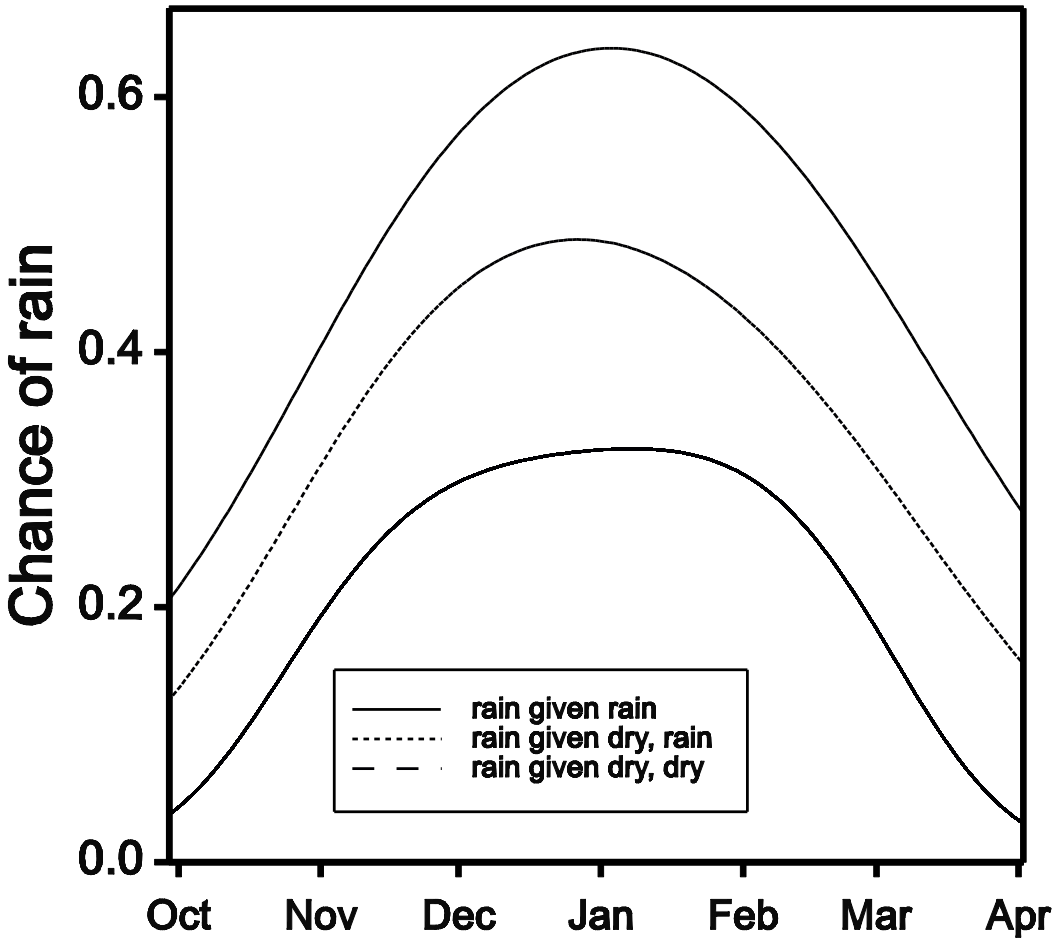


A modelling approach?

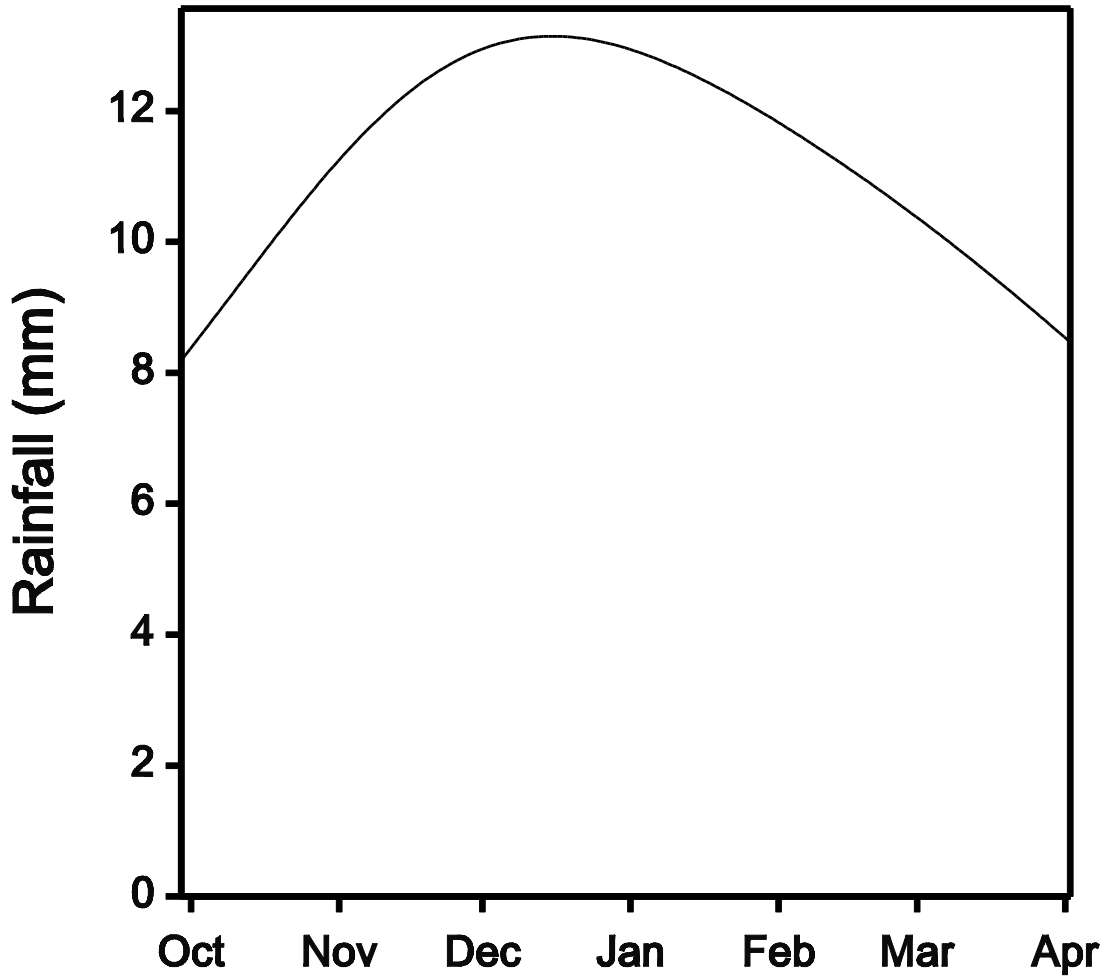
With links to the seasonal forecast

ON TO ZAMBIA

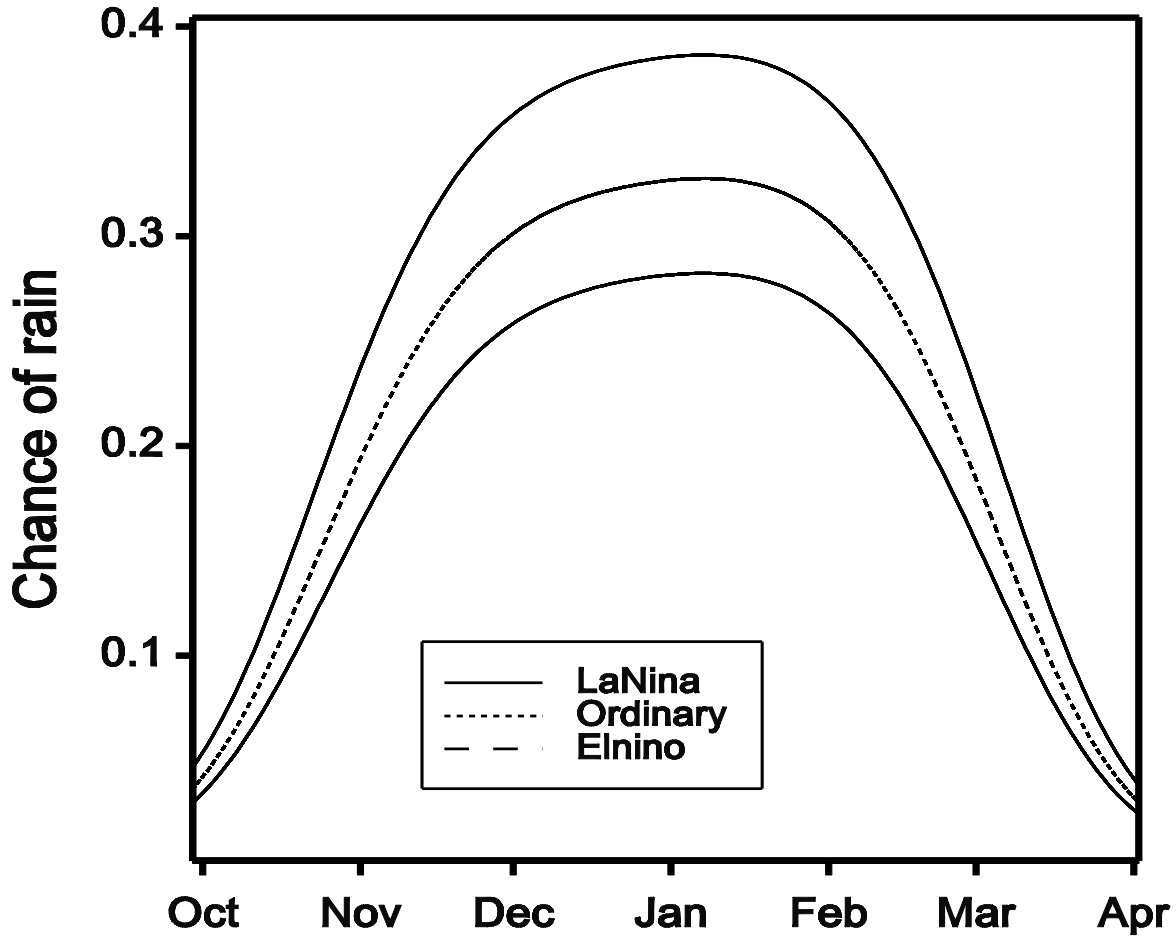
Model the chance of rain

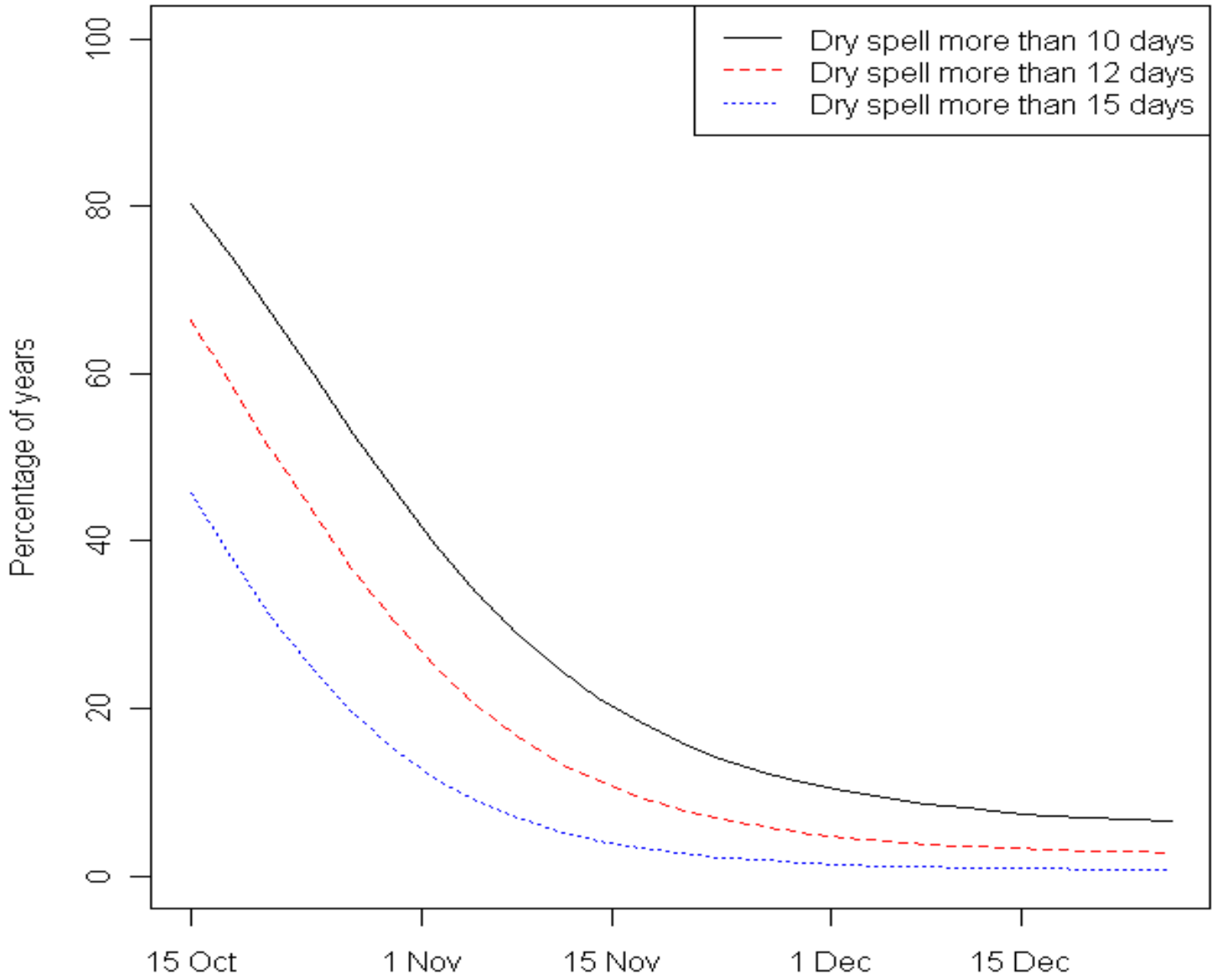


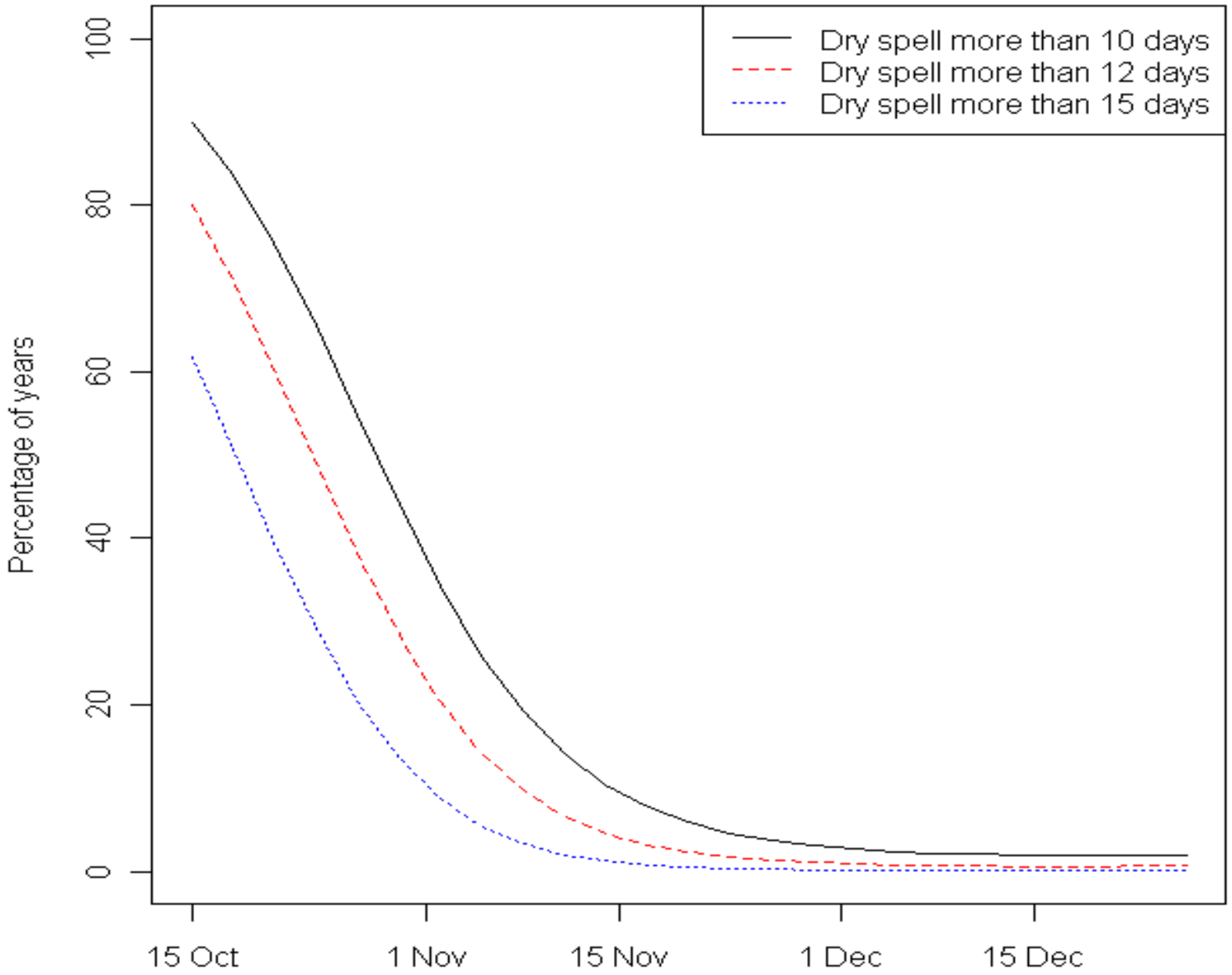
And the rain per rain day



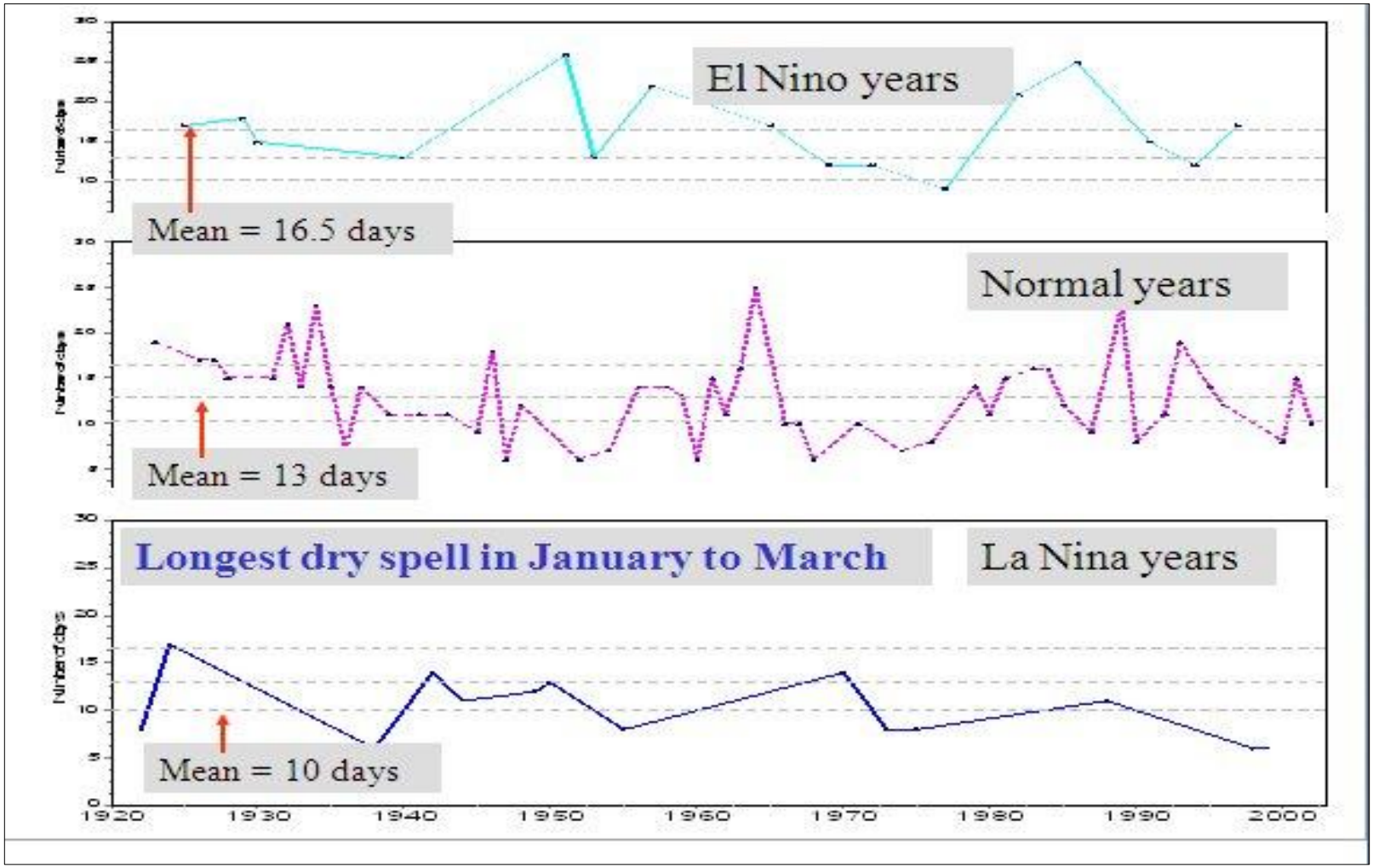
The ENSO effect!




Dry spell more than 10 days
Dry spell more than 12 days
Dry spell more than 15 days
Percentage of years
0
20
40
60
80
100
15 Oct
1 Nov
15 Nov
1 Dec
15 Dec


Dry spell more than 10 days
Dry spell more than 12 days
Dry spell more than 15 days
Percentage of years
0
20
40
60
80
100
15 Oct
1 Nov
15 Nov
1 Dec
15 Dec

Linking to the seasonal forecast?



Overall lesson

- The data are there
  - But need to be analysed
- How?
- Let's start with the farmers
  - Or probably with the NGOs and extension staff who work with them
- The Met Services have had long enough!

Thank you