



...and estimation of drought impact in Hungarian Agriculture

Gábor Kemény – András Molnár



*Training course on drought risk assessment,
HMS/DRMKC, Budapest, 6-8th November 2018*

Background and motivation

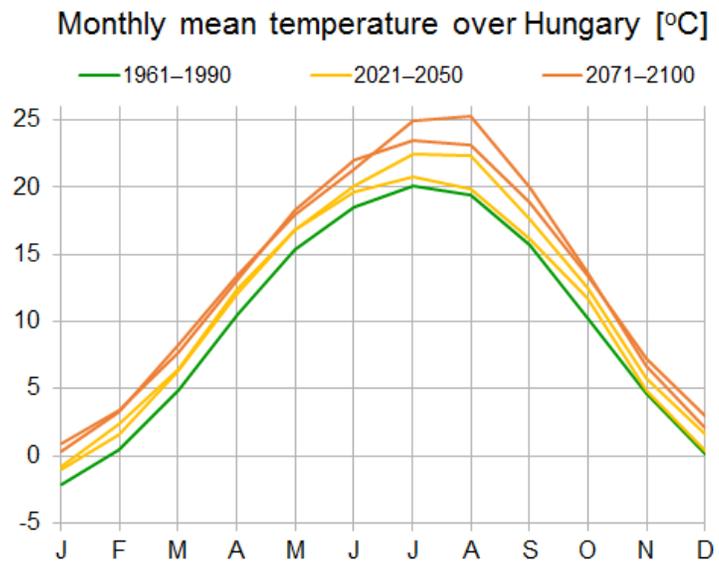
Background

- Hungarian Agricultural Risk Management System
- NAGIS, AGRATÉR
- Hungarian Irrigation Strategy (in process)

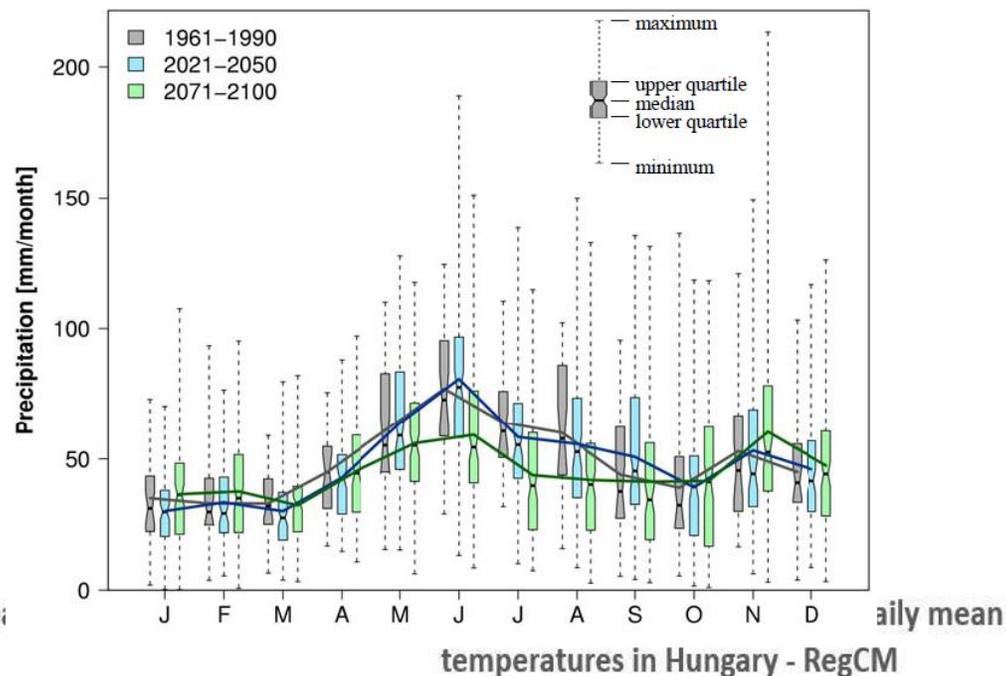
Motivation

- Can we prof „better data, better results”?
- How much sensitivity joined to different RCM data?
- What yield level should we expect for maize?
- What adaptation measures are relevant for maize?

Beyond the averages...



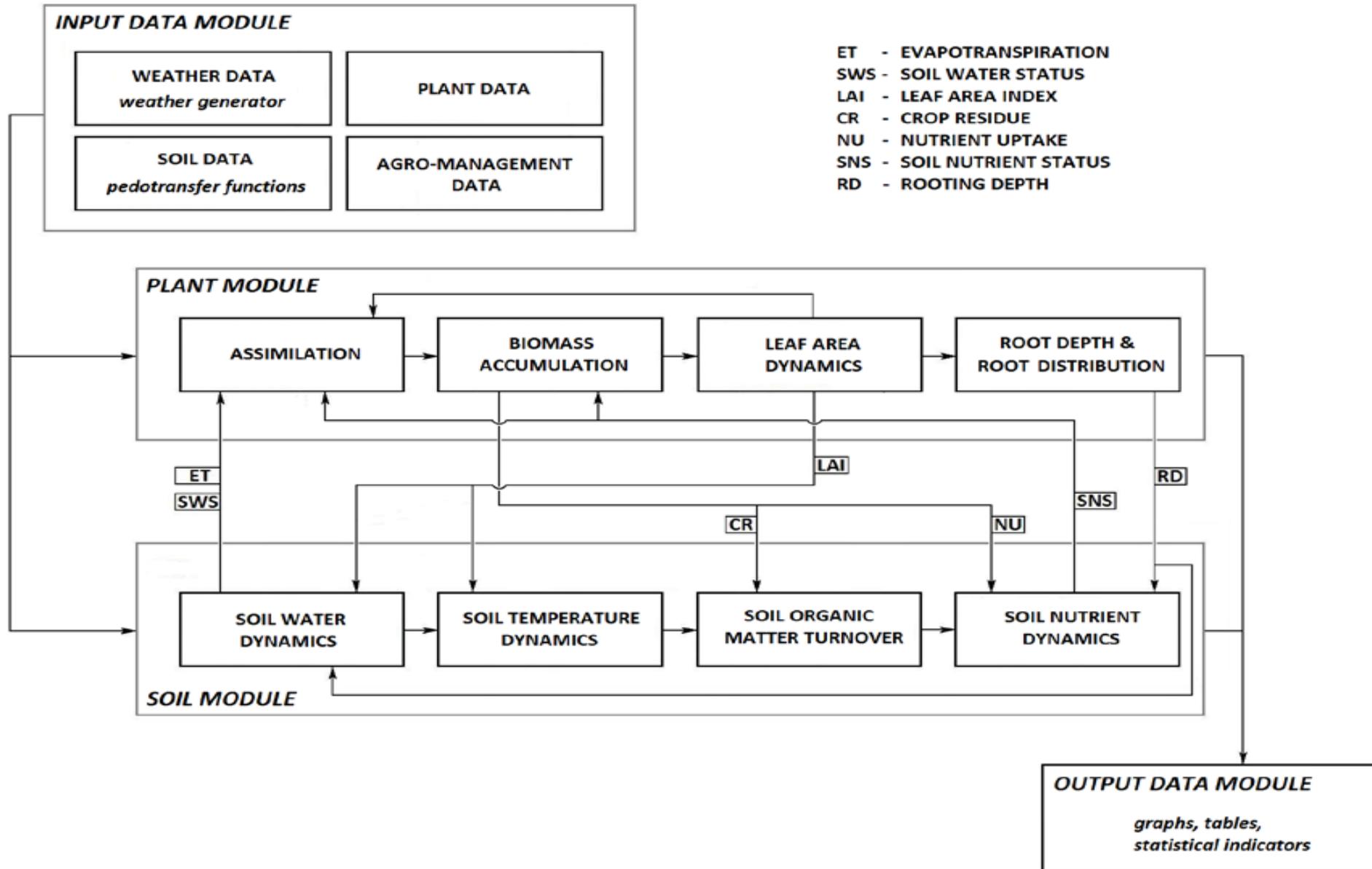
Relative frequency distribution of July daily mean temperatures in Hungary - ALADIN



Index	2021-2050	2071-2100
Summer day: daily maximum temperature > 25°C	4-21	28-40
Hot day: daily maximum temperature > 30°C	1.7-24	8-49

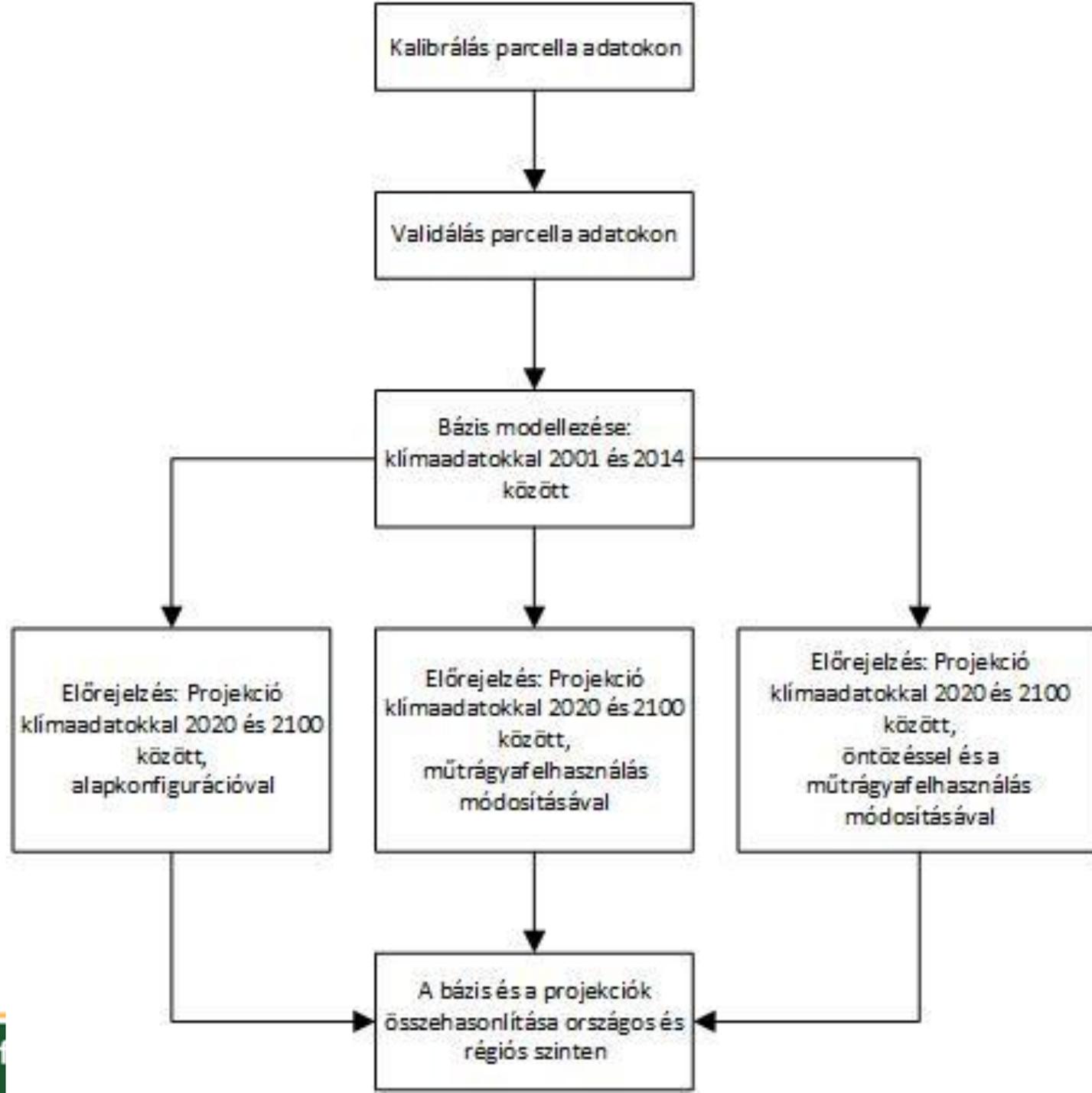
Source: Szépszó et al., 2015.

Modules and workflow of 4M



Data

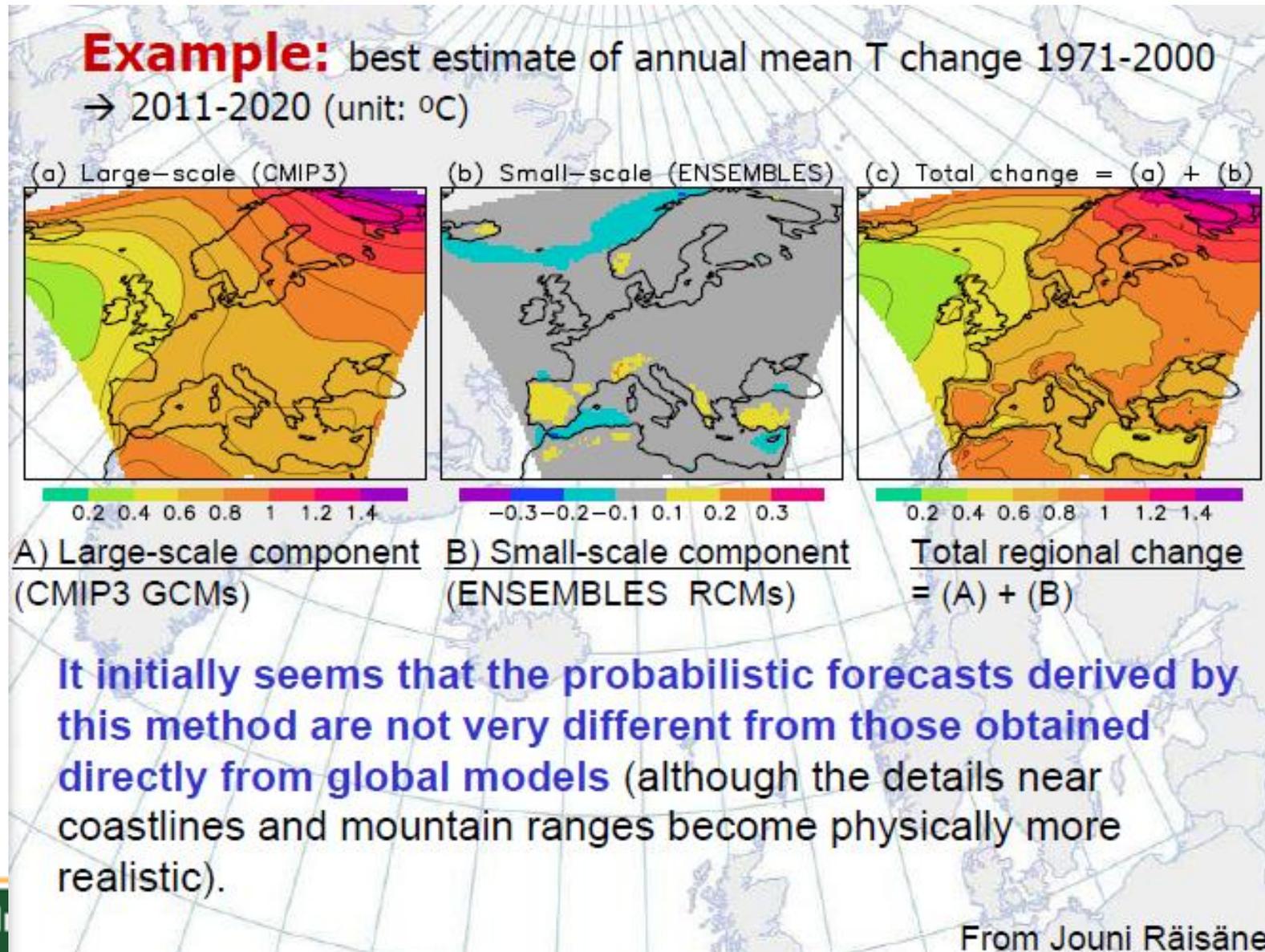
- Soil
 - 5×5 km resolution adaptation of the DoSoReMi database (Pásztor et al., 2014)
 - missing inputs estimated by using pedotransfer functions (Fodor and Rajkai, 2011)
- Climate
 - Agri4cast for calibration/validation
 - Six validated RCM (by ENSEMBLES project) for future:
 - C4I-HadCM3, DMI-ARPEGE, KNMI-ECHAM5, ETZH-HadCM3Q, MPI-ECHAM5, SMHI-BCM
 - A1B carbon-dioxid levels, no bias correction
- Agro-management
 - Calibration&validation: plot database
 - Projections: 3 scenarios



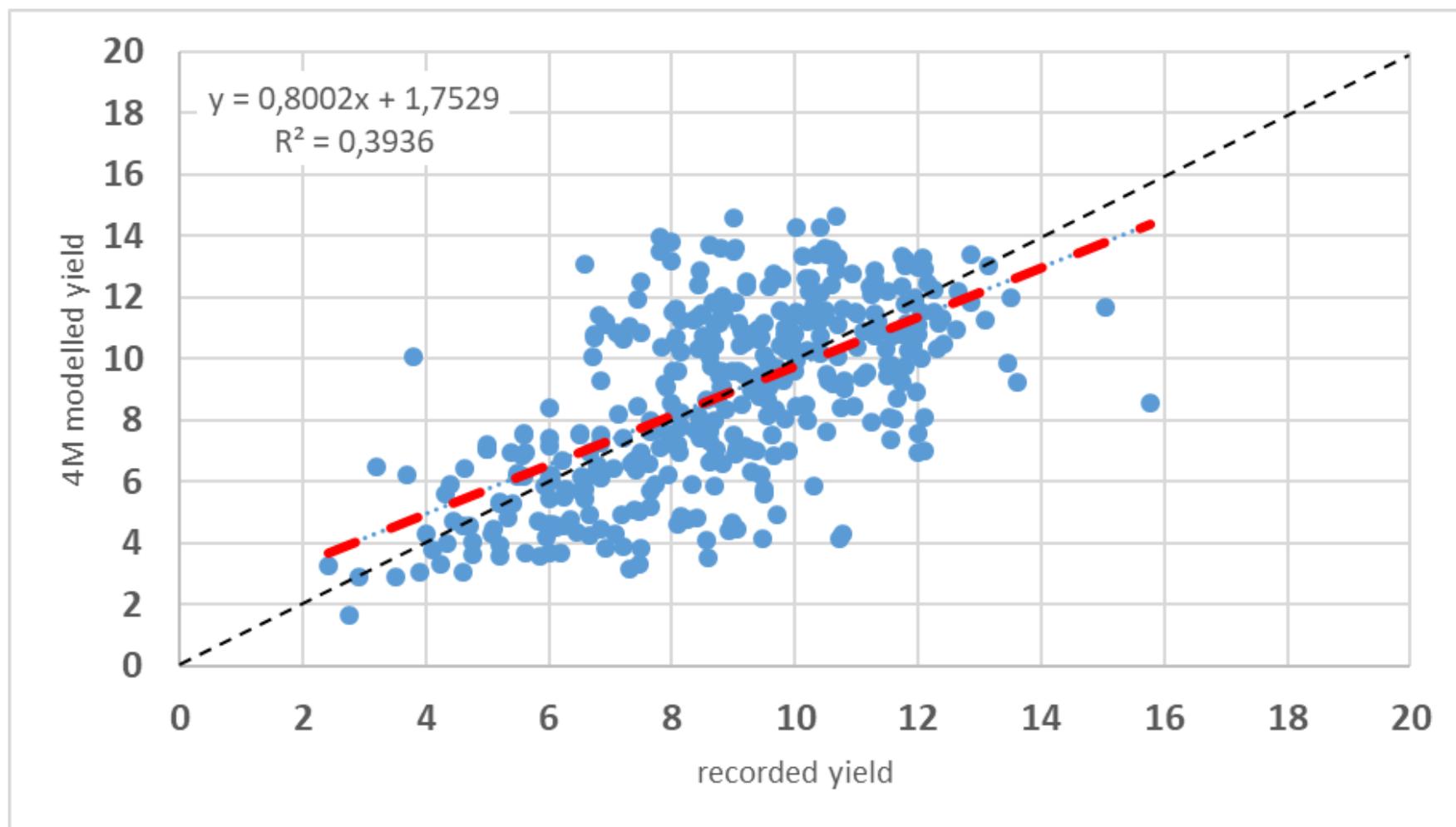
Agro-management scenarios

- Baseline: avg. N rates of 2001-2014 FADN maize producers, planting date using the “7 days > 10 Celsius” rule, plant density was 70000 p/ha, nitrogen fertilizer was applied on the same day of planting and harvest was timed after physiological maturity that was calculated by the model.
- A1: The second scenario is only different by the fact that we applied a minimum N rate of 90 kg/ha.
- A2: Minimum N rate of 90 kg/ha and supplementary irrigation.

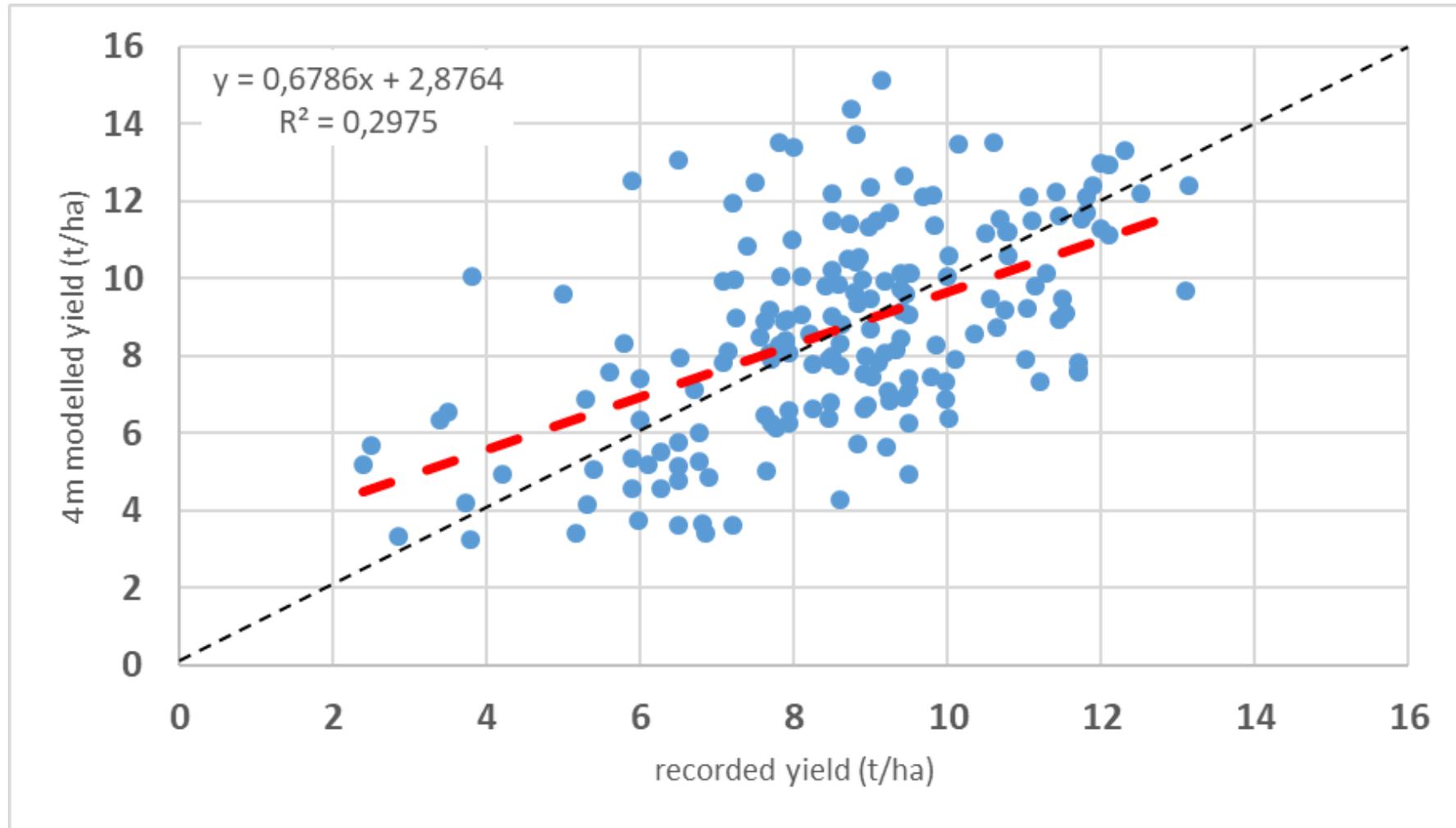
Importance of RCM data



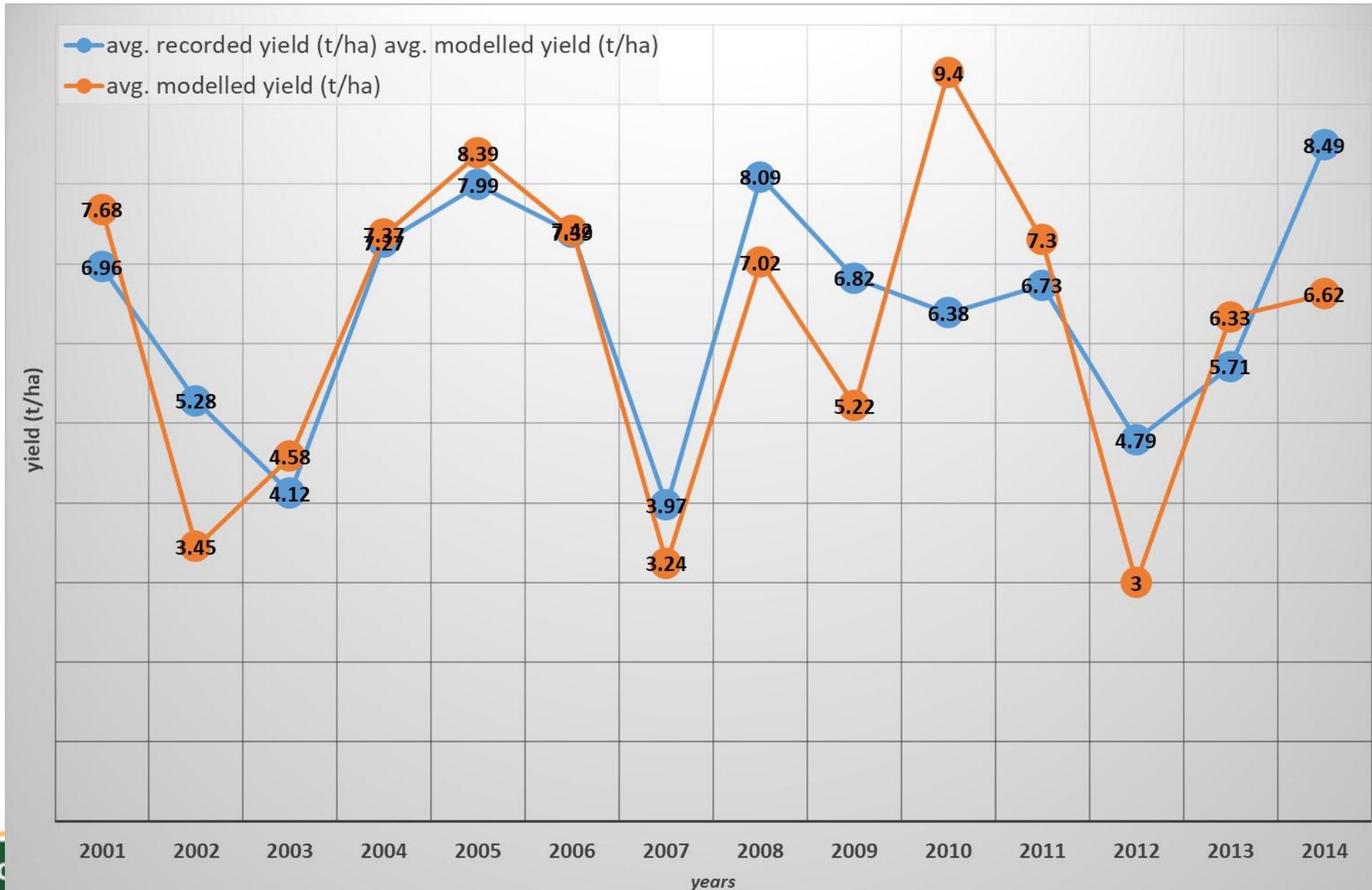
Calibration



Validation

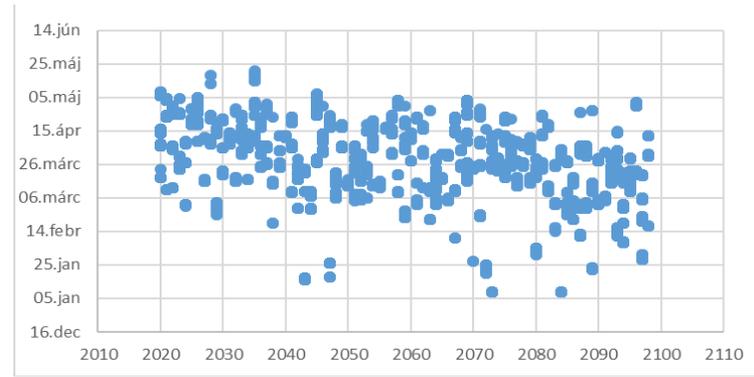


Validation with FADN data

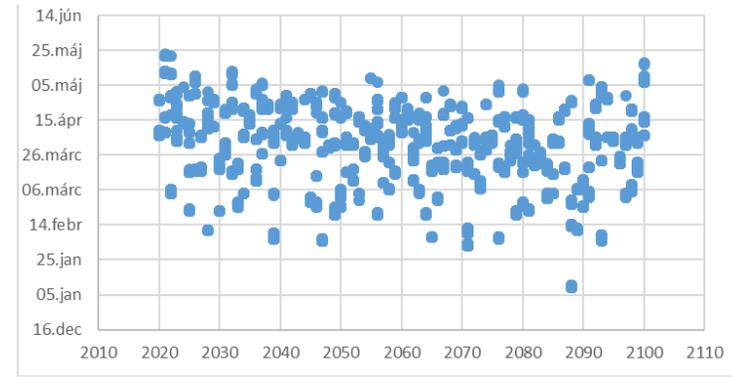


Sowing date

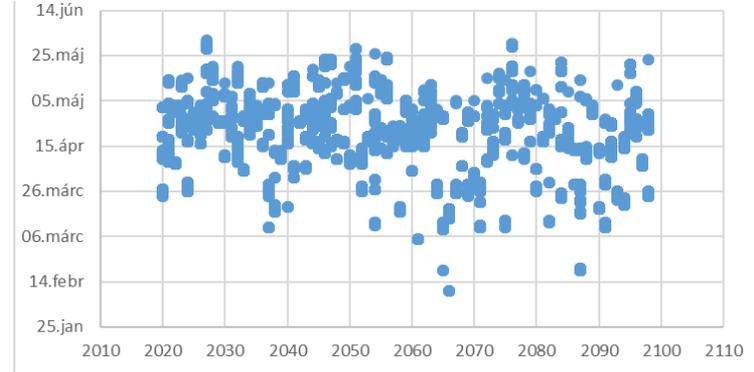
C4I



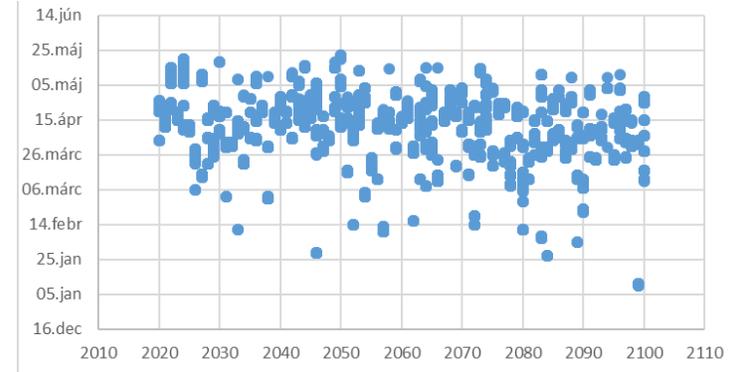
DMI



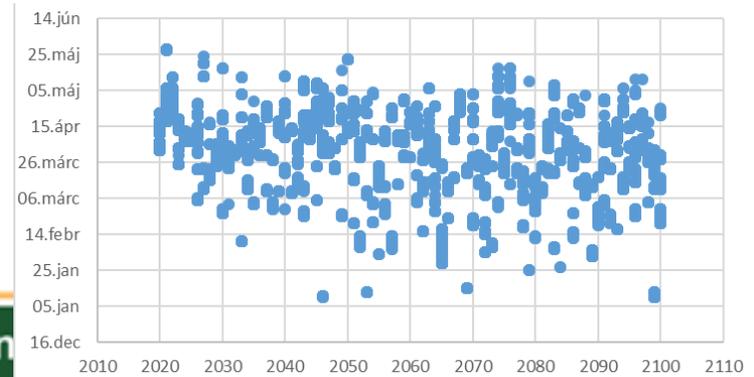
ETHZ



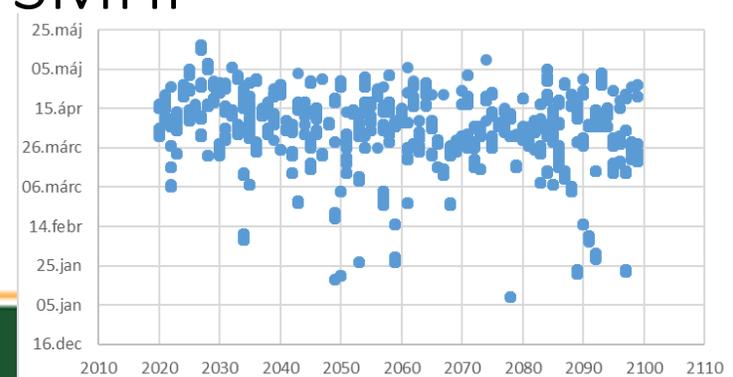
KNMI



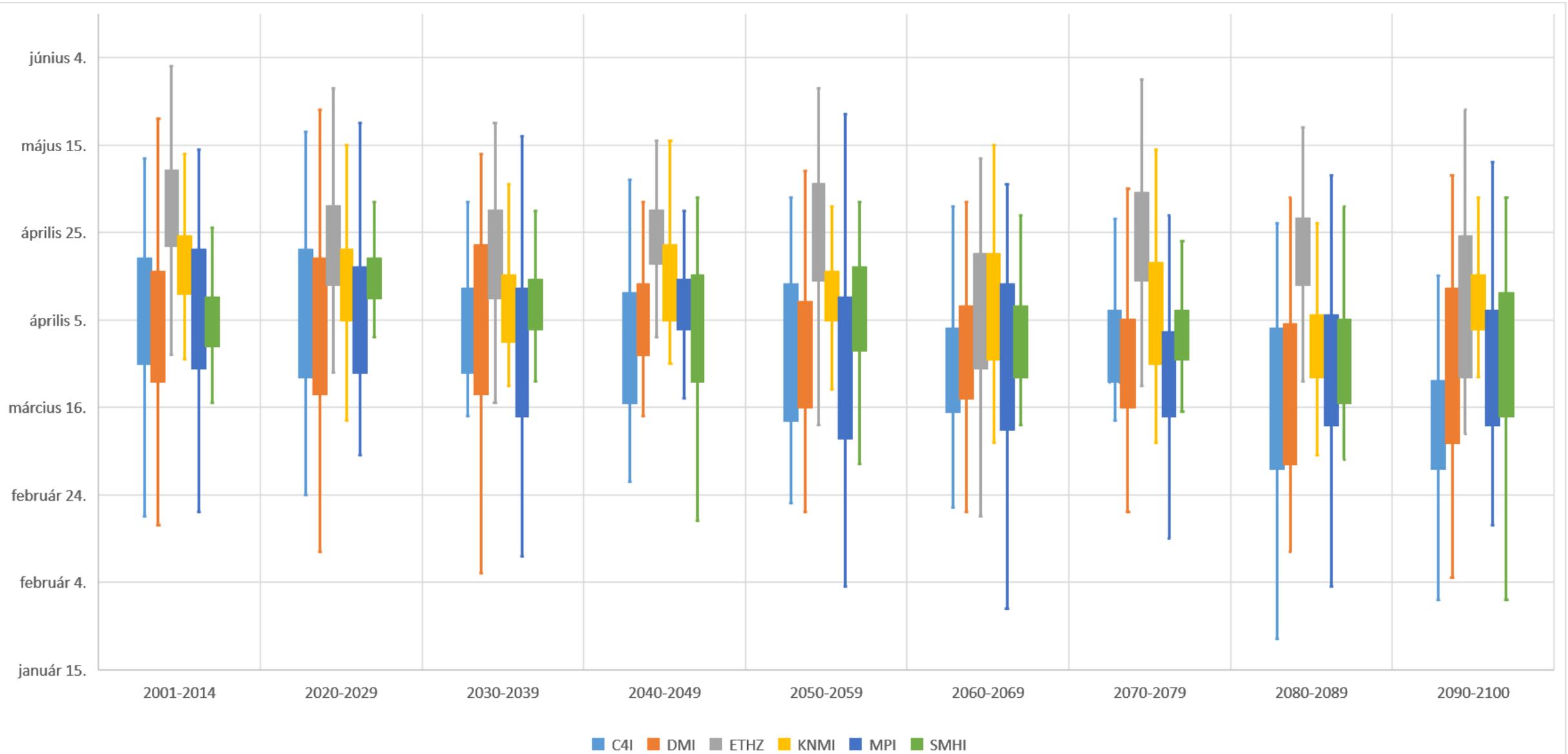
MPI



SMHI

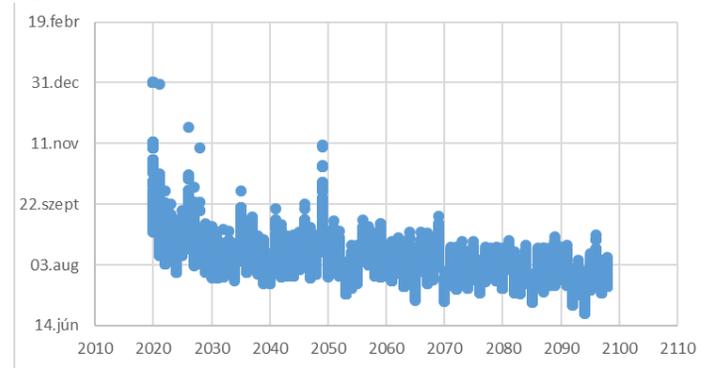


Comparing sowing dates

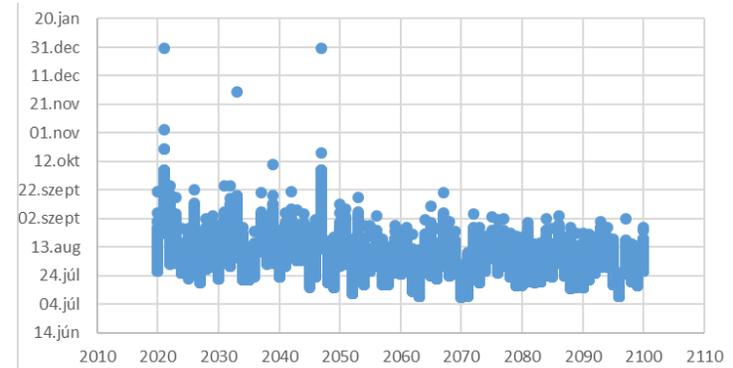


Harvest date

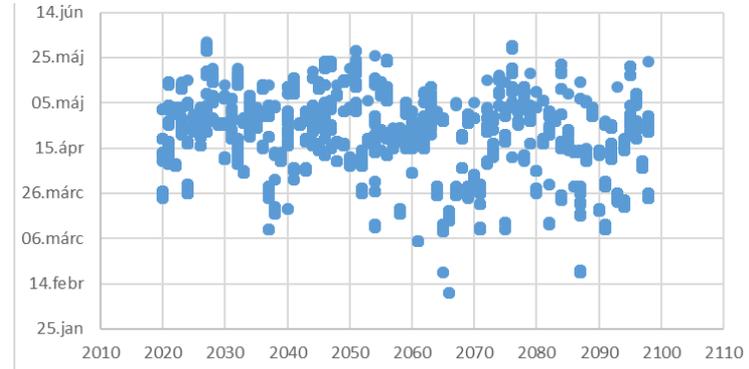
C4I



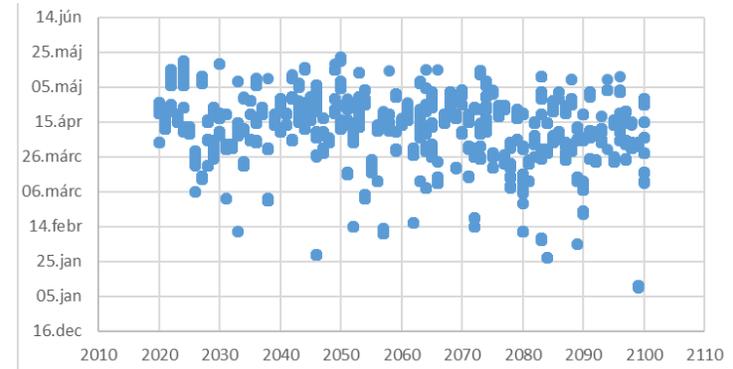
DMI



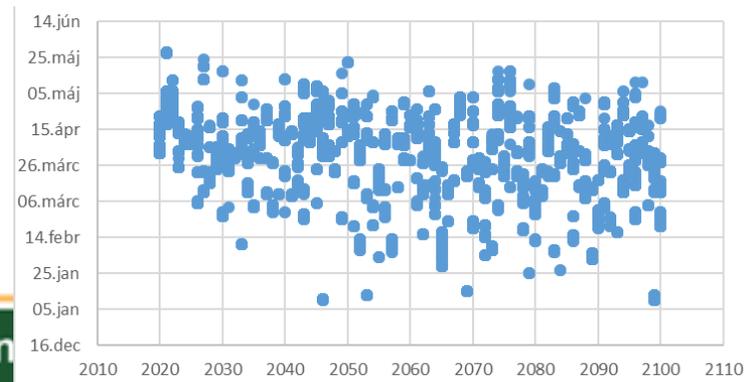
ETHZ



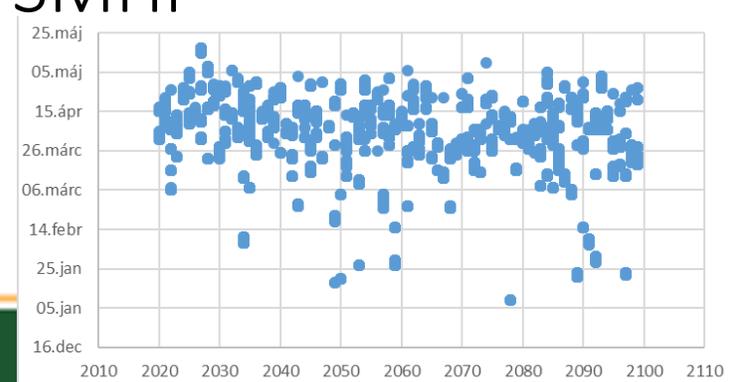
KNMI



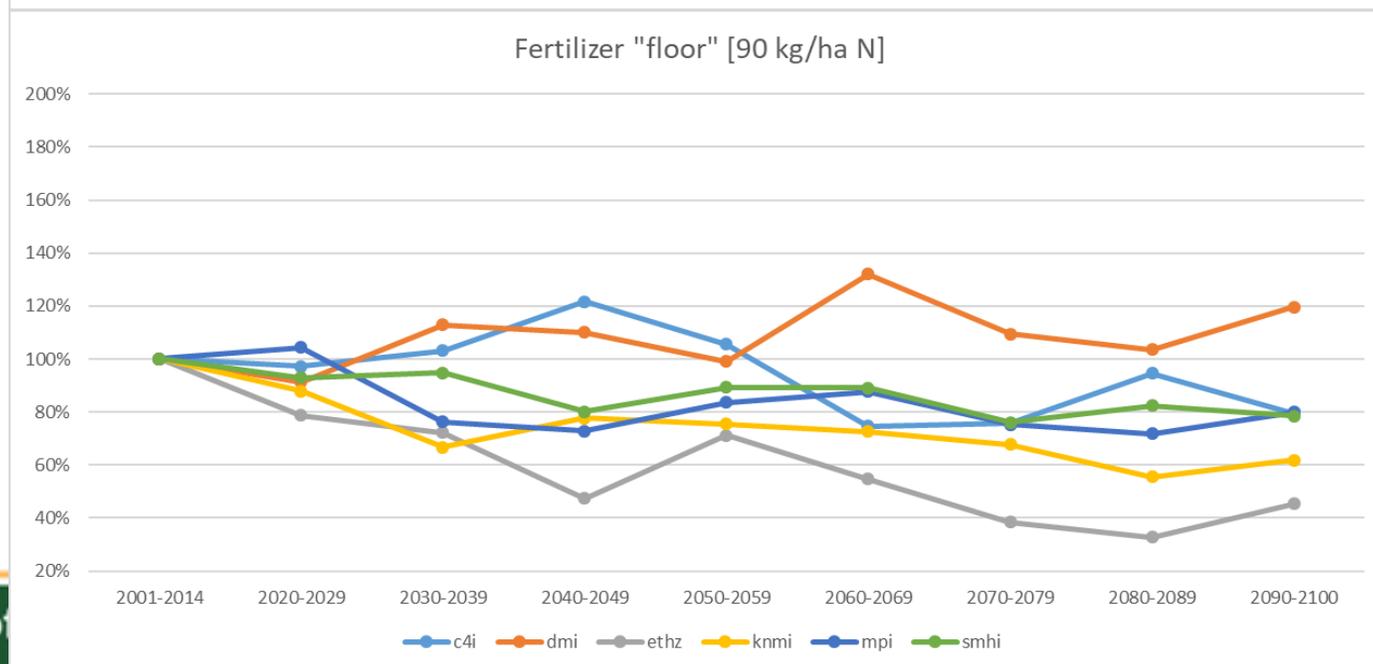
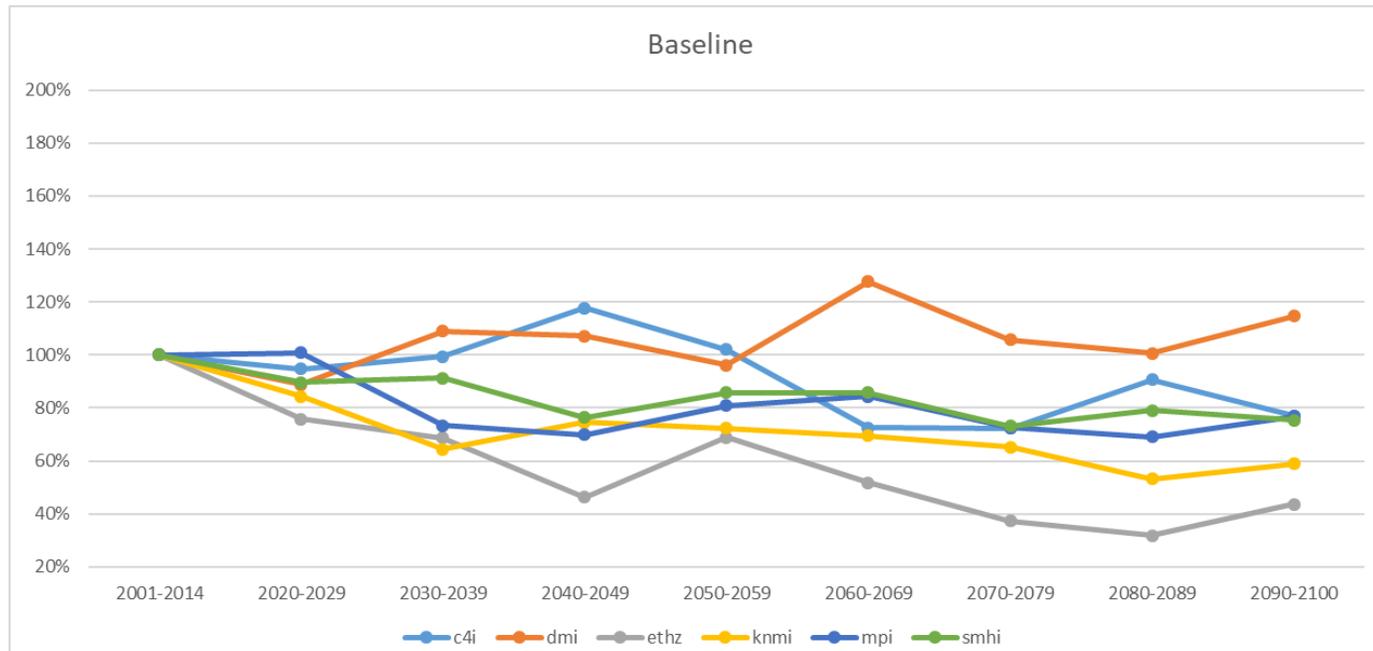
MPI



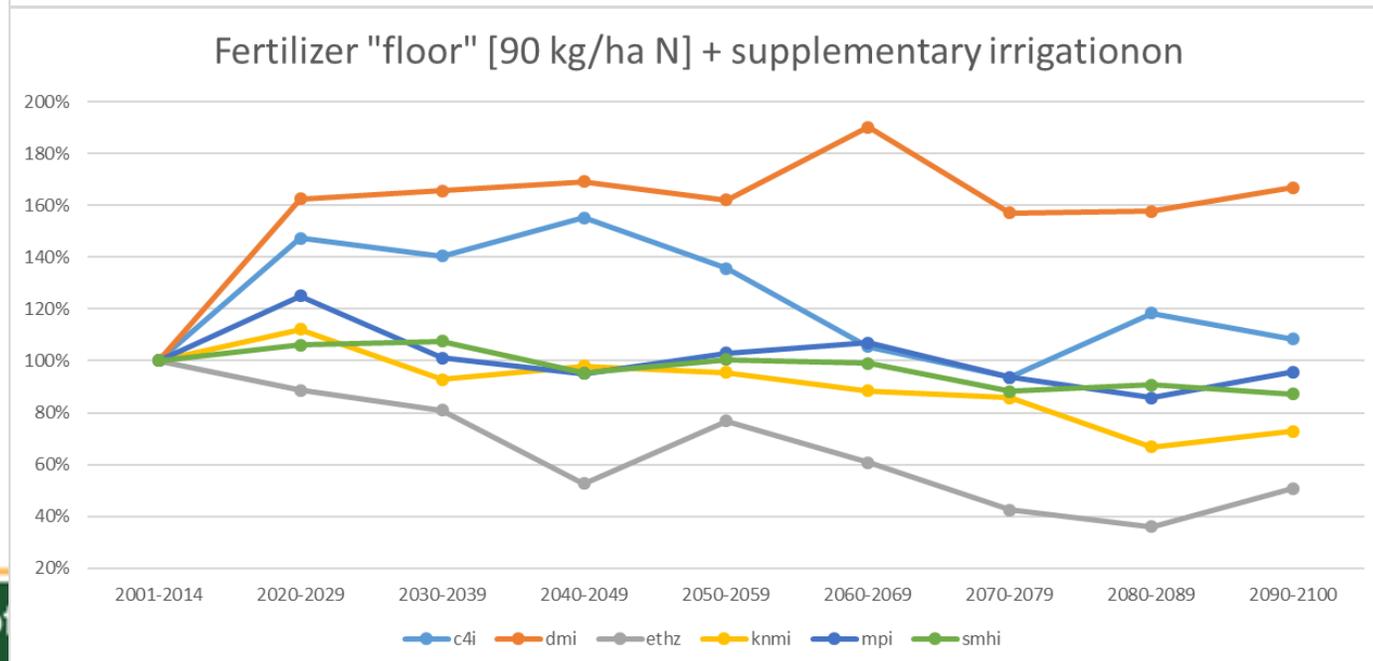
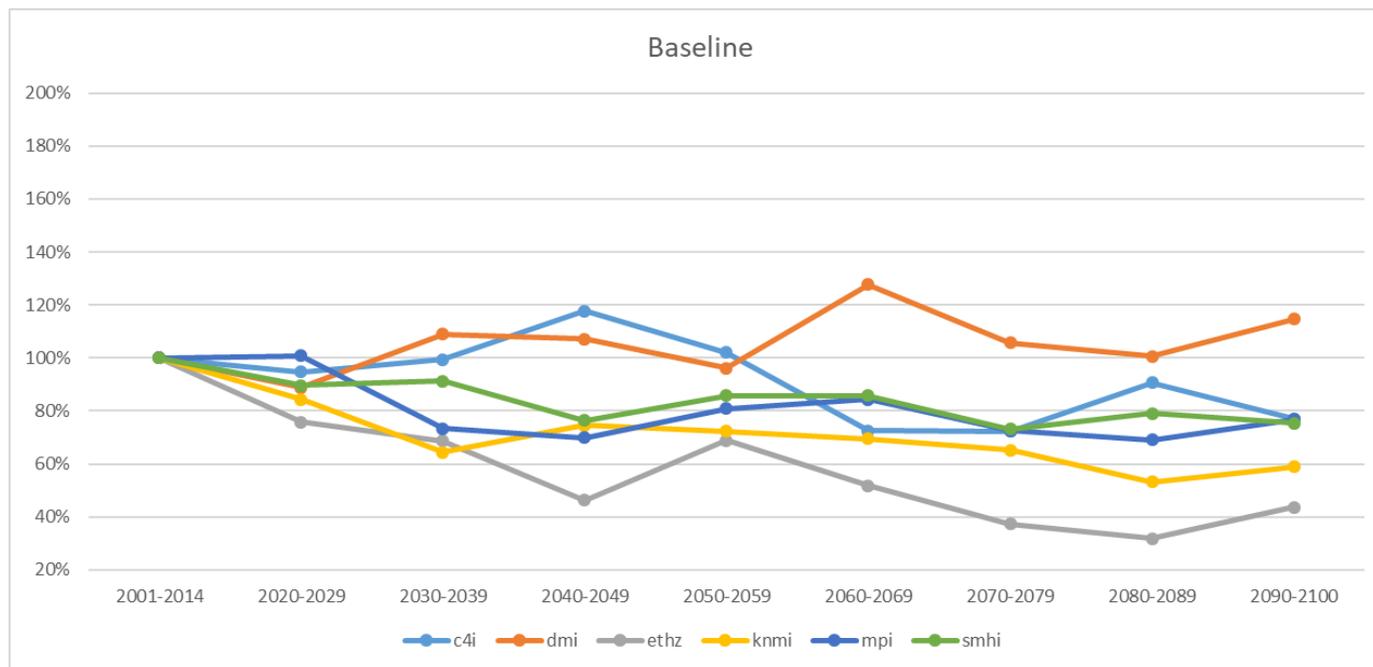
SMHI



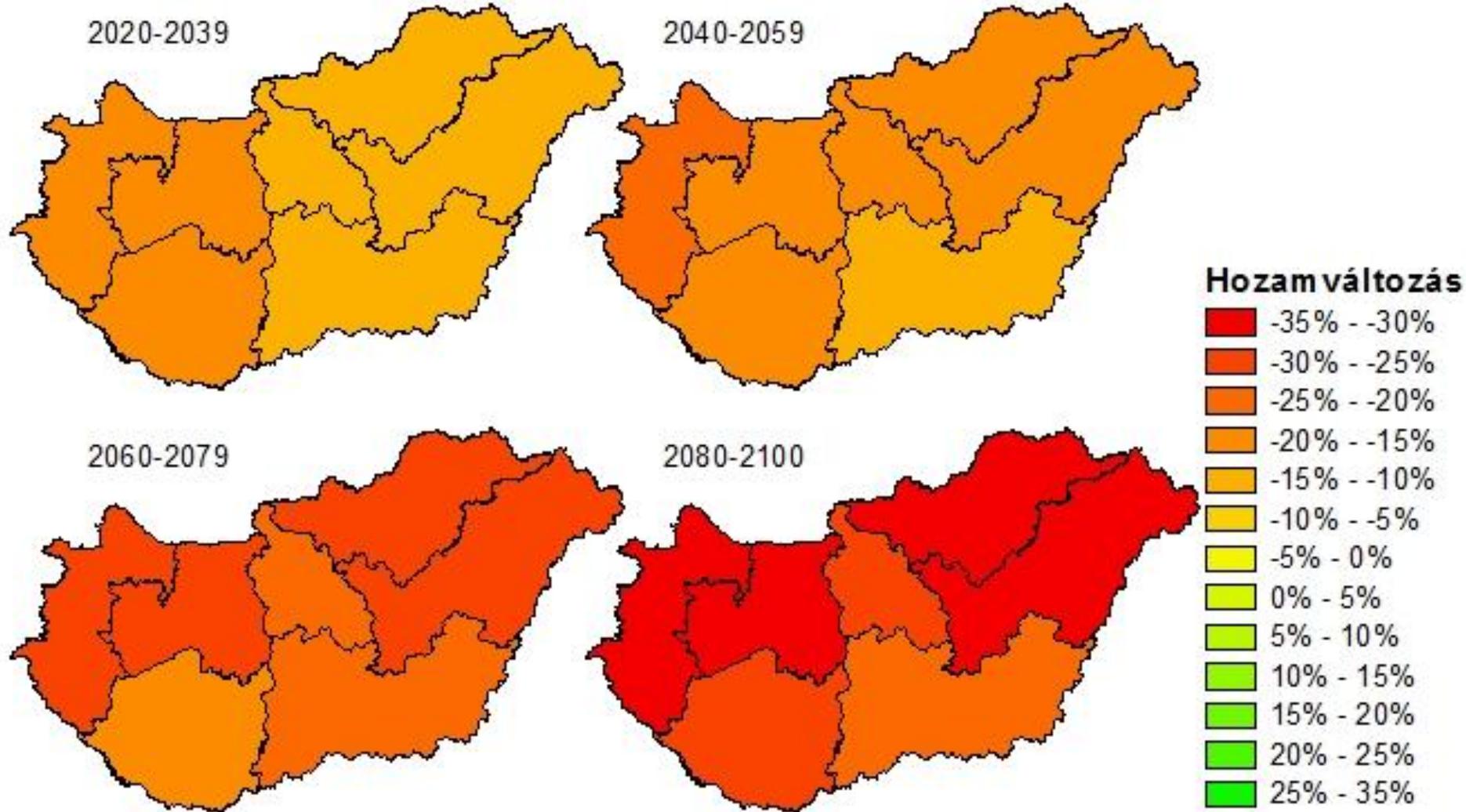
Yield



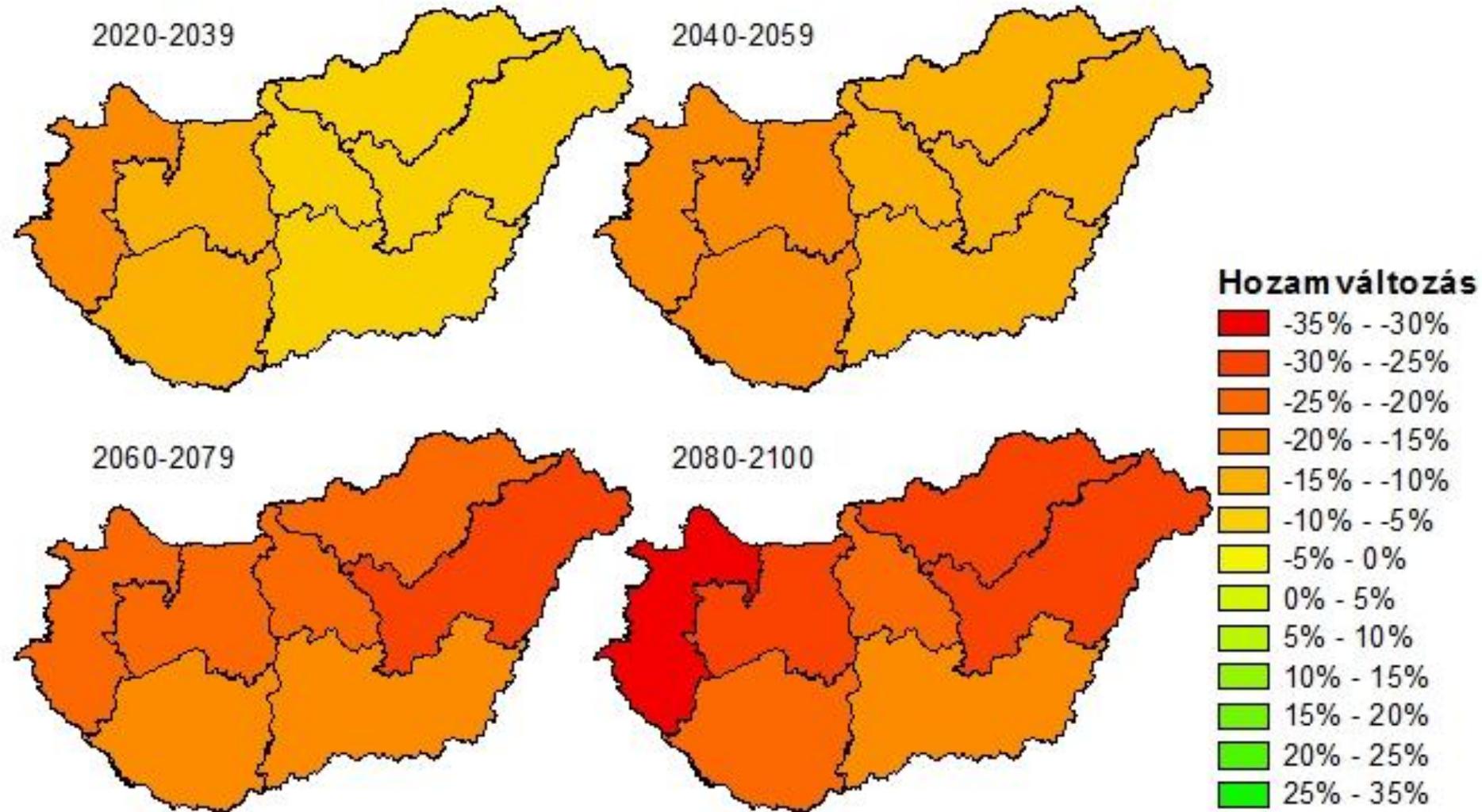
Yield



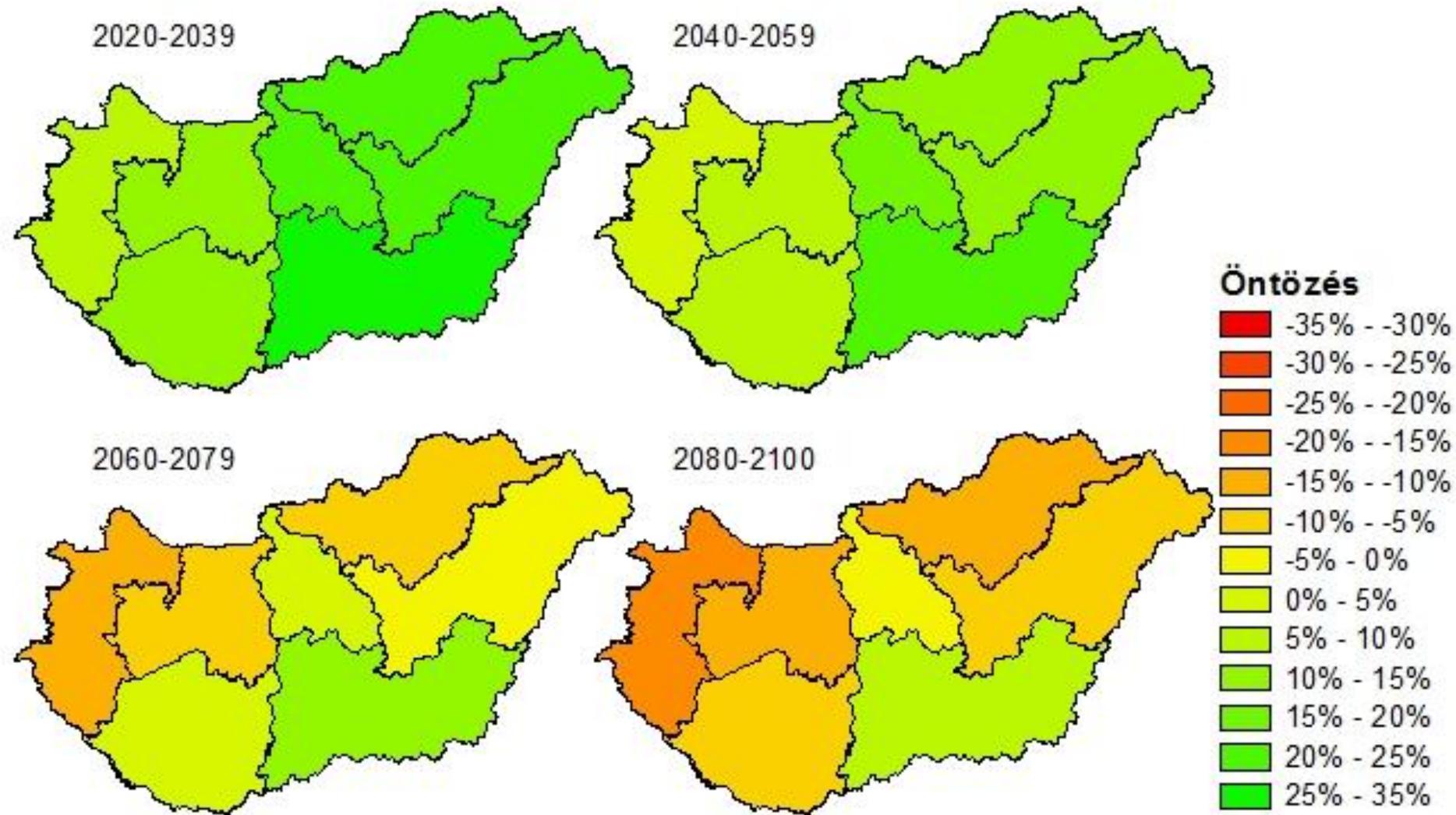
Maize – „BAU” (only sowing/harvest date adjust.)



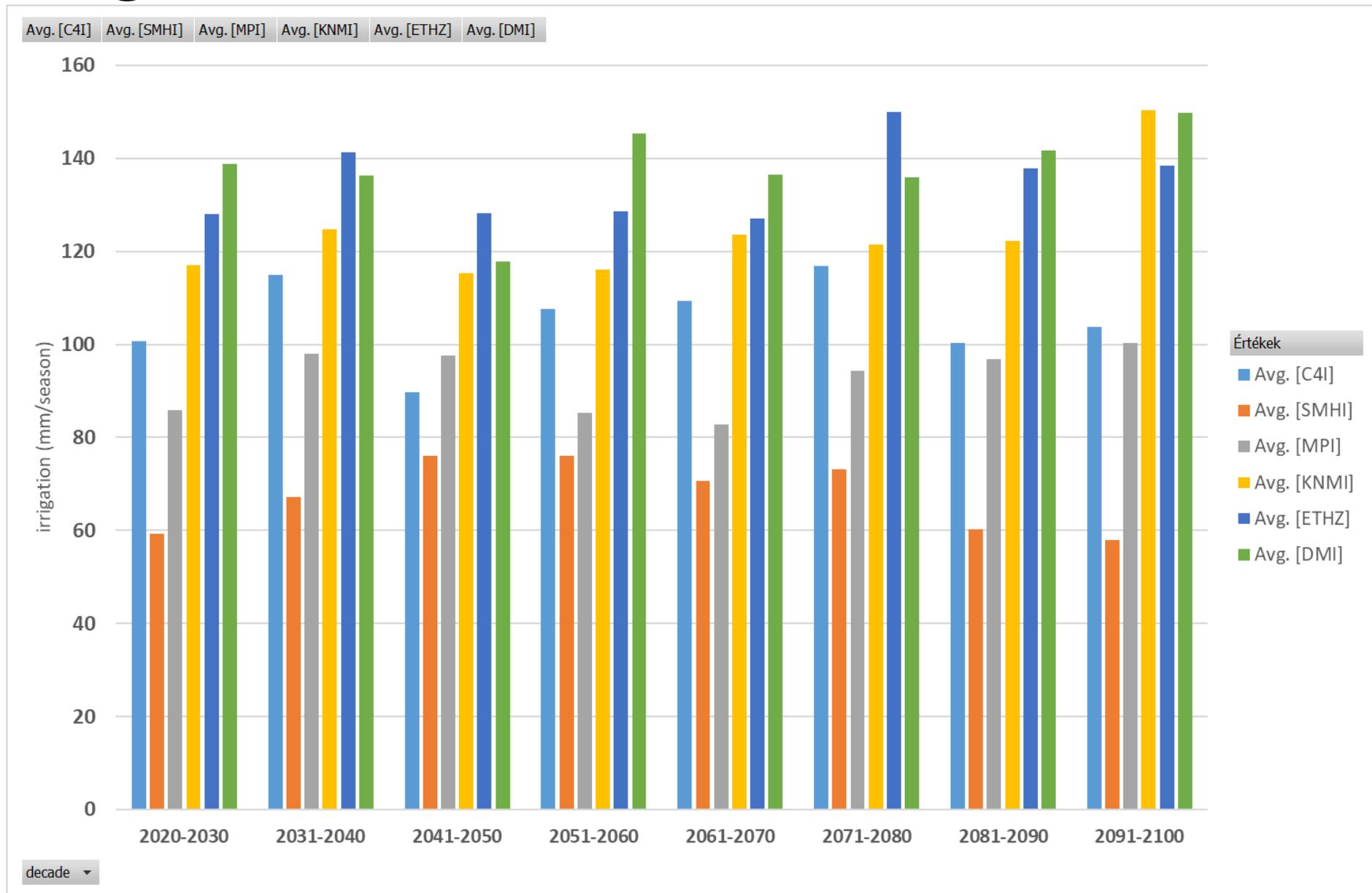
Maize – min. 90 kg/ha N



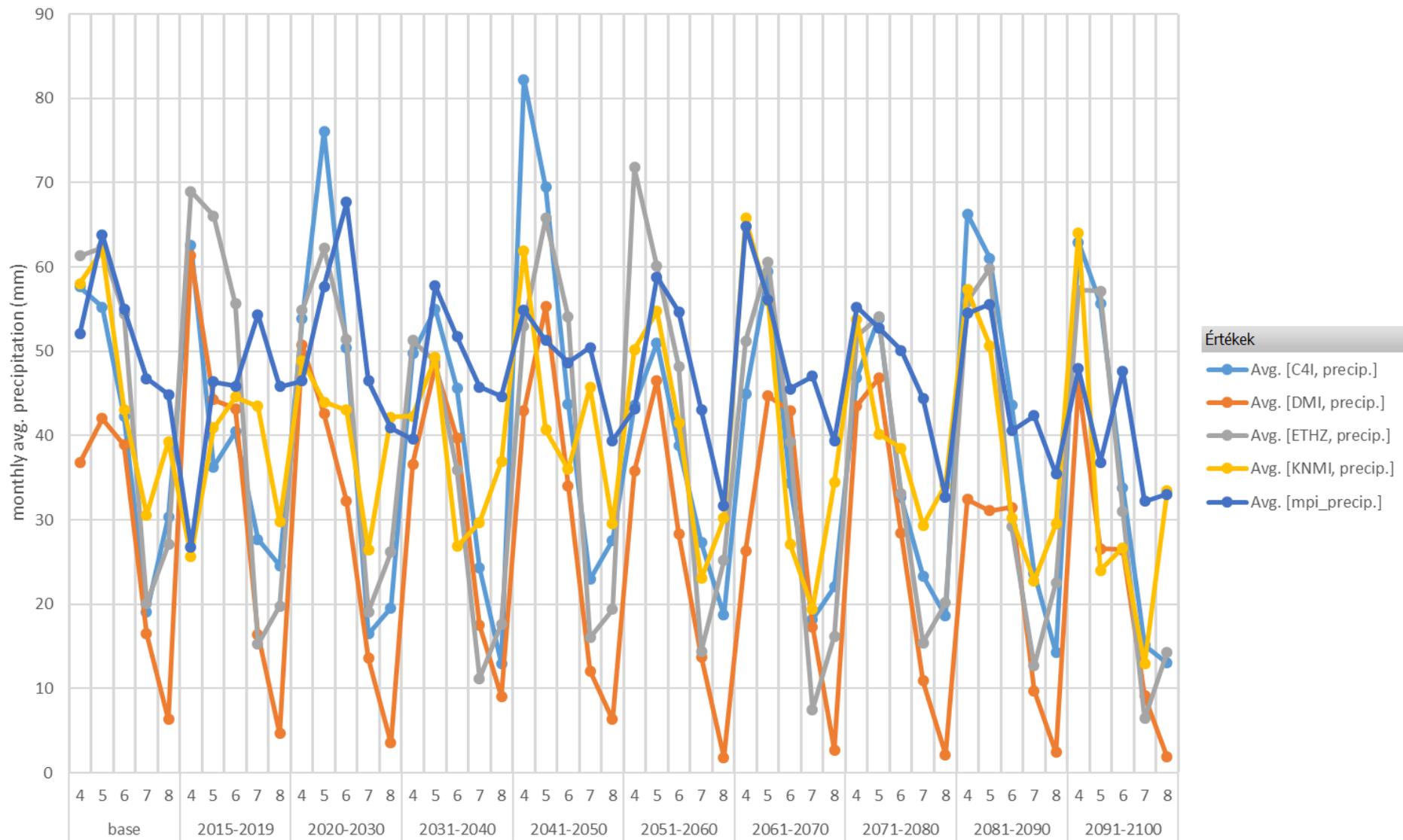
Maize – min. 120 kg/ha N + irrigation



Irrigation



Avg. [C4I, precip.] Avg. [DMI, precip.] Avg. [ETHZ, precip.] Avg. [KNMI, precip.] Avg. [mpi_precip.]

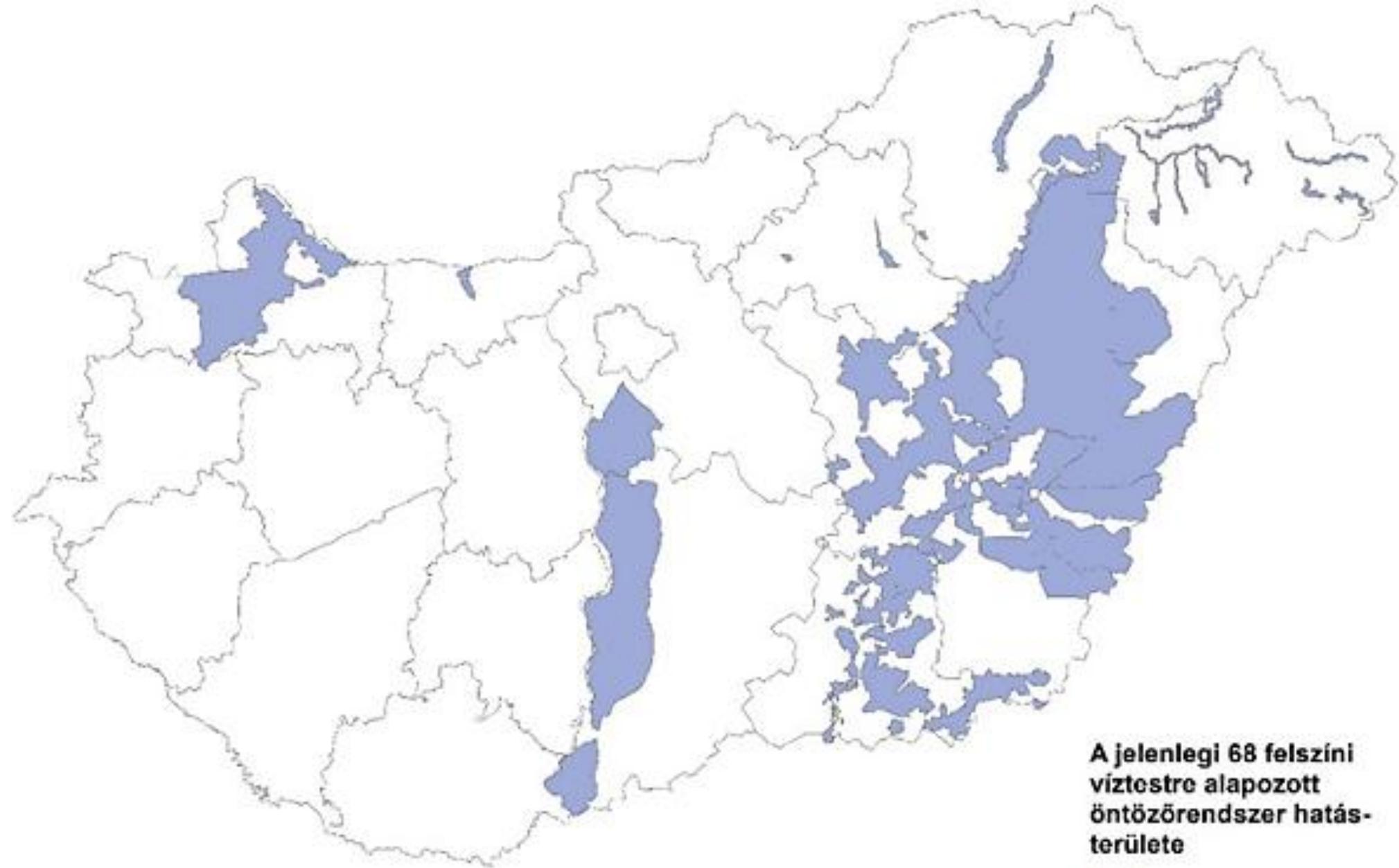


decade month

+ -

Conclusions

- „More data, more analysis, more time”
- „Significant” variability/uncertainty in RCM data
- Slowly changing agro-management dates
- More spatial and temporal variability of yields
- Researchers and policy makers should pay more attention to study irrigation...



**A jelenlegi 68 felszíni
víztestre alapozott
öntözőrendszer hatás-
területe**



Main issues

1. Tenure, possibilities and willingness of cooperation (common/shared irrigation plant, rights of ways)

2. Status of water rights licenses

3. Current possibilities (equiped or accessed to irrigation, application frequency)

- Parcel level, place of water outtake (based on latest official hydrography maps)
- Tervezett vetésszerkezetet megjelölve
- Jelenlegi/tervezett öntözési technológiát megjelölve
- Öntözővíz forrása (FE, FA), áttérési hajlandóság (FA → FE)
- Származtatott vízmennyiség

4. Jövőbeni szándékok

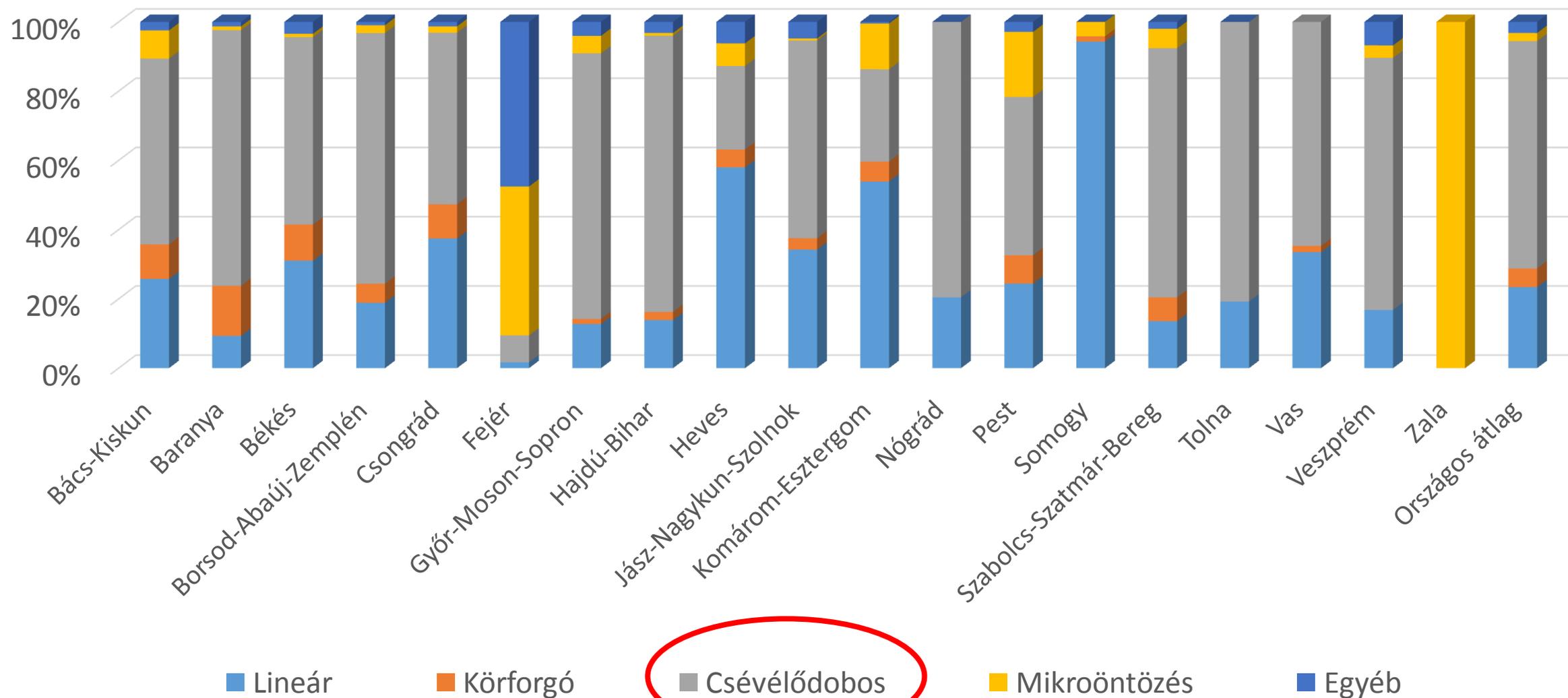
5. Öntözés gazdasági hatása

Munkaerő (csak jelen), Beruházási költség, Elvárt támogatási szint, Várt öntözőüzemi többletköltség, VP pályázati státusz (benyújtott, ha nem miért)

Main figures

- Survey area: ~ 1,2 million ha (242 472 farmer parcel)
- Farms approached: 43 030 (actual data from 39 076)
- Farmers currently use irrigation equipped land: 3 880 farmers
- Area currently irrigation equipped: 144 389 ha
- Farmers wish to irrigate in the near future: 14 220 farmers
- Area wished to be irrigated: 267 310 ha

Expected technologies to be used in new irrigation



IMPACTS

	AREA(ha)	WATER USE (m ³)	INVESTMENT (million EUR)	SURPLUS PRODUCTION VALUE (million EUR)
PRESENT	120 709	123 606 107	0	46,5
FUTURE	266 217	265 338 594	631,7	63,9

Major goals of national irrigation development strategy

In order to utilize the currently available possibilities, incentives towards farmers are needed:

- Should have access to surface water in case all basis conditions are given
- Need of irrigation investment support at farm level

Irrigation requires long run planning, significant coordination among stakeholders and cooperation among farmers.

According to our calculation, approximately 39% would result positive return of the indicated 266 217 ha area planed to be irrigated.

Thank you for your attention!

kemeny.gabor@aki.gov.hu
molnar.andras@aki.gov.hu