GROWING Opportunities

Applying Weather-Related Risk to Cropping Systems

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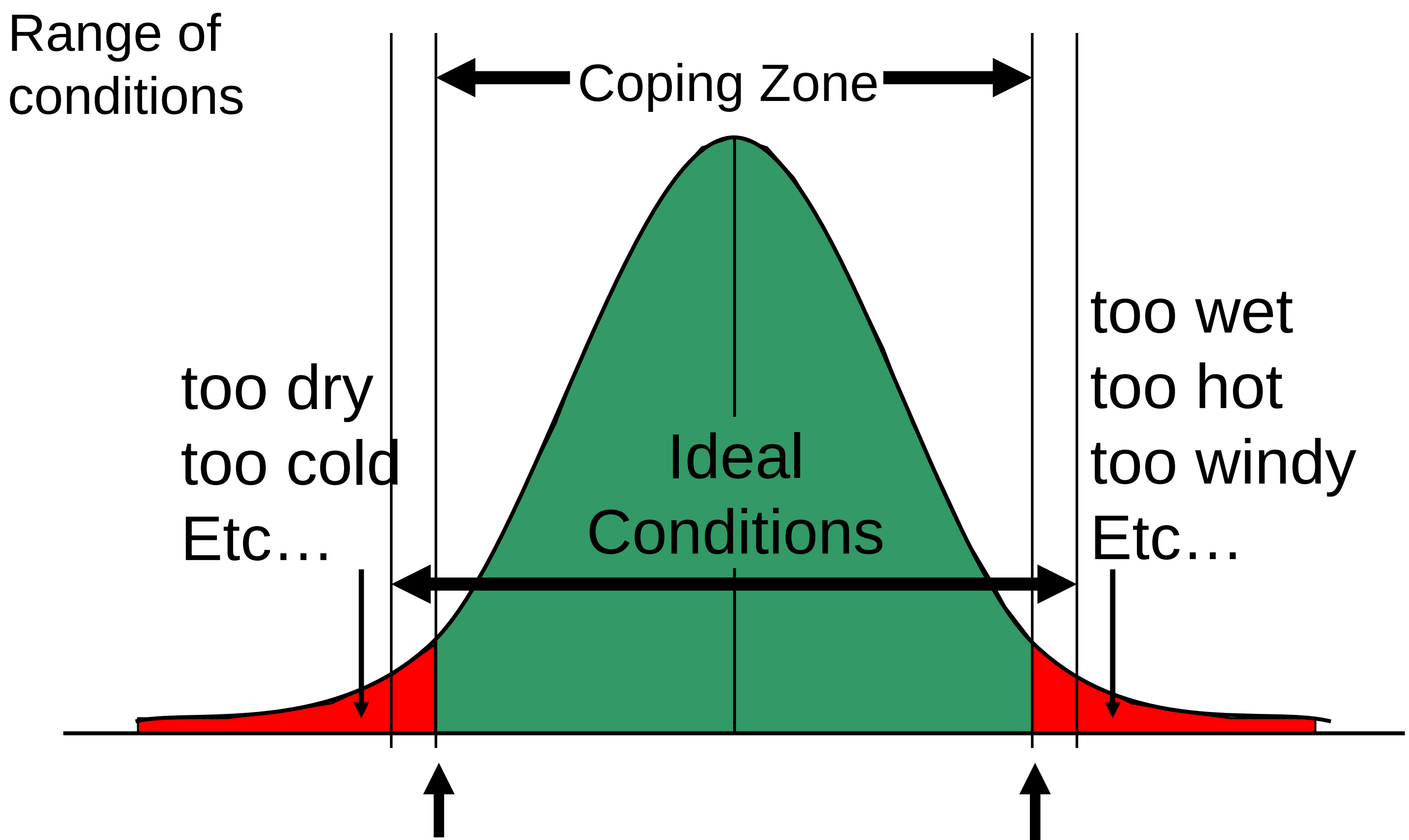
Agro-Climatic Risk…

- Production Risks:
  - VARIABILITY in WEATHER
    - Flooding, drought, freezing, heat, timing of weather…

Too Dry (yield loss) ← Ideal Conditions (potential yield) → Too Wet (yield loss)

Agro-Climatic Risk…



It is important to know…

1) What are these limits? What are the thresholds?
2) What are the risks of occurrence (how often?)

Dealing with agro-Climatic Risk…

- Risk cannot be eliminated
  - There are always risks in farming
- Risk management is essential
  - Designed to reduce the variability in net income (not necessarily increasing it)
- Factors that affect risk tolerance
  - Individual level of comfort
  - Overall farm success / optimism
  - Financial status, family status, age
  - Past experiences

How to deal with risk

Methods of adjustment and adaptation…

- Spread it out
  - Diversification (crop type, crop variety, markets)
  - Additional sources of income, all eggs in one basket
- Reduce the risk
  - Less risky crops, proven varieties, more suitable areas, take fewer risks (often with less payback)
  - Timing of operations (seeding, input use, harvest)
  - Tillage practices
- Increase the resiliency
  - Technology (tile drainage, irrigation, machinery)
- Crop Insurance (as a last resort)

Adaptation

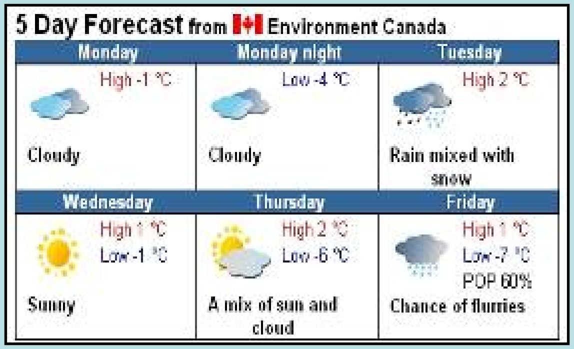
In order to adapt…

we must know *what* to adapt *to!*

A farm's climate profile should be the foremost tool for managing climate risk

Short range forecast

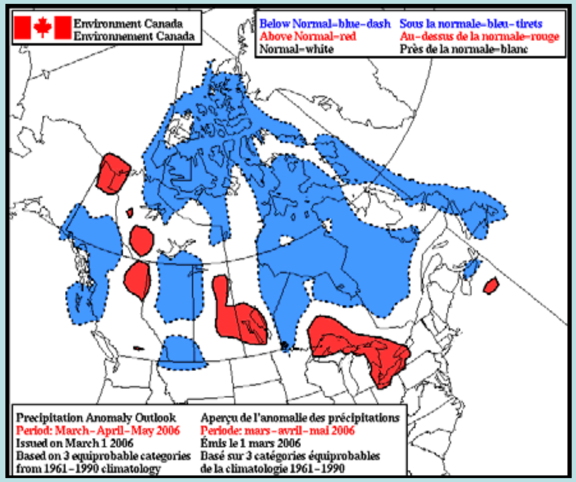
•Based on dynamical models (real conditions)
•Most accurate and precise (daily or hourly)

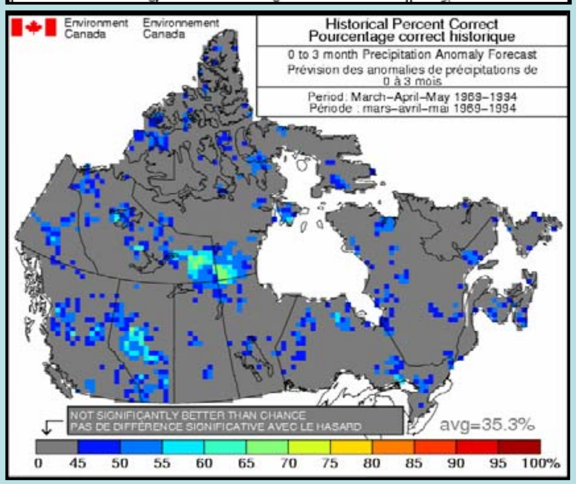


•Short term risk requires reactive approach
•Delayed field operations, affects day to day operations

Long range forecast

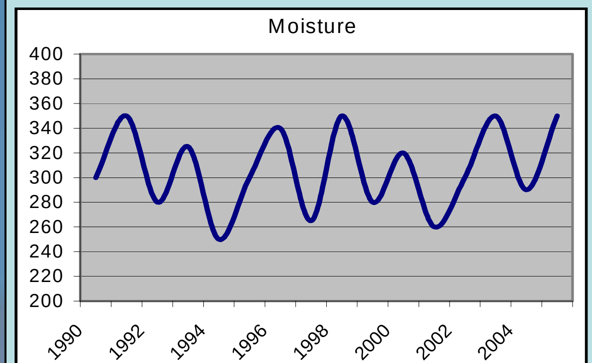
•Derived from both dynamical models & statistical models





Climate Profile

•Based on probability (best guess)
•Least accurate and precise (provides annual averages)

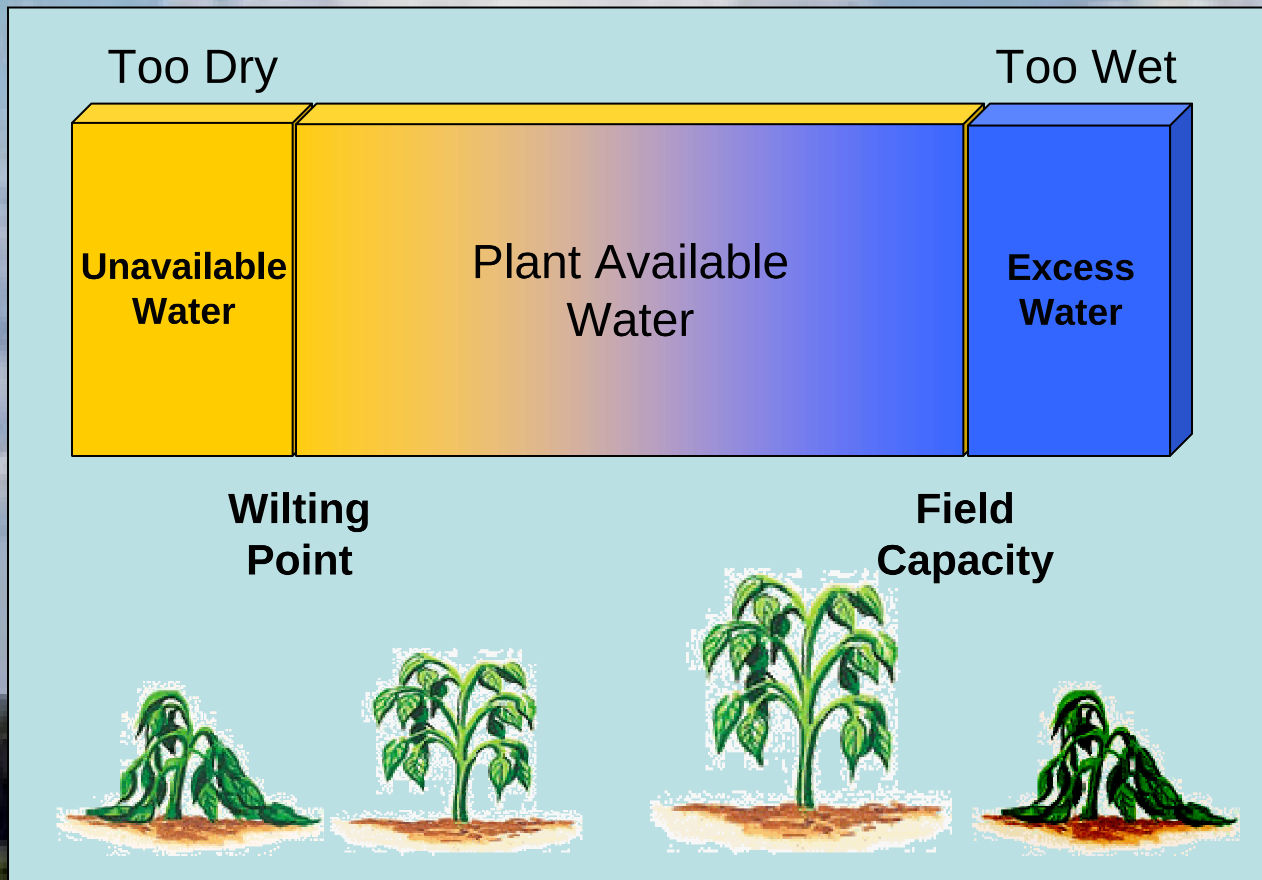


•Long term risk requires proactive adaptation
•Long term investments (irrigation, drainage infrastructure)

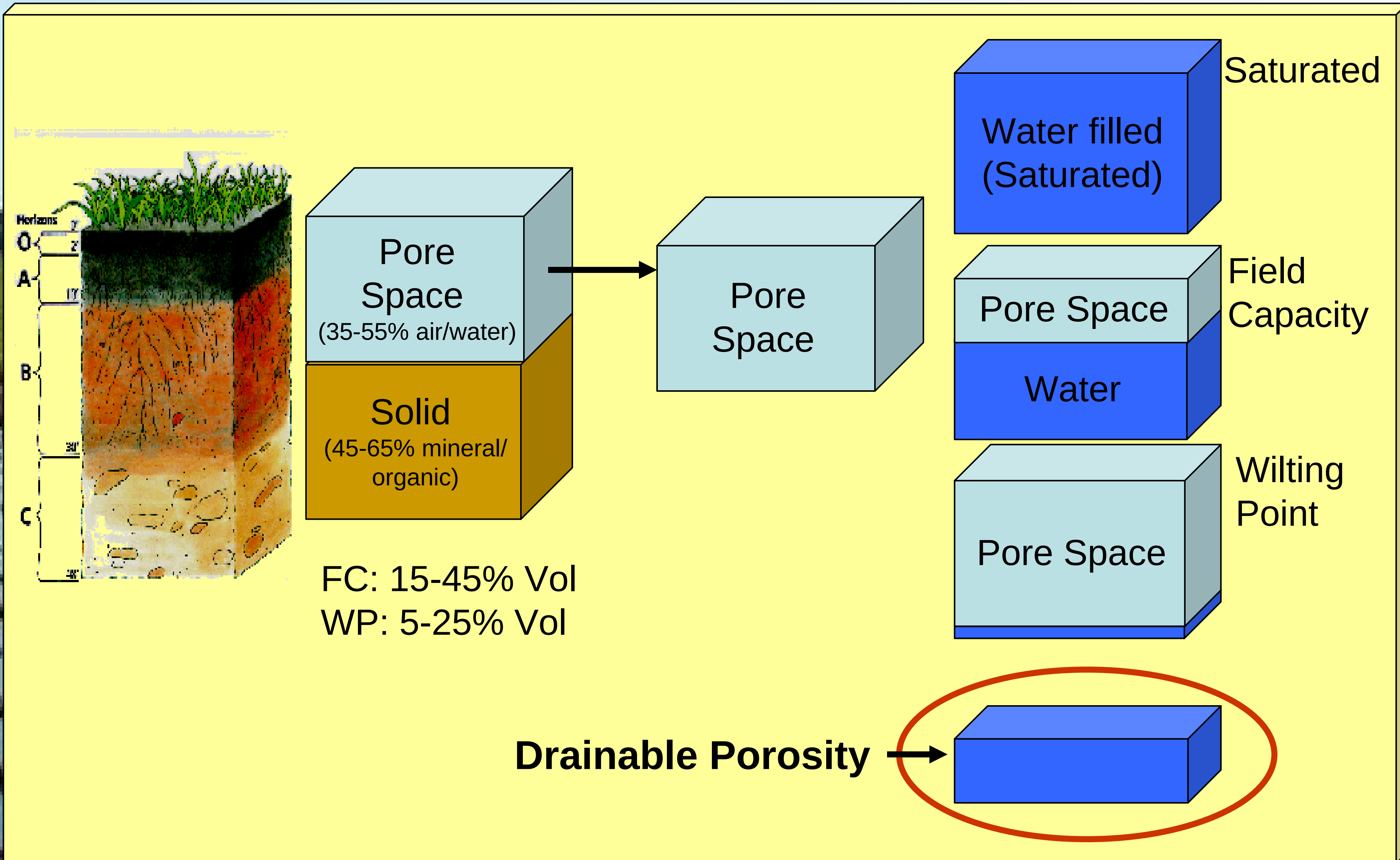
Long term adaptations

- For capital investments:
  - Compare expected returns with the alternative uses of the capital including other risk management strategies such as the purchase of inputs.
  - Since these investment costs are high, also look at strategies which do not require a direct expenditure to reduce risk such as diversification.
  - Even long term adaptations end up being reactive

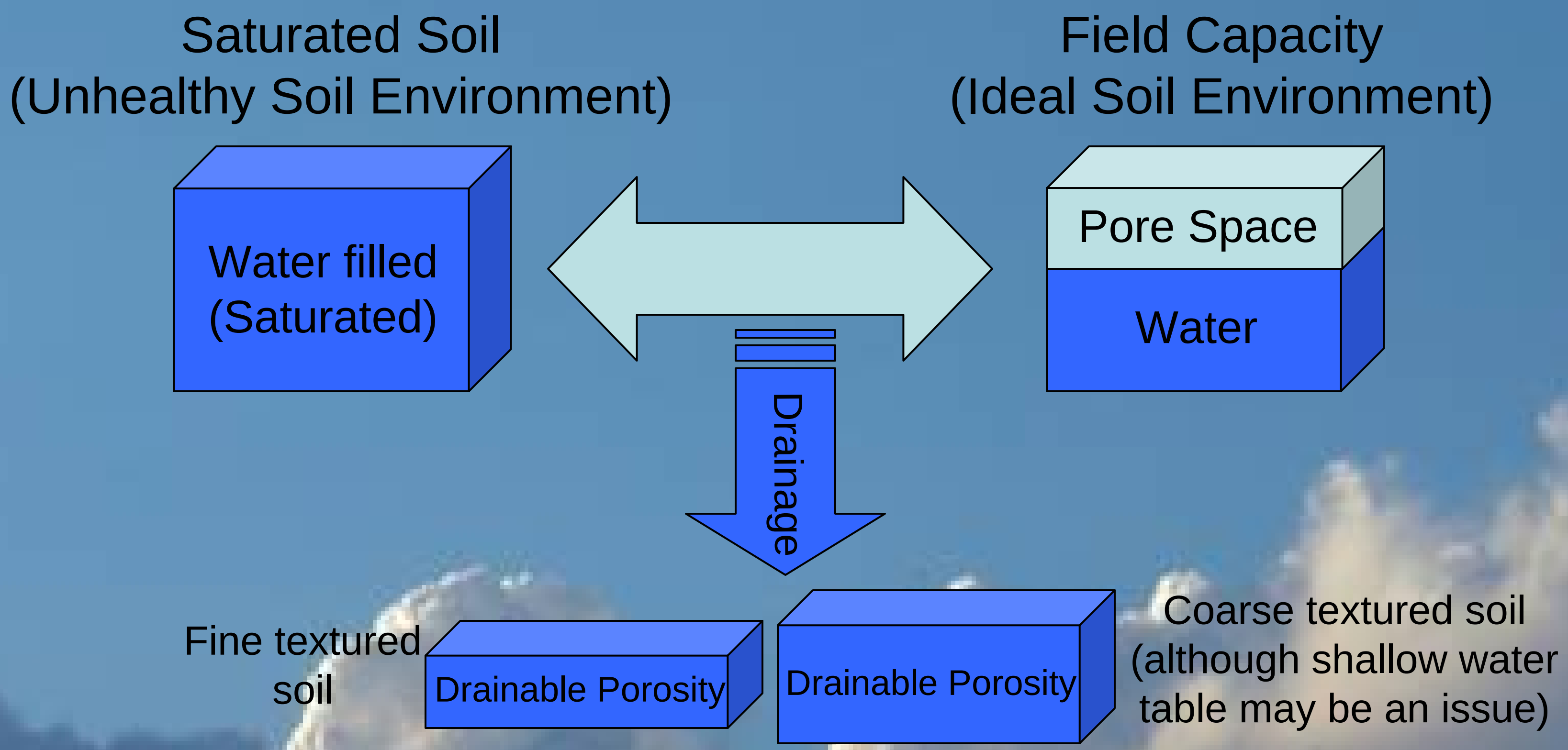
Soil Moisture



Soil Composition



Excess Moisture



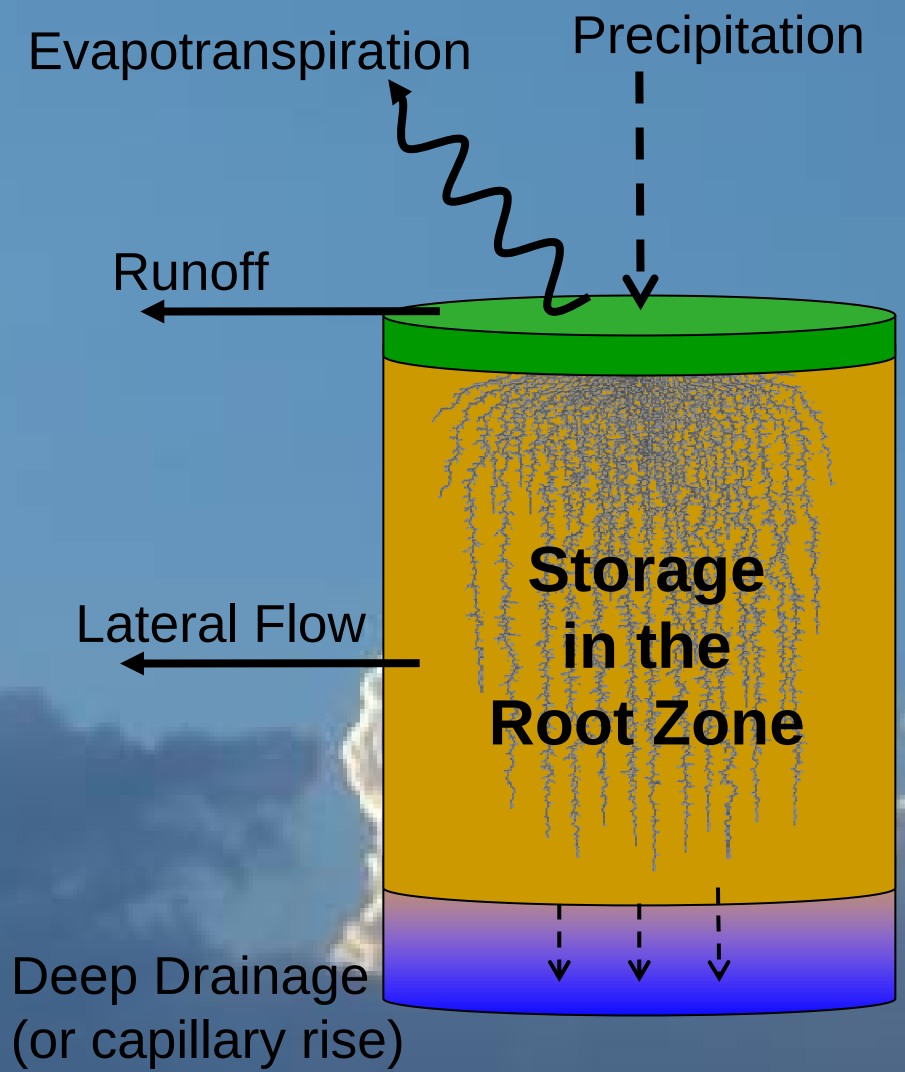
Soil Texture	Drainable Porosity in the root zone	
Clay, clay loam, silty clay	3 - 11%	1.5 - 6”
Loam	10 - 15%	5 – 7”
Sandy	18 - 35%	8 - 16”

Source: University of Minnesoda

What is the Risk?

- Methods to determine risk…
  - Past experience
    - Memories are sometimes short
  - Rainfall data
    - Lots of rain is not necessarily excess moisture
    - Averages do not help either
      - In Minnedosa, on average it rains 450 mm/year
      - What that really means is that it has rained somewhere between 290 and 700 mm over the past number of years
  - Soil moisture measurements
    - Nothing long term is available
  - Soil moisture modelling…

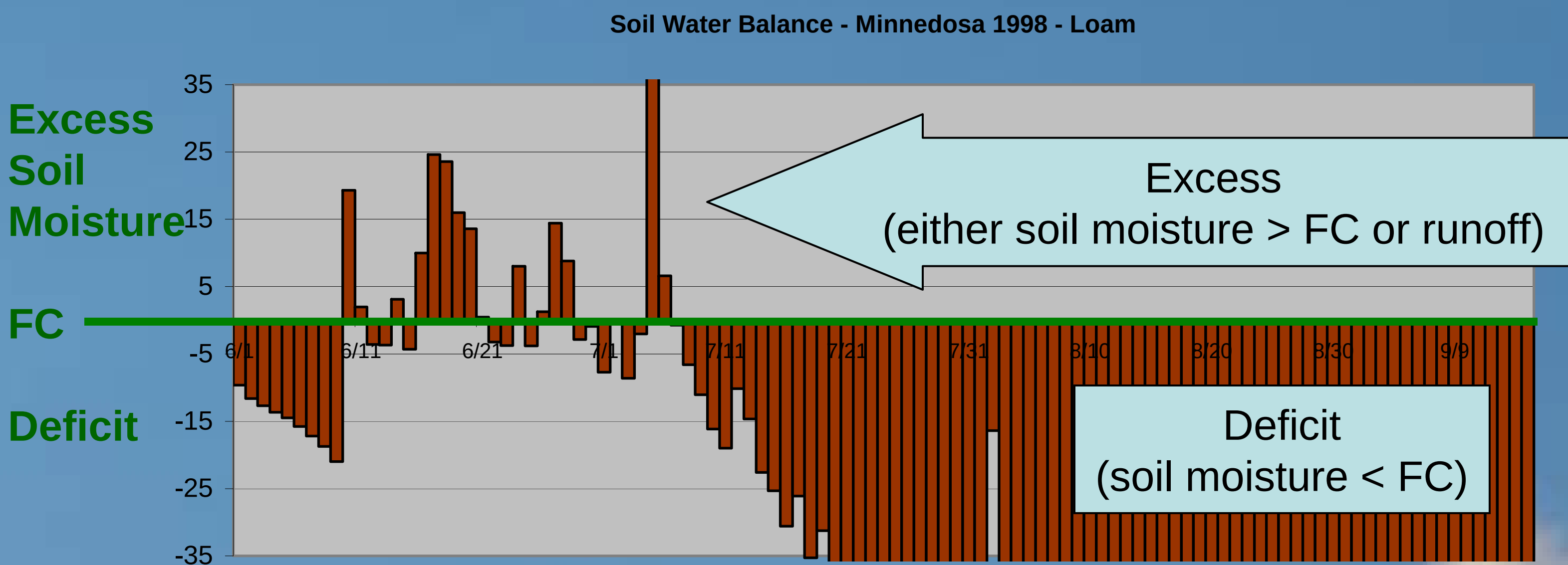
Water Budget Model?

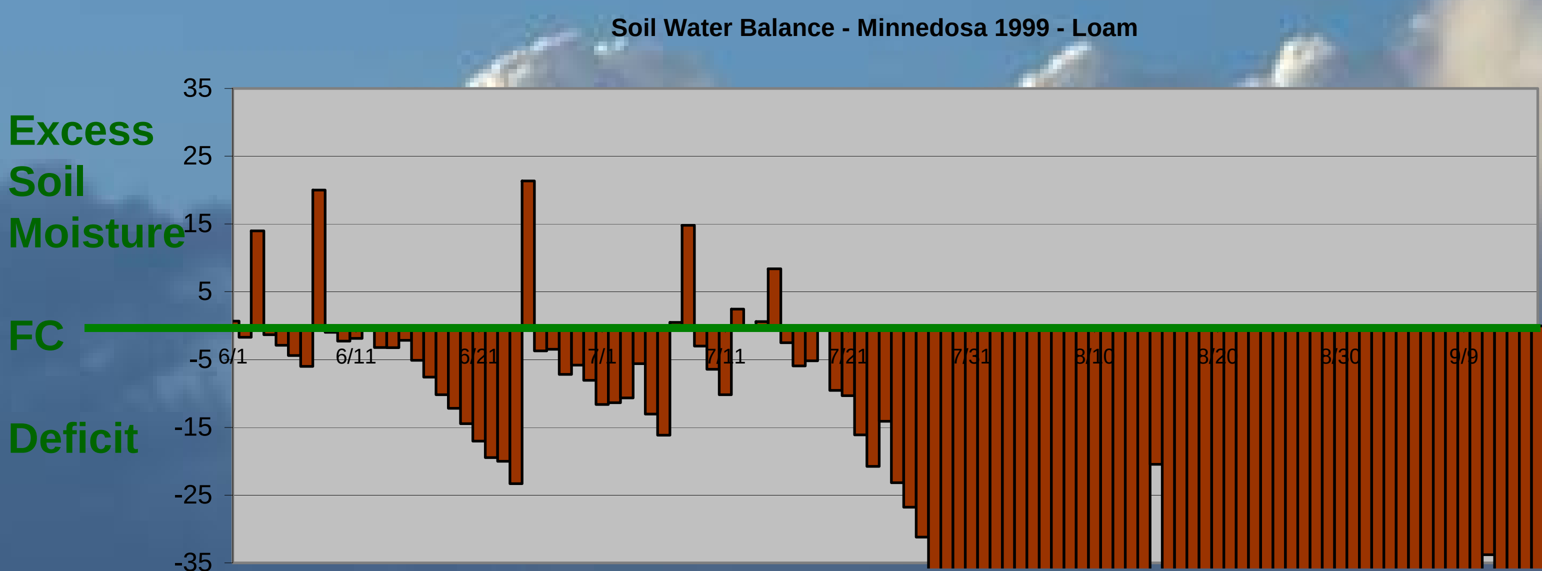


+ Precipitation
- Evapotranspiration
- Runoff
- Deep Drainage
= Storage

If storage > Field Capacity
Then soil is too wet!

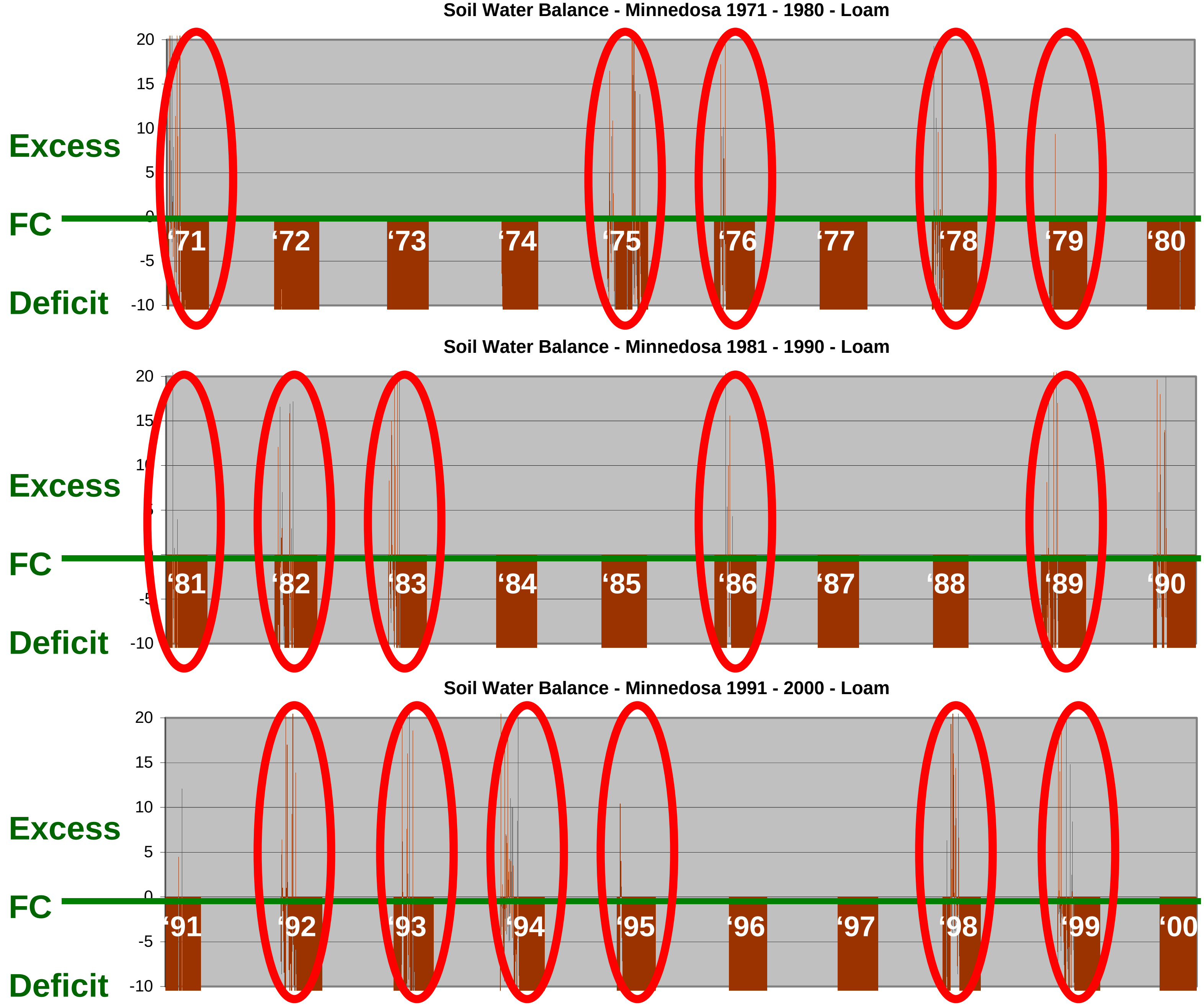
Daily water budget – 2 yrs





Minnedosa

Daily water budget – 30 yrs

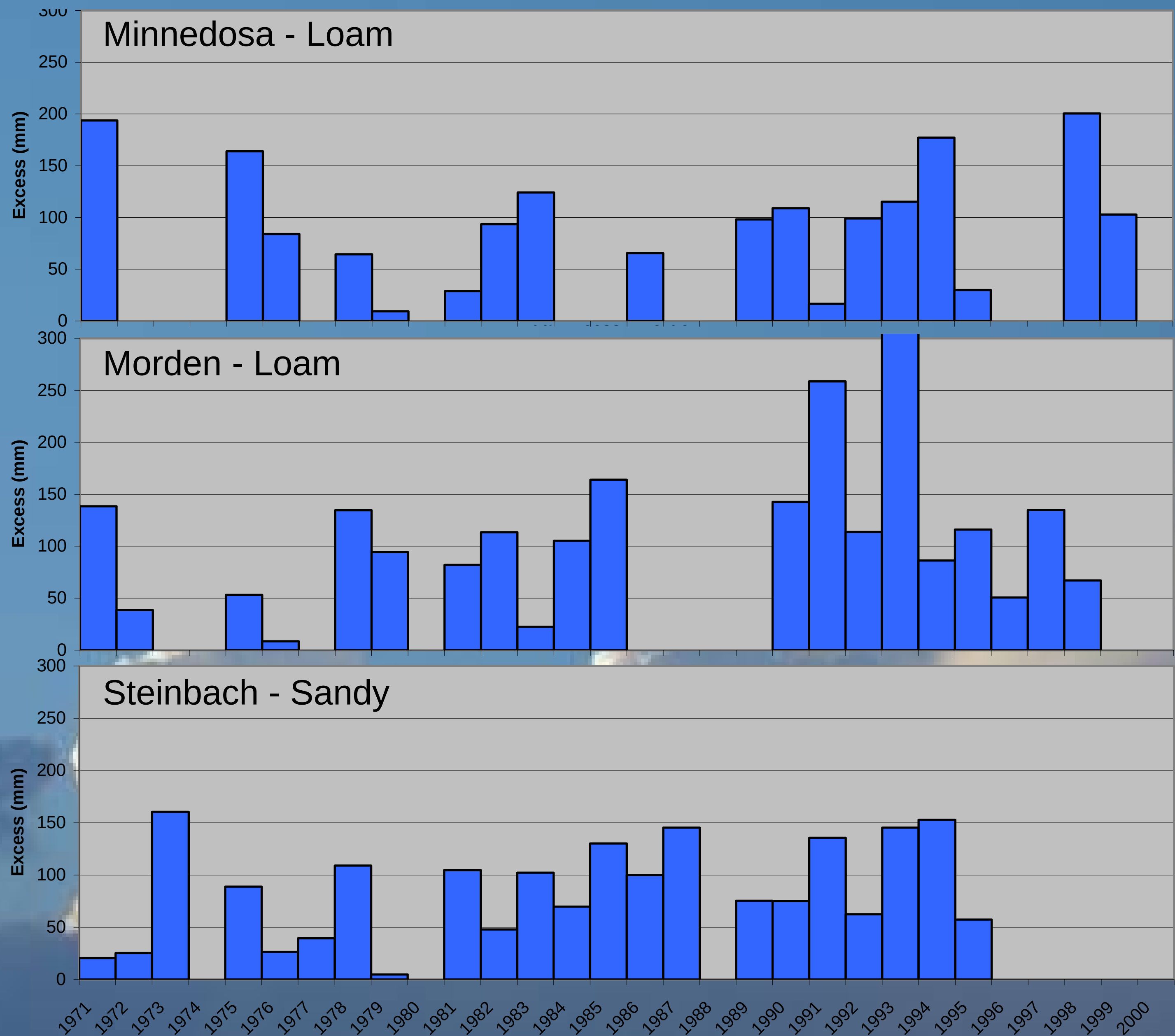


1970’s
<u>5 yrs</u>
in 10

1980’s
<u>5 yrs</u>
in 10

1990’s
<u>6 yrs</u>
in 10

Excess Soil Moisture per Year 1971 – 2000



How do various locations compare?

Location	% of years with excess moisture	Probability of having excess moisture	Average mm excess moisture/year
Minnedosa	50%	1 in 2 years	93 mm
Morden	66%	2 in 3 years	112 mm
Steinbach	75%	3 in 4 years	85 mm

What it can tell us…

- Some locations have a higher risk of receiving excess moisture.

How many wet years are needed to pay off drainage?

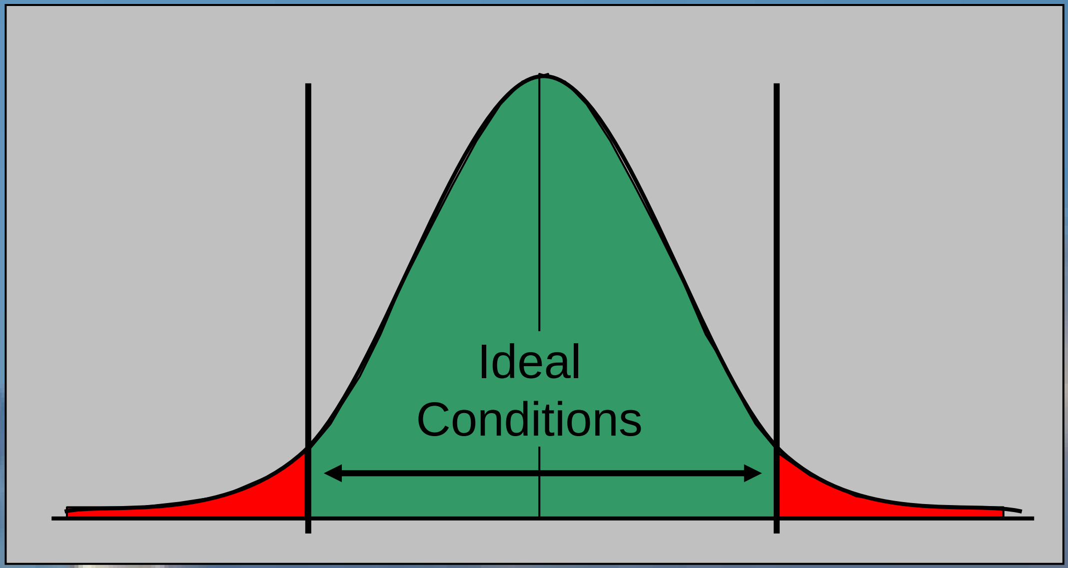
- Might not be every year with significant payback

Factors to consider…

- Climate
  - Rainfall (amount and timng), potential evapotranspiration, trends
- Soil / site characteristics
  - Texture, Ksat, internal drainage, management, topography, depth of water table
- Crop
  - Crop water demand, stress tolerance, yield impact

Conclusion:

- Past weather should be used to assess risk
- Determining probability of an event occurring is quite simple
- Defining the thresholds of the coping range is not simple. It depends on the crop, the operation, the location, and the comfort level of the individual producer



Better knowledge of this risk enables better planning and more effective adaptation measures


Thank you
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