EPIC harvest Cultivars - parallelized

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INITIAL SETUP

crop params

paths

```
path_in <- "c:/Users/krizovak/Documents/__EPIC__/R/"

path_met <- "C:/Users/krizovak/Documents/__EPIC__/R/_tables/v3_czsk/"
path_epic <- "c:/Users/krizovak/Documents/__EPIC__/EPIC_CS_v4_Aug2022/"

path_tab <- "c:/Users/krizovak/Documents/__EPIC__/R/_tables/"
path_shp <- "c:/Users/krizovak/Documents/__EPIC__/R/_shapefiles/"

path_out <- "c:/Users/krizovak/Documents/__EPIC__/R/_cultivarRESULTS/"

# REPORT COPY

report <- "C:/Users/krizovak/Documents/__EPIC__/R/markdown/__epicRMD/PARALL_hrvCult.pdf"

if (file.exists(report)){
  print("File exists!")
  mtime <- file.info(report)$mtime
  # mtime <- as.Date(mtime, format=c('y-m-d','h-m-s'))
  # mtime <- as.POSIXlt(mtime)
  mtime <- format(mtime,format='%Y%m%d-%H%M%S')
  path_old <- "C:/Users/krizovak/Documents/__EPIC__/R/markdown/__epicRMD/"
  path_new <- paste0(path_out, crop, "/_outs/_reports/")
  file.rename(from = paste0(path_old, "PARALL_hrvCult.pdf"),
              to = paste0(path_new, "PARALL_hrvCult_", mtime, ".pdf"))
} else {
  print("File does not exist!")
}
```

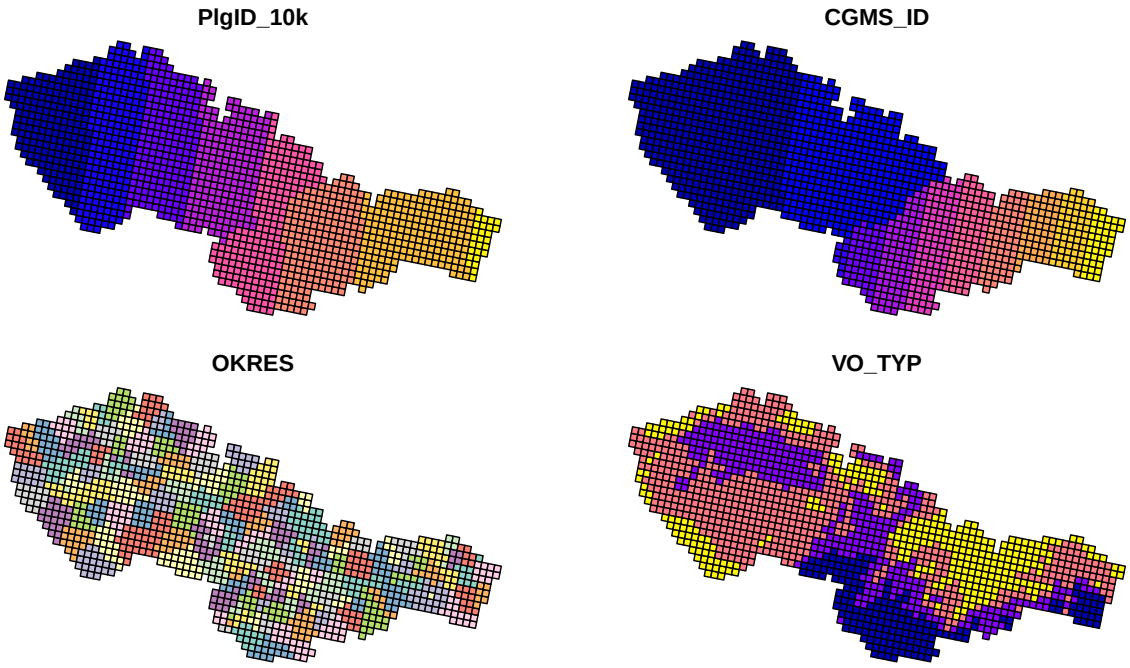
```
## [1] "File does not exist!"
```

time period

```
period <- 1989:2019
```

- crop: CORN
- crop ID: 2
- crop name: corn
- seasonality: SPG
- WCY parameter: 1.15

SPATIAL REFERENCE



- total GRIDS: 1427

HARVEST OUTPUT FILES

Steps for AFTER simulation:

COPY AND PASTE ACM AND ACY

EPIC output files are stored in **EPIC_CS_X/EPIC0810** folder

Backup files:

- create a folder '_outs' in cultivar results folder
- create a subfolder 'crop_outs_currentDate' in '_outs' folder
- copy all files in both newly created folders, so that:
  - there is a backup in date-named folder
  - there are always the latest ACM and ACY files to be further worked with

ACM HARVEST

Annual cropman file

Variable / Description / Units
Y = Year
RT# = Rotation number
PRCP = Precipitation mm
ET = Potential evapotranspiration mm
ET = Evapotranspiration mm
Q = Runoff mm
SSF = Subsurface flow mm
PRK = Percolation mm
CVF = MUSLE crop cover factor
MUSS = Water erosion T/ha
YW = Wind erosion T/ha
GMN = N mineralized kg/ha
NMN = Humus mineralization kg/ha
NFIX = Nitrogen fixation kg/ha
NITR = Nitrification kg/ha
AVOL = Nitrogen volatilization kg/ha
DN = Denitrification kg/ha
YON = Nitrogen loss with sediment kg/ha
QNO3 = Nitrate loss in surface runoff kg/ha
SSFN = Nitrogen in subsurface flow kg/ha
PRKN = Nitrogen loss in percolate kg/ha
MNP = Phosphorus mineralized kg/ha
YP = Phosphorus loss in sediment kg/ha
QAP = Labile phosphorus loss in runoff kg/ha
PRKP = Phosphorus loss in percolate kg/ha
LIME = Lime applied kg/ha
OCPD = Organic carbon in plow layer depth set by PARM(16) kg/ha
TOC = Organic carbon in soil profile kg/ha
APBC = Labile phosphorus content in plow layer %
TAP = Total labile p in soil profile kg/ha
TNO3 = Total nitrate in soil profile kg/ha

ACY HARVEST

Annual Crop Yield

Variable / Description / Units
Y = Year
RT# = Fertilizer ID
CPNM = Crop name
YLDG = Grain yield T/ha
YLDF = Forage yield T/ha
BIOM Biomass T/ha
YLN = Nitrogen used by crop kg/ha
YLP = Phosphorus used by crop kg/ha
FTN = Nitrogen applied kg/ha
FTP = Phosphorus applied kg/ha
IRGA = Irrigation volume applied mm
IRDL = Irrigation water lost in delivery system mm
WUEF = Water use efficiency (crop yield / growing season ET) kg/mm
GSET = Growing season et (mm) mm
CAW = Crop available water (soil water at planting + growing season rainfall - runoff) mm
CRF = Growing season rainfall mm
CQV = Growing season runoff mm
COST = Cost of production $/ha
COOP = Operating cost $/ha
RYLG = Return for grain yield $/ha
RYLF = Return for forage yield $/ha
PSTF = Pest damage factor (fraction of yield remaining after pest damage
WS = Water stress days d/yr
NS = Nitrogen stress days d/yr
PS = Phosphorus stress days d/yr
KS = Potassium stress days d/yr
TS = Temperature stress days d/yr
AS = Aeration stress days d/yr
SS = Salinity stress factor
PPOP = Plant population plants/m2
IPLD = Planting date
IGMD = Germination date
IHVD = Harvest date

OUTPUT TABLE

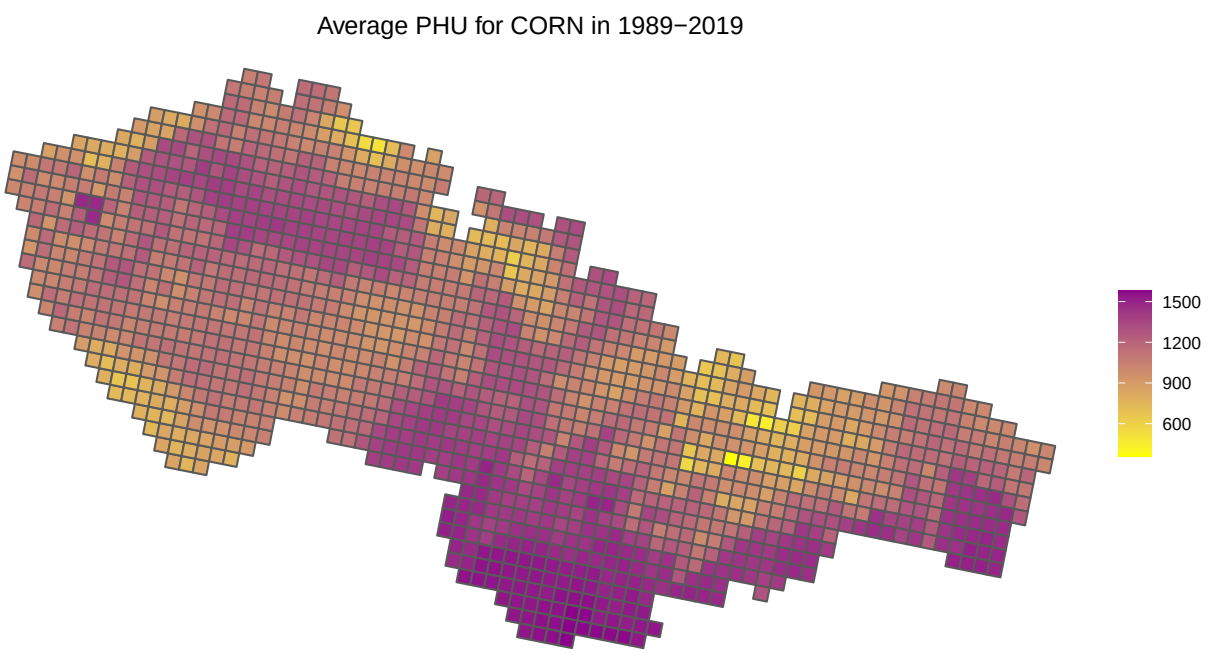
ACM and ACY tables combined in one
Contains all important outputs of the simulation

CULTIVARS REVIEW

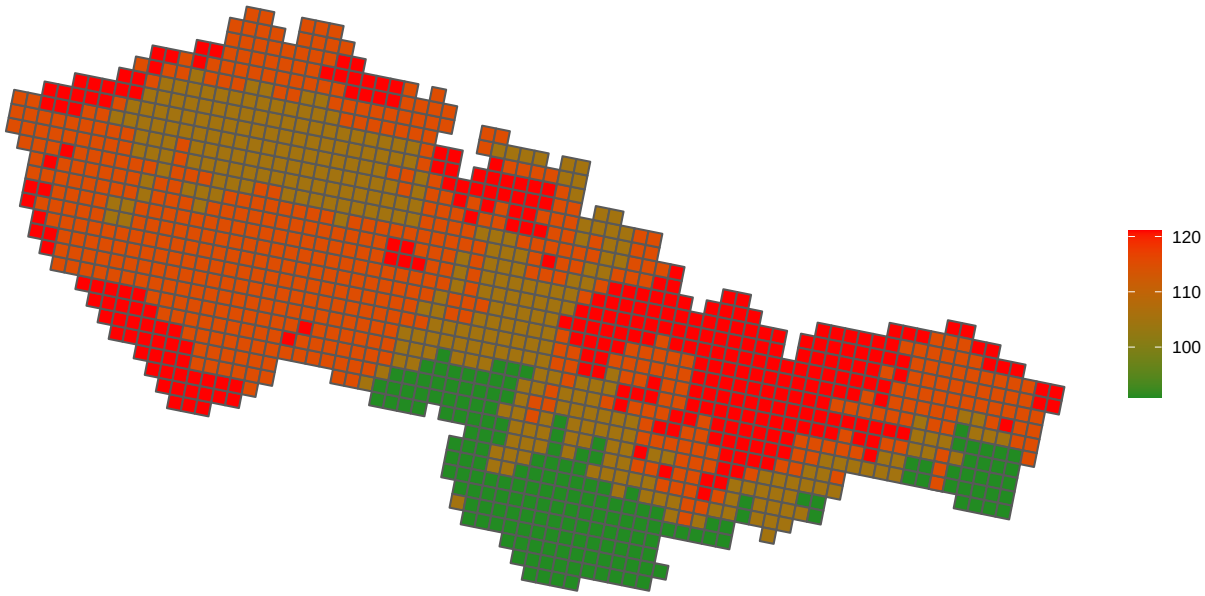
CULTIVARS

Table 1: Cultivars of corn

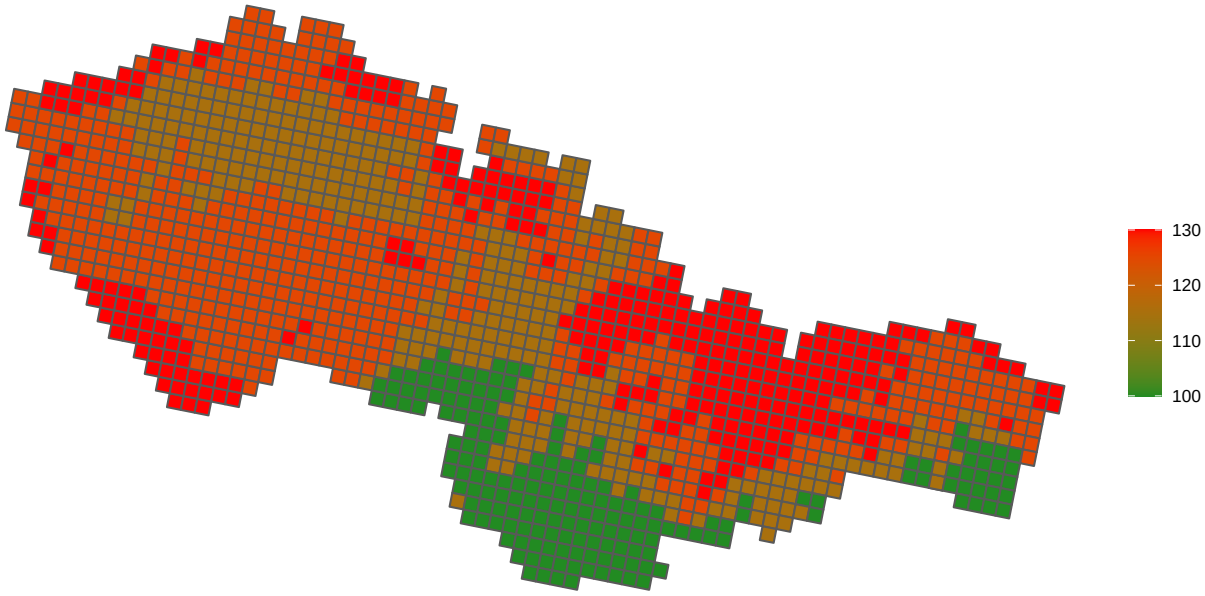
CROP	CROPID	CULT	PLN_JUL	HRV_JUL	LVP	sow_dat	PLN_MON	PLN_DAY	Hrv_dat	HRV_MON	HRV_DAY
CORN	155	b1	115	265	150	425	4	25	922	9	22
CORN	155	b2	125	275	150	505	5	5	1002	10	2
CORN	155	b3	135	285	150	515	5	15	1012	10	12
CORN	155	h1	121	266	145	501	5	1	923	9	23
CORN	155	h2	130	275	145	510	5	10	1002	10	2
CORN	155	h3	140	285	145	520	5	20	1012	10	12
CORN	155	k1	91	266	175	401	4	1	923	9	23
CORN	155	k2	100	275	175	410	4	10	1002	10	2
CORN	155	k3	110	285	175	420	4	20	1012	10	12
CORN	155	r1	105	280	175	415	4	15	1007	10	7
CORN	155	r2	115	290	175	425	4	25	1017	10	17
CORN	155	r3	125	300	175	505	5	5	1027	10	27



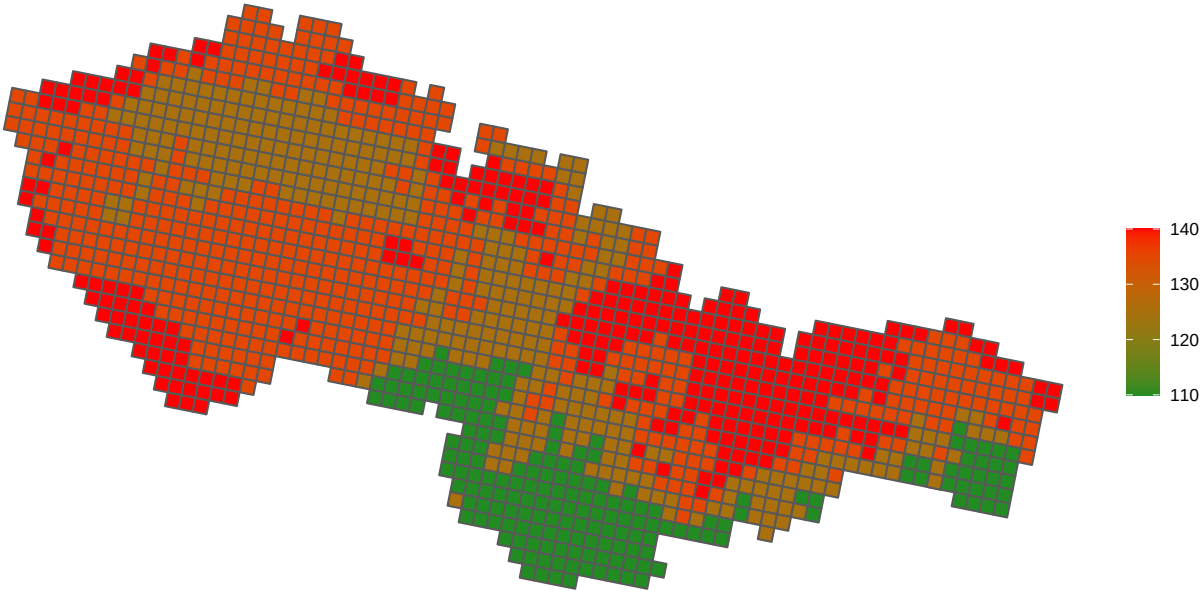
Planting day (julian) for CORN / scenario:1



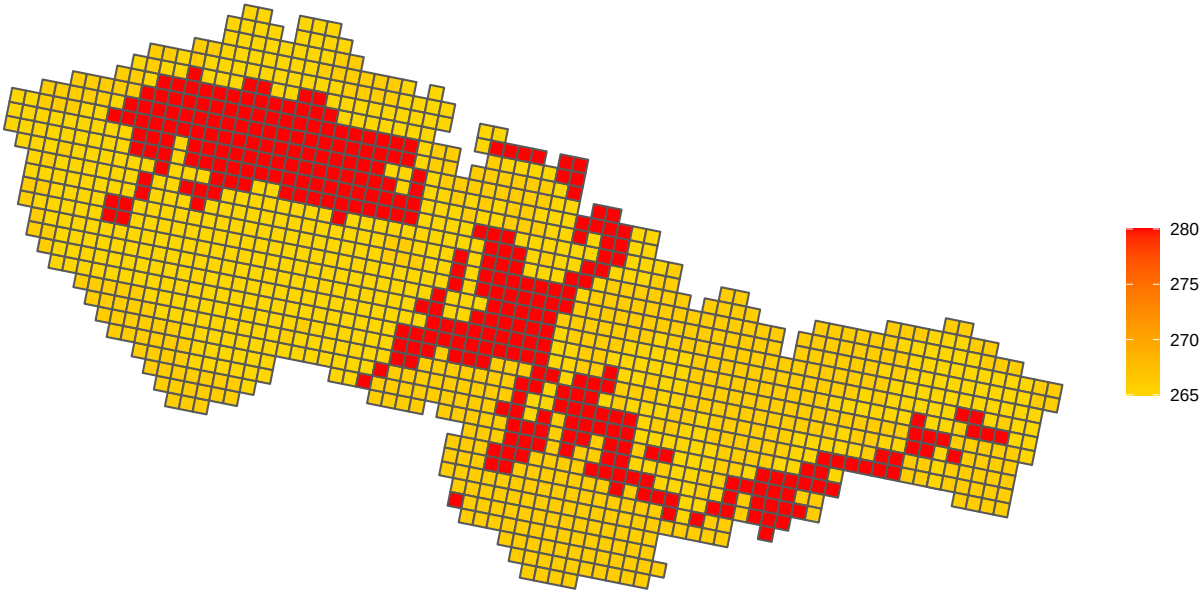
Planting day (julian) for CORN / scenario:2



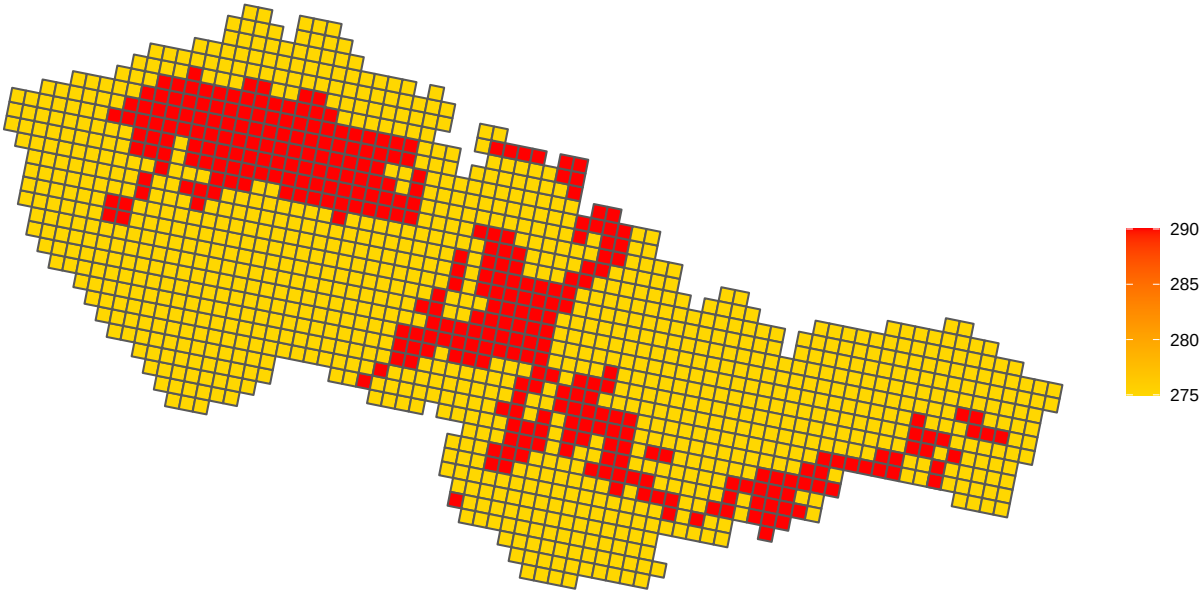
Planting day (julian) for CORN / scenario:3



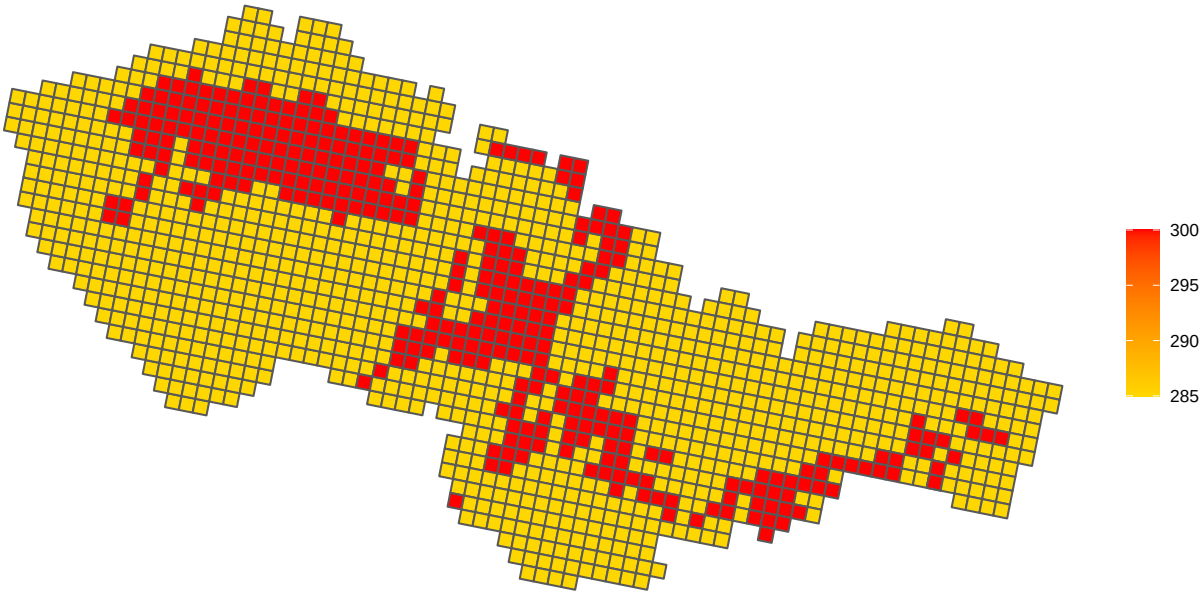
Harvesting day (julian) for CORN / scenario:1



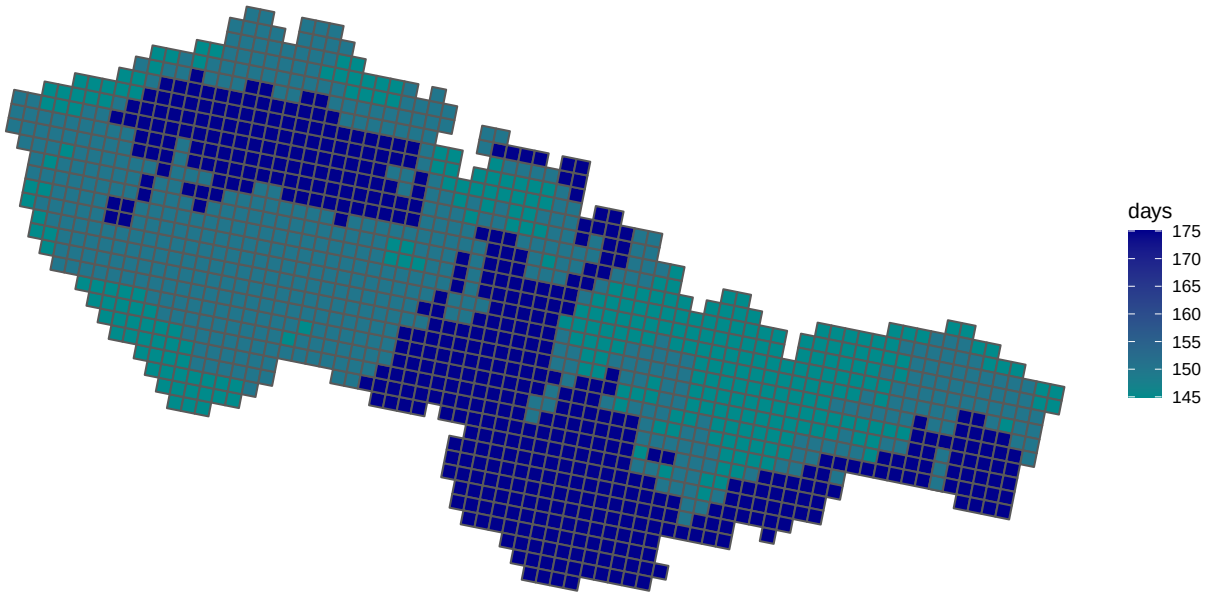
Harvesting day (julian) for CORN / scenario:2



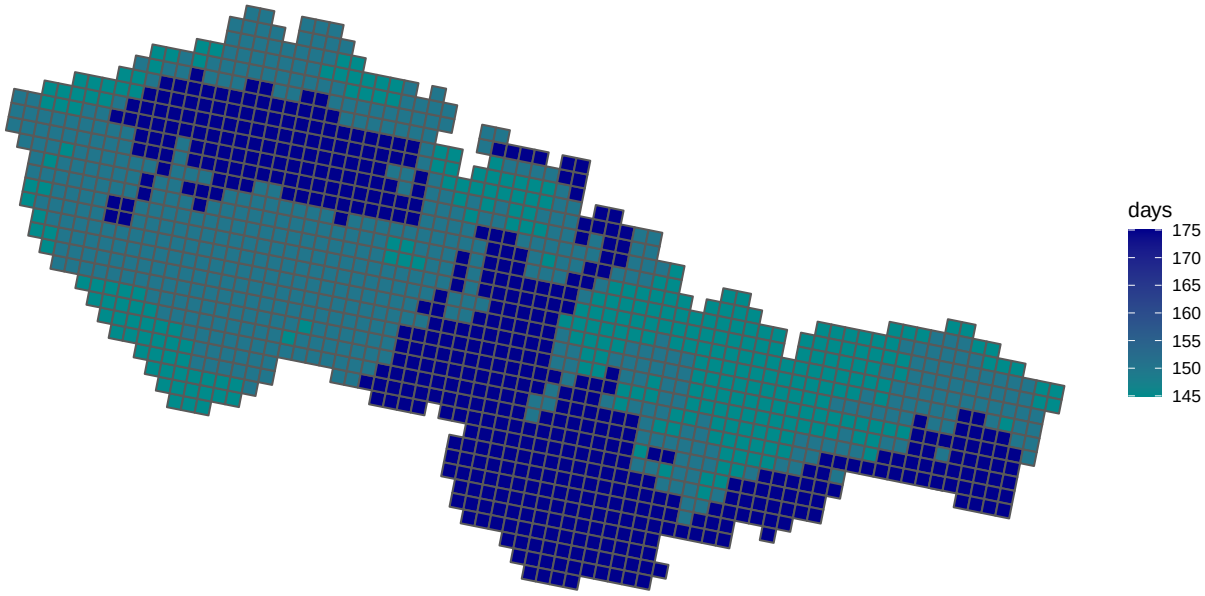
Harvesting day (julian) for CORN / scenario:3



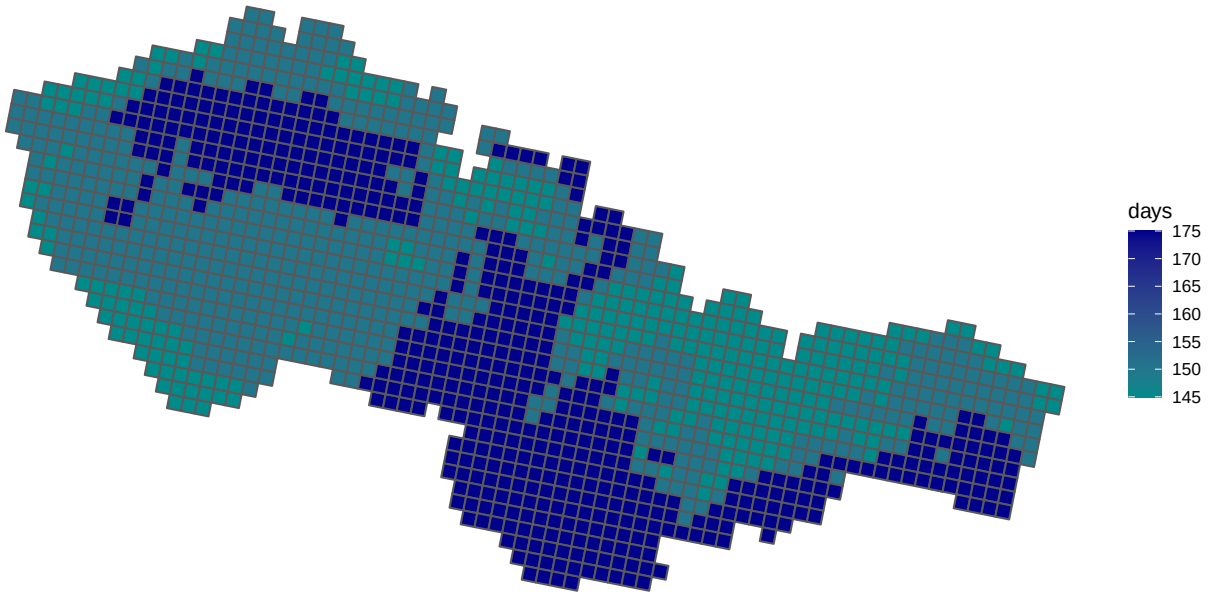
Length of vegetation period for CORN / scenario:1



Length of vegetation period for CORN / scenario:2

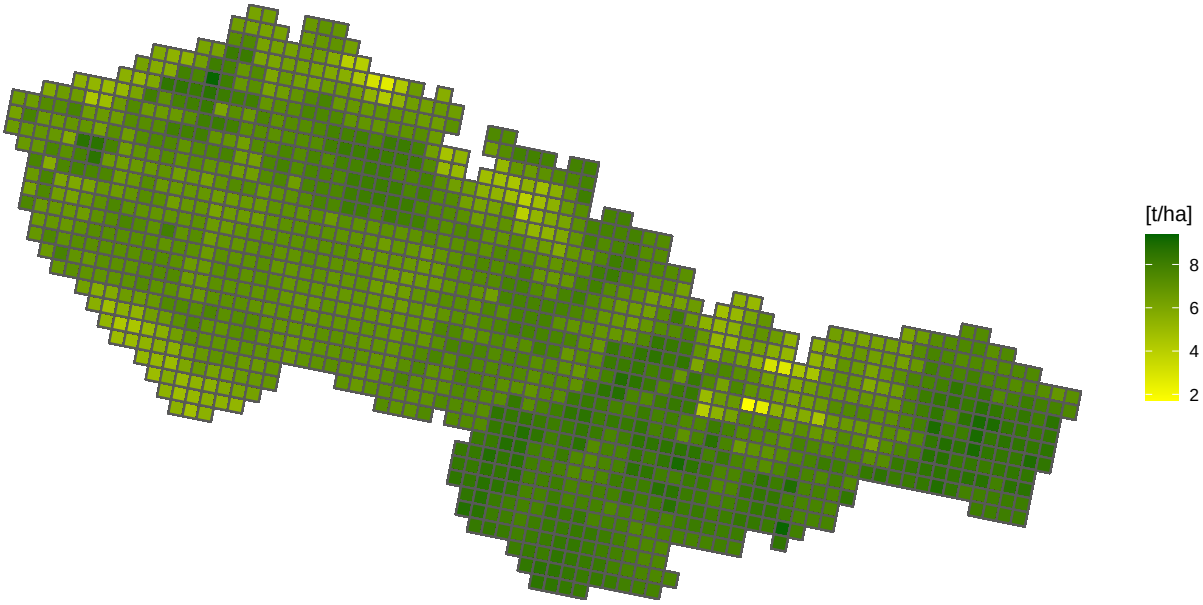


Length of vegetation period for CORN / scenario:3

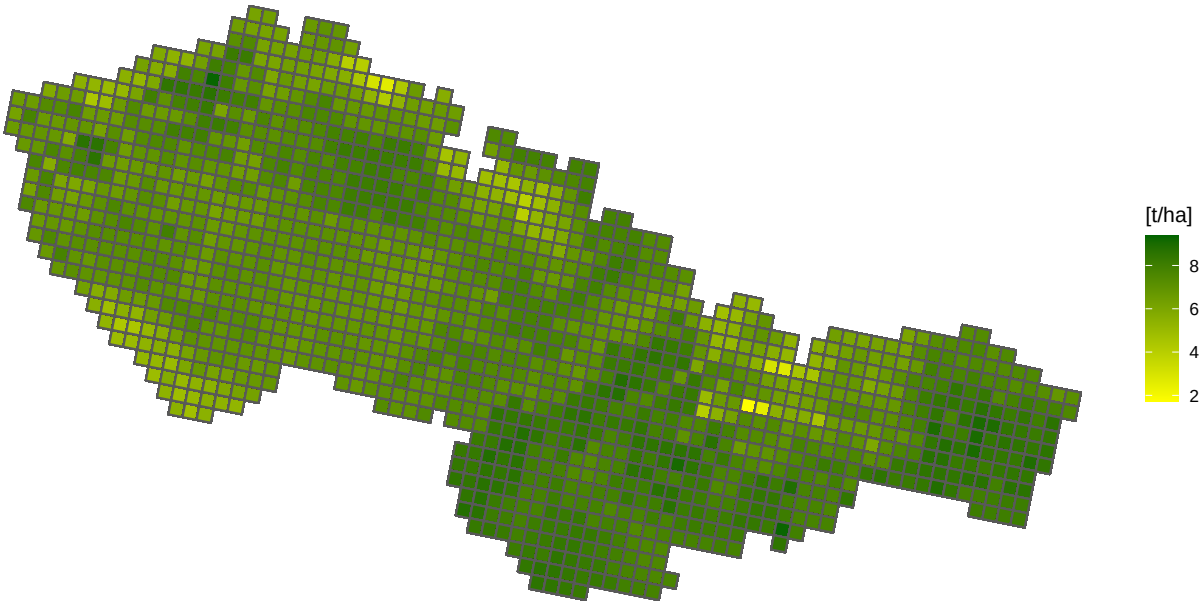


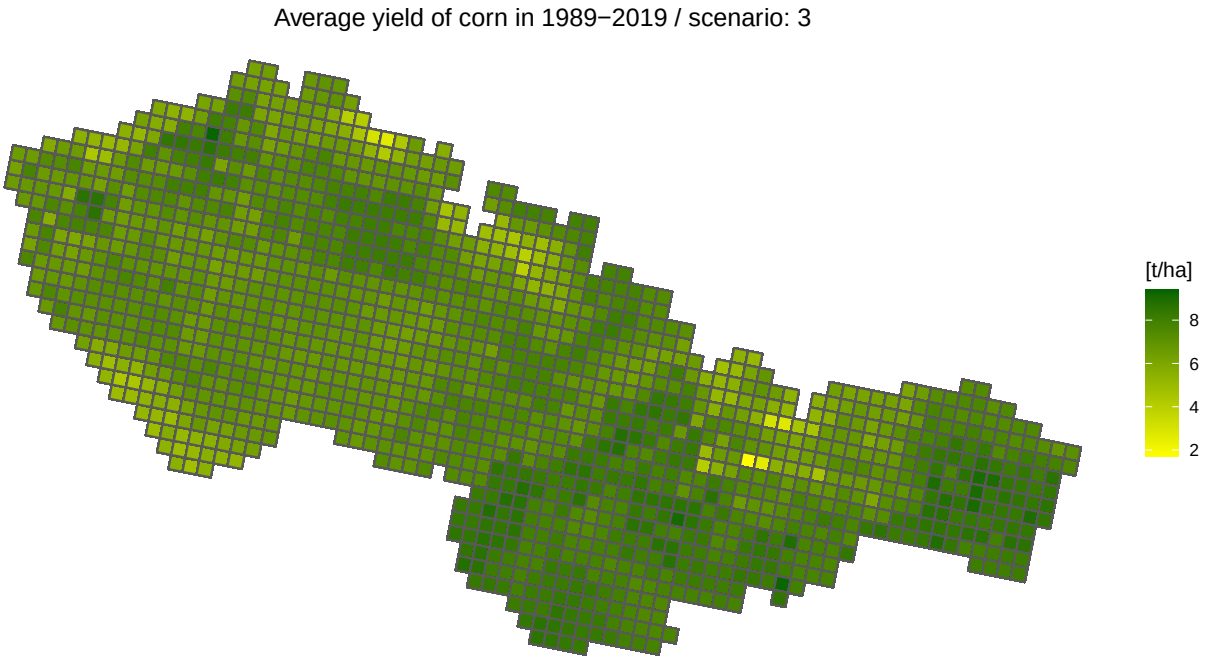
MAP YIELD FOR ALL SCENARIOS

Average yield of corn in 1989−2019 / scenario: 1

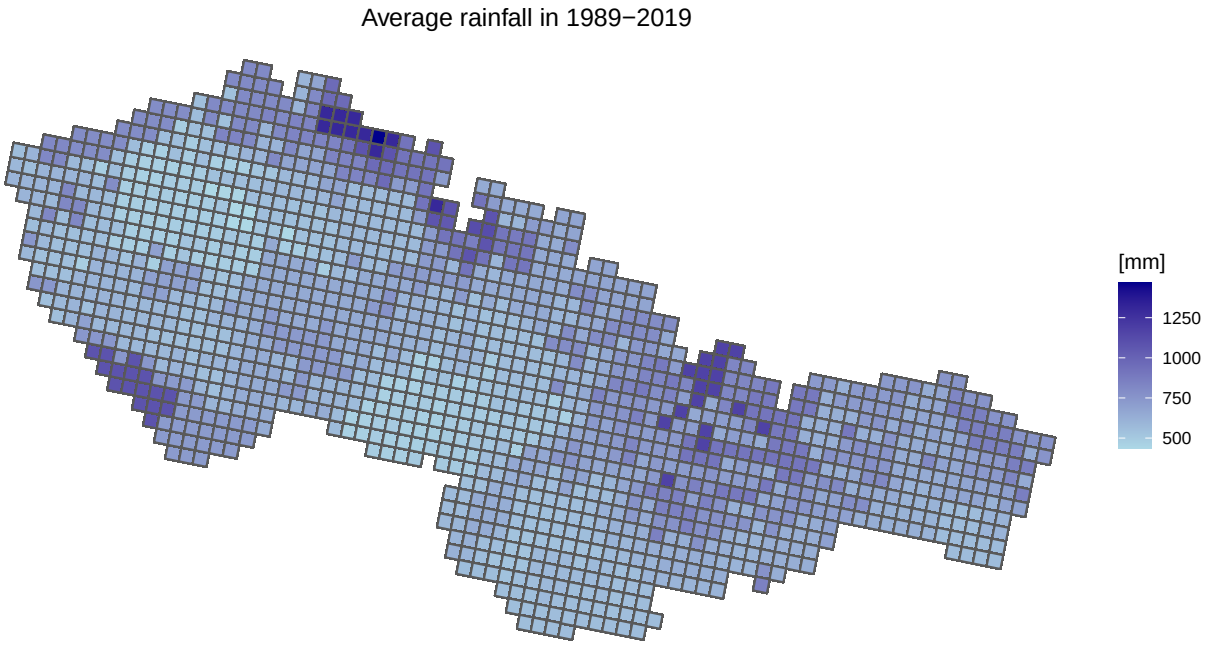


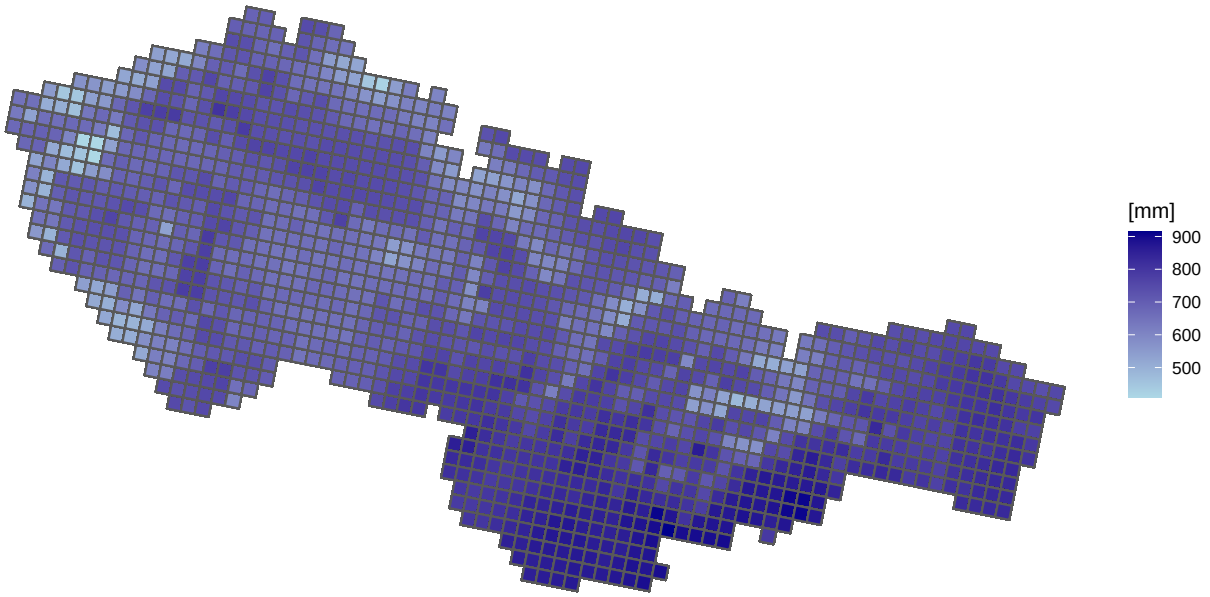
Average yield of corn in 1989−2019 / scenario: 2




Average yield of corn in 1989−2019 / scenario: 3
[t/ha]
8
6
4
2

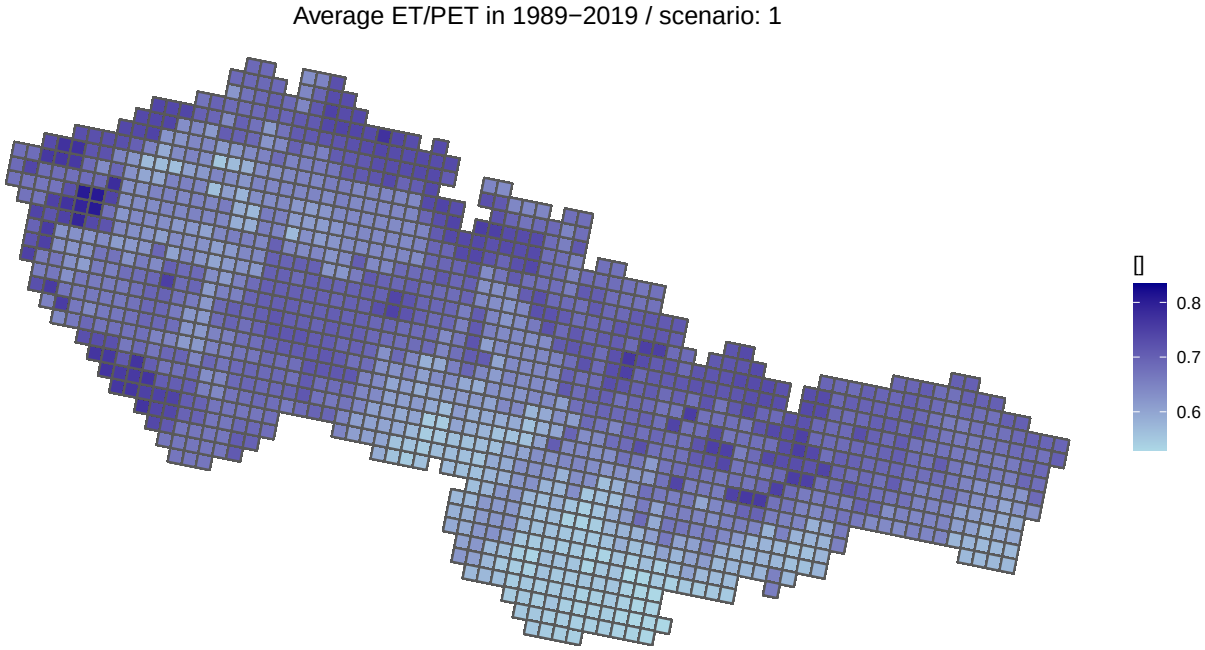
METEOROLOGICAL MAPS

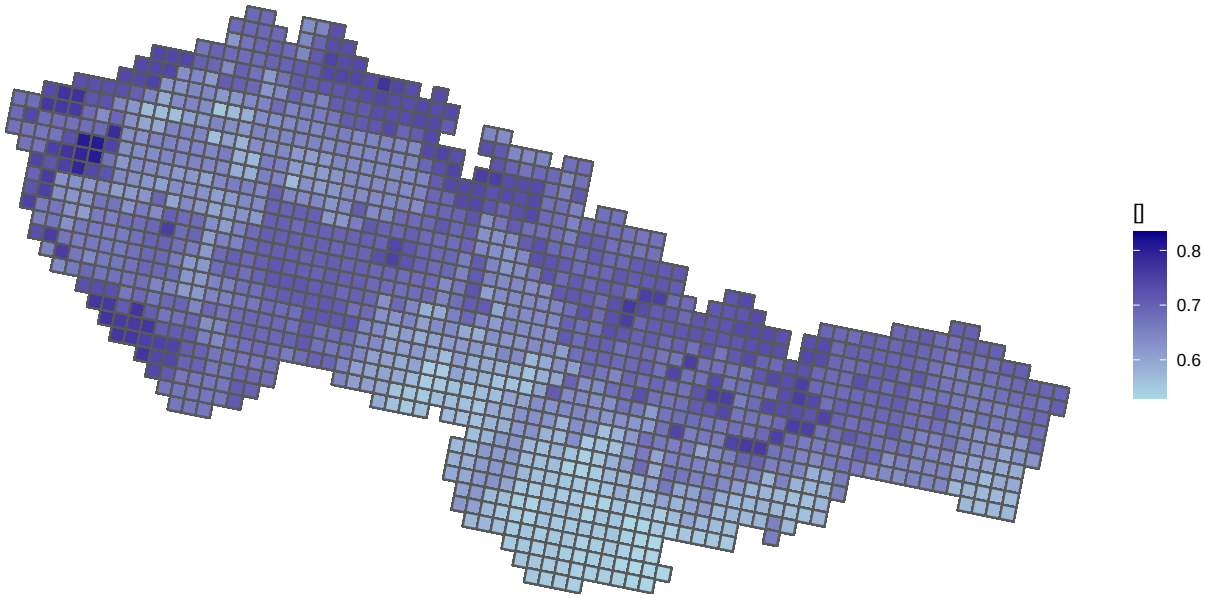




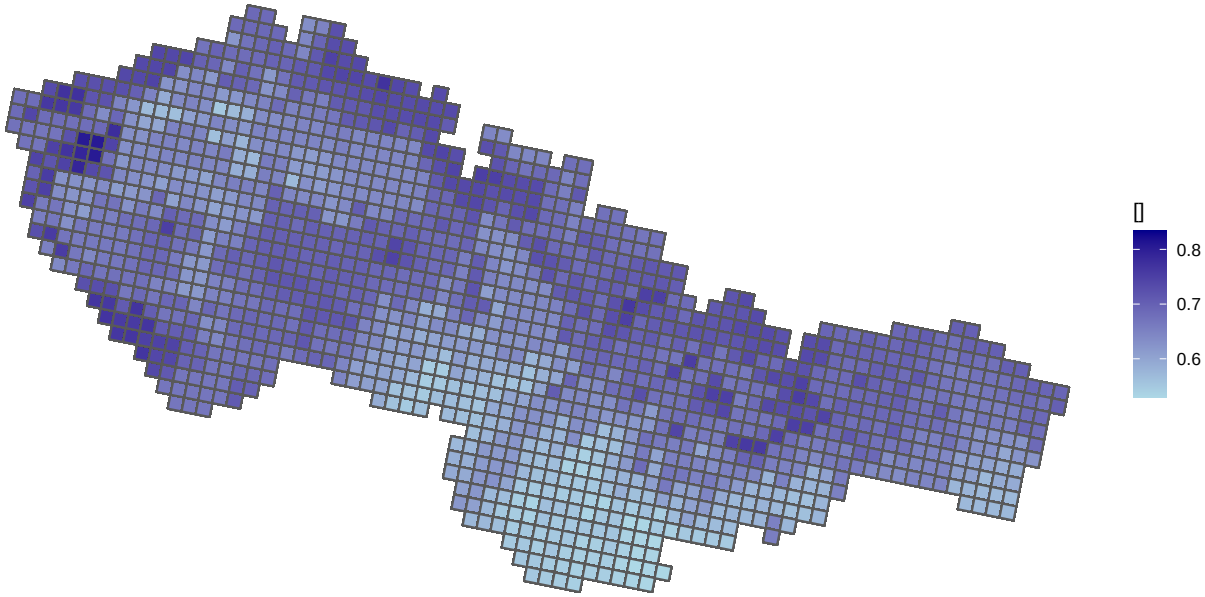
STRESS MAPS

- scenario-specific factors

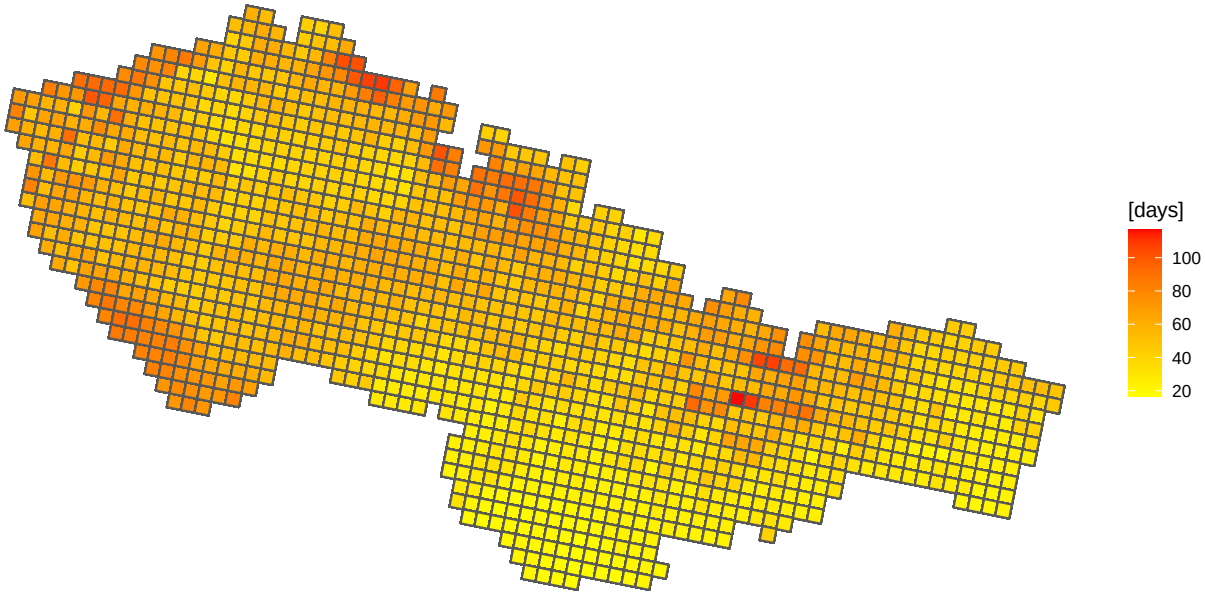

Average ET/PET in 1989−2019 / scenario: 1
0.8
0.7
0.6


Average ET/PET in 1989−2019 / scenario: 2
0.8
0.7
0.6

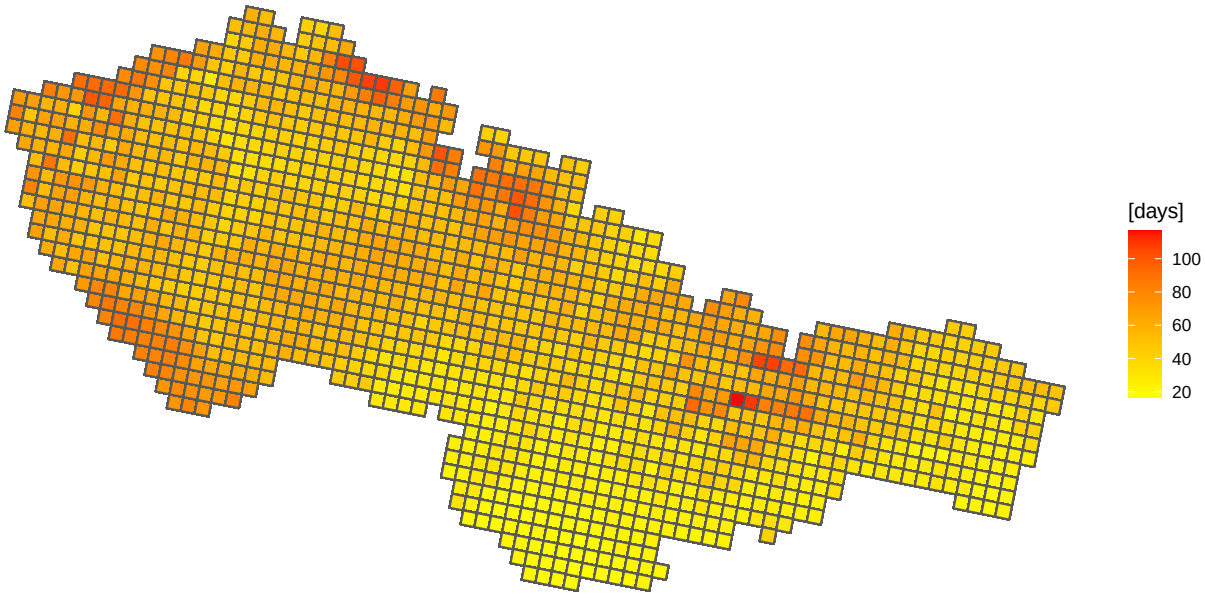
Average ET/PET in 1989−2019 / scenario: 3



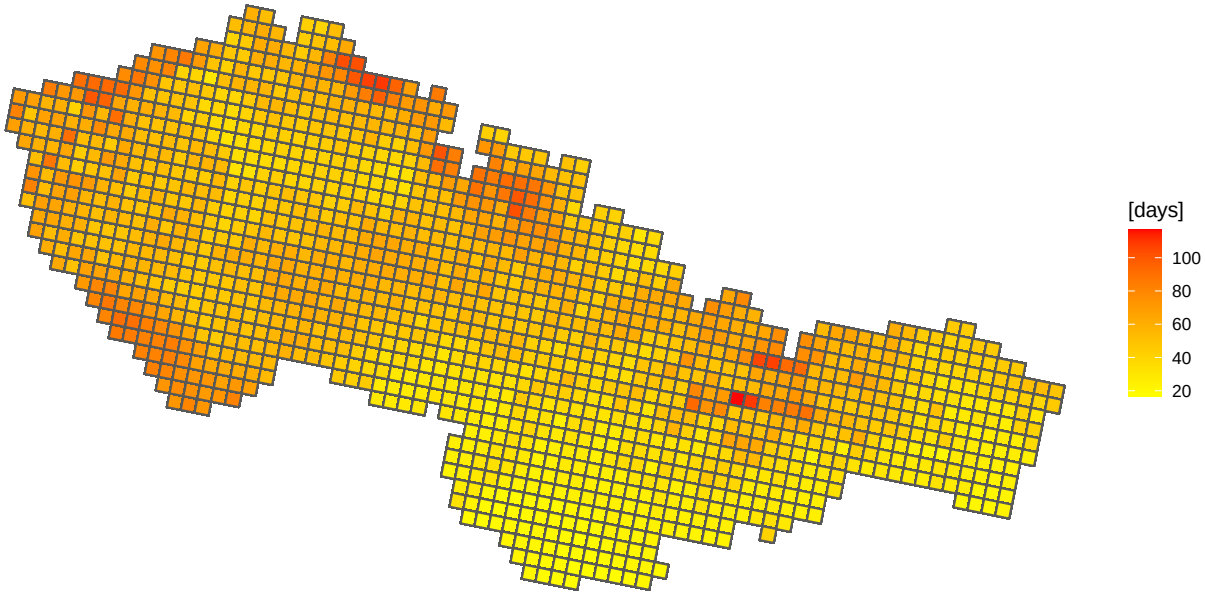
Average temperature stress in 1989−2019 / scenario: 1

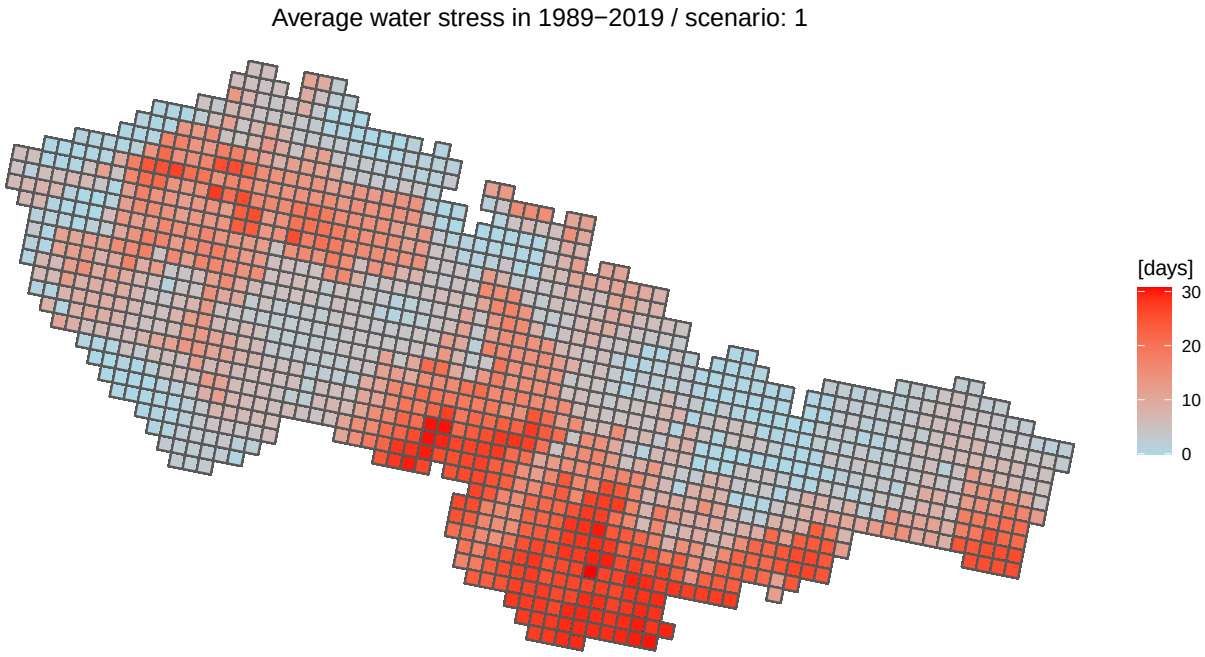


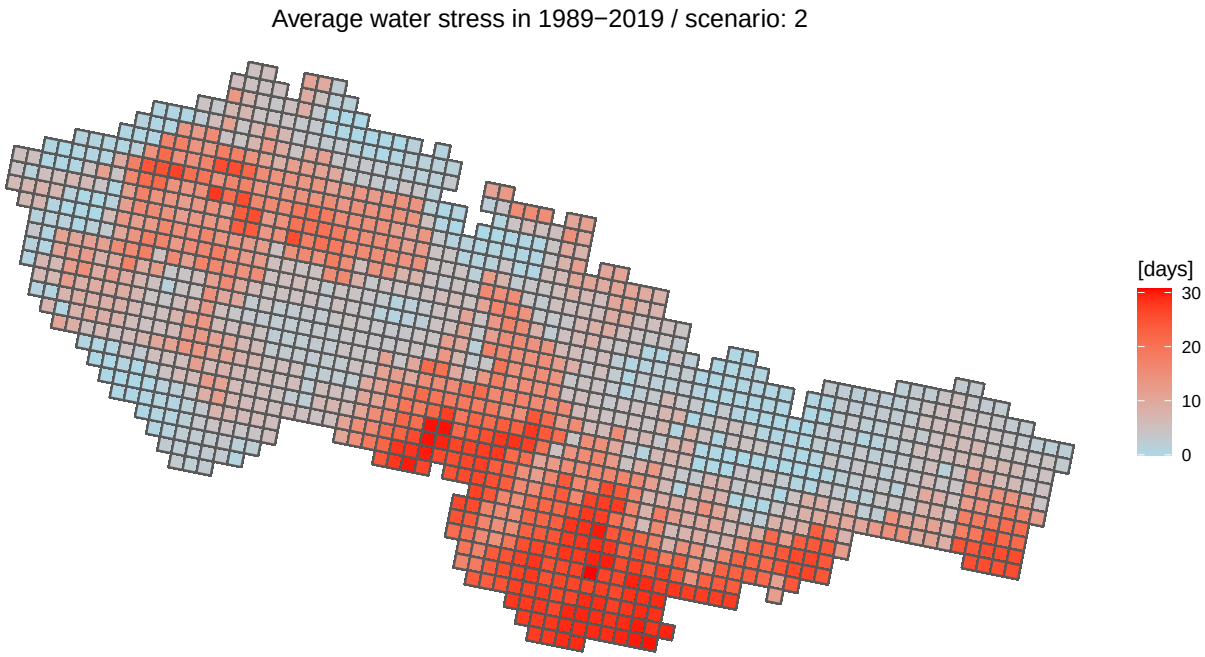
Average temperature stress in 1989−2019 / scenario: 2

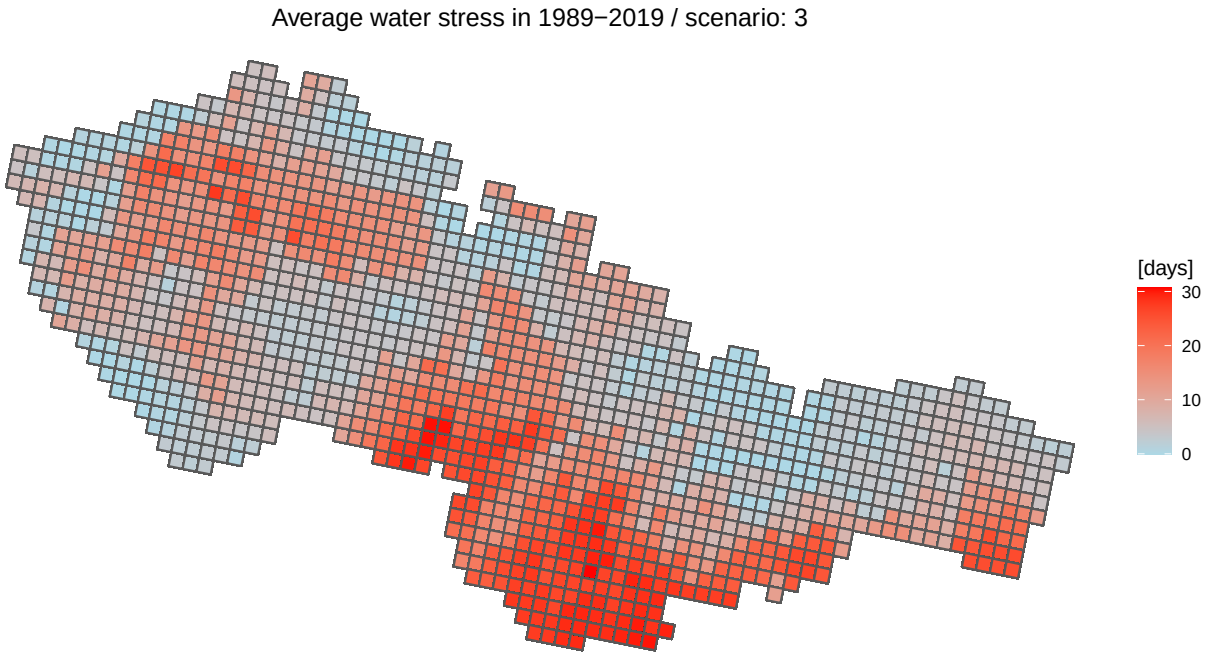


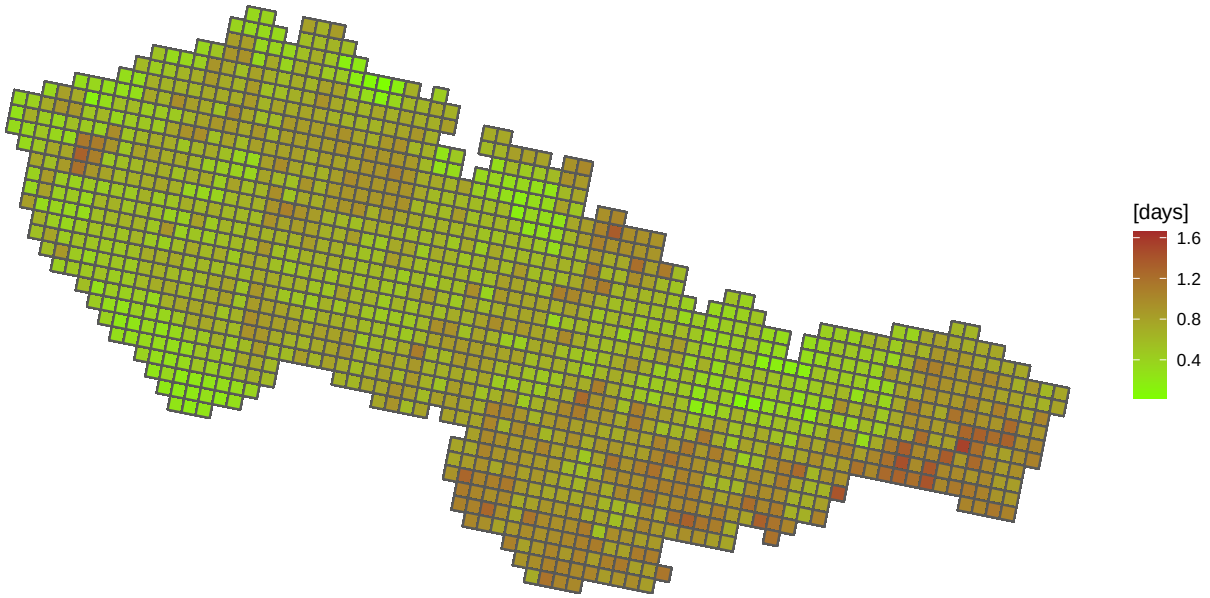
Average temperature stress in 1989−2019 / scenario: 3



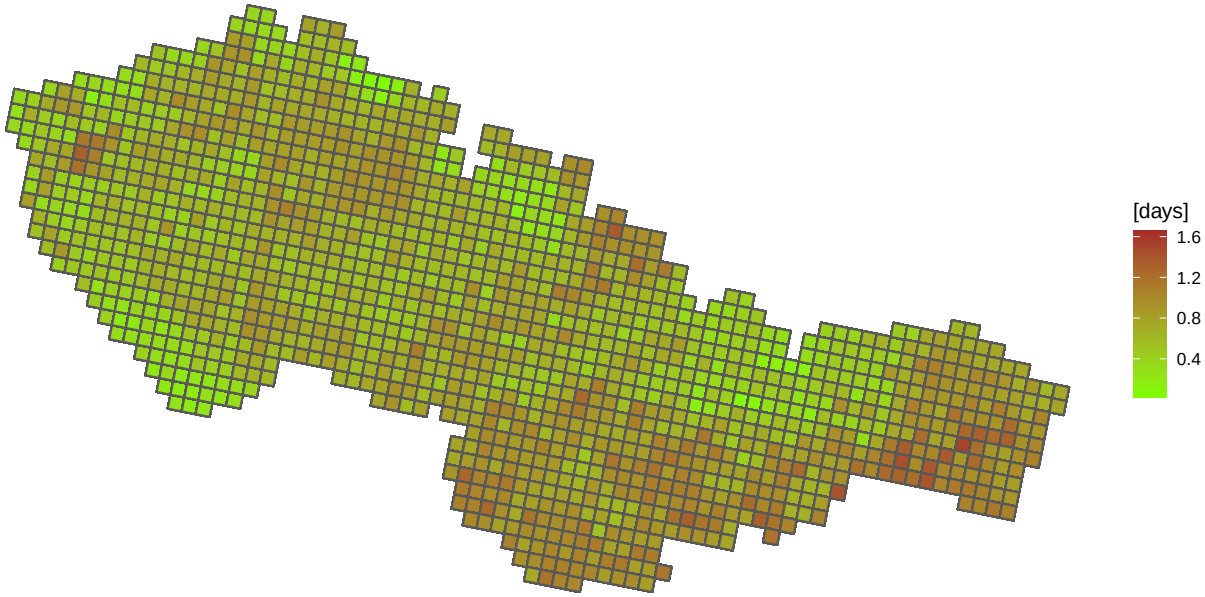

Average water stress in 1989−2019 / scenario: 1
[days]
30
20
10
0


Average water stress in 1989−2019 / scenario: 2
[days]
30
20
10
0

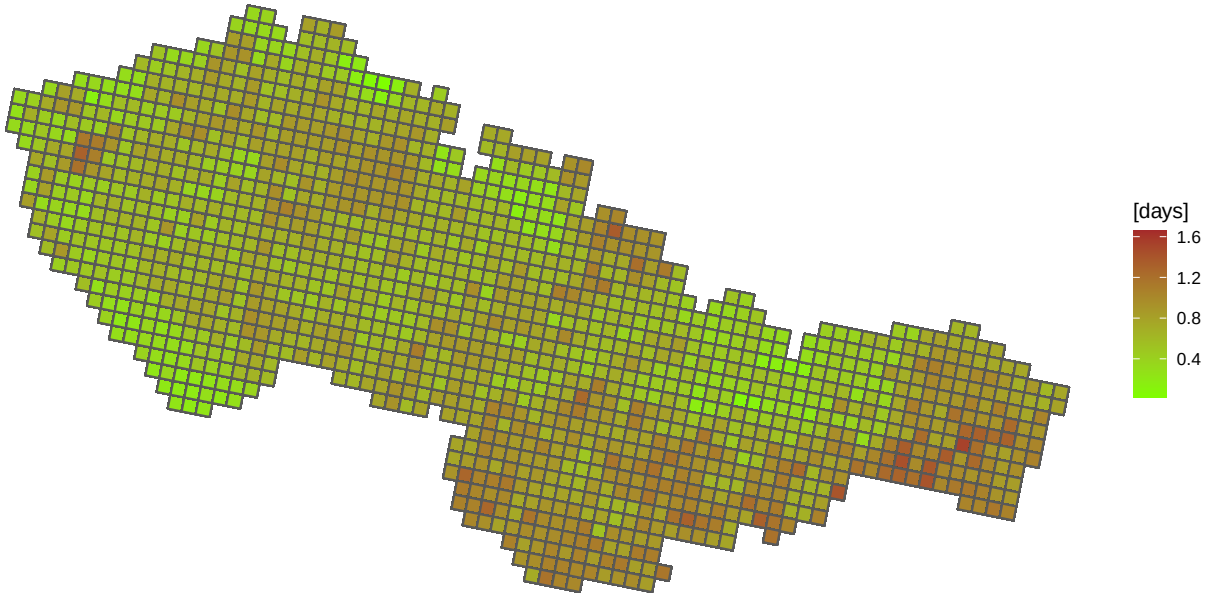

Average water stress in 1989−2019 / scenario: 3
[days]
30
20
10
0


Average nitrogen stress in 1989−2019 / scenario: 1
[days]
1.6
1.2
0.8
0.4

Average nitrogen stress in 1989−2019 / scenario: 2



Average nitrogen stress in 1989−2019 / scenario: 3



PLANTING, GERMINATION AND HARVEST DATE SHIFTS

criteria:

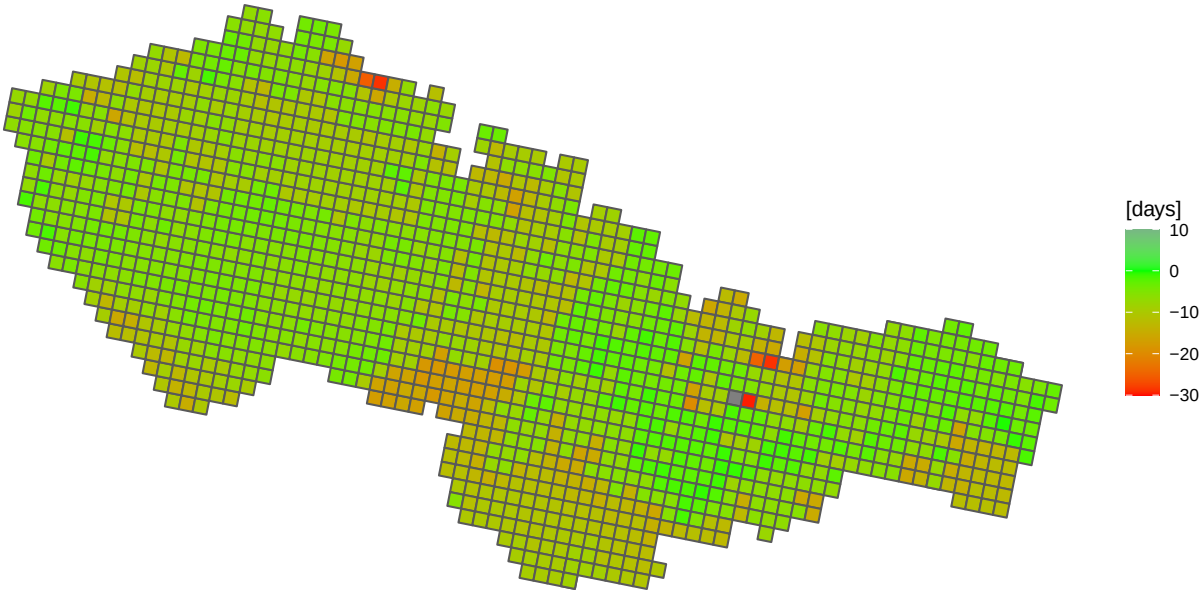
- given IPLD and IPLD shift (0-2; 3-10; >10)
- IPLD and IGMD shift (0-5; 5-10; >10)
- given IHVD and IHVD shift (0-7; 7-14; >14)

working DF: **shifts**

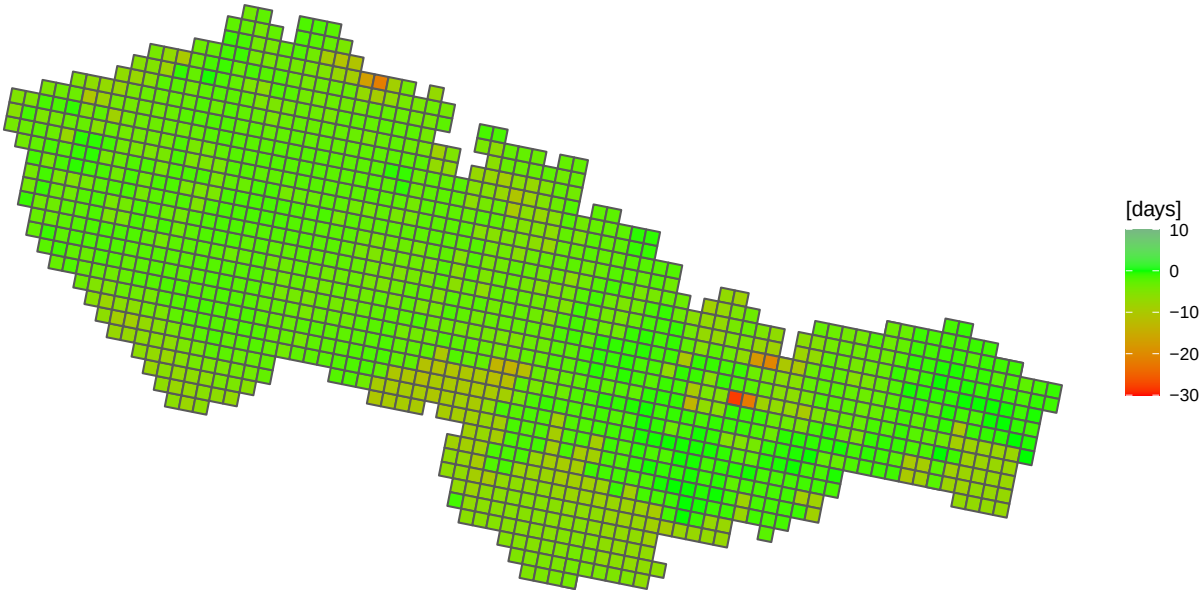
working DF: **avg_shifts**

IPLD

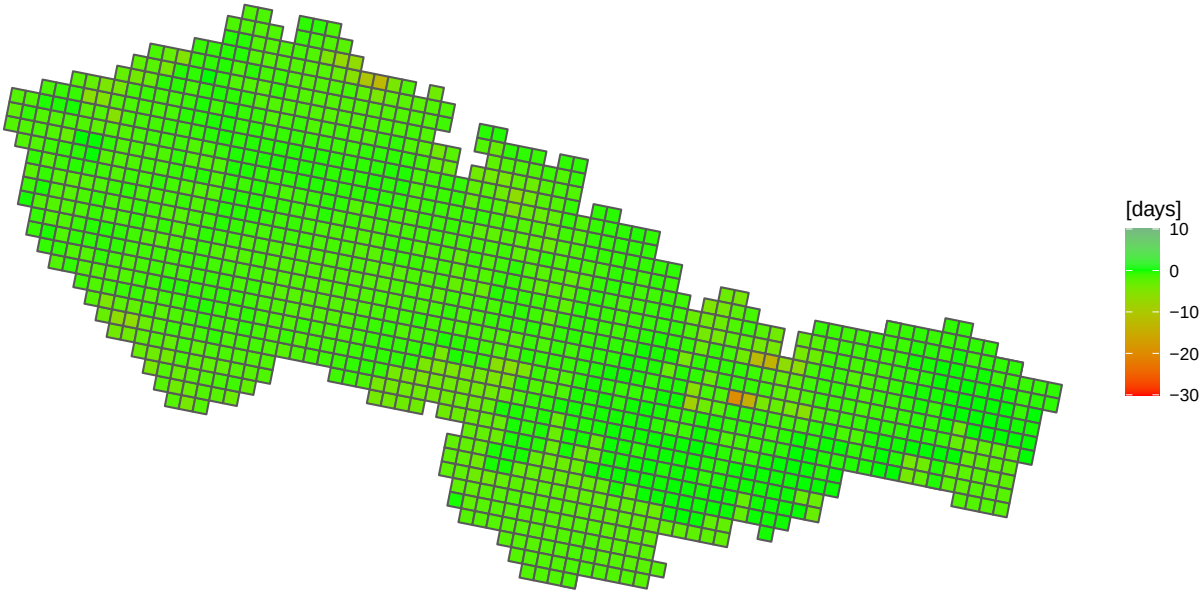
Average shift of given IPLD and actual IPLD for corn / scenario: 1



Average shift of given IPLD and actual IPLD for corn / scenario: 2

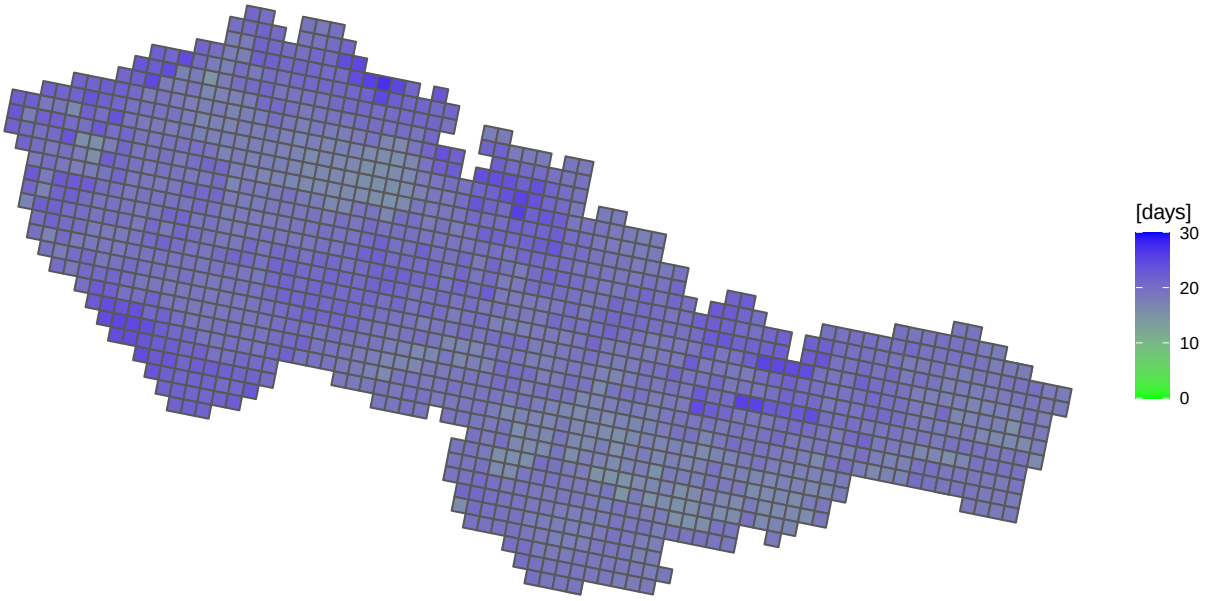


Average shift of given IPLD and actual IPLD for corn / scenario: 3

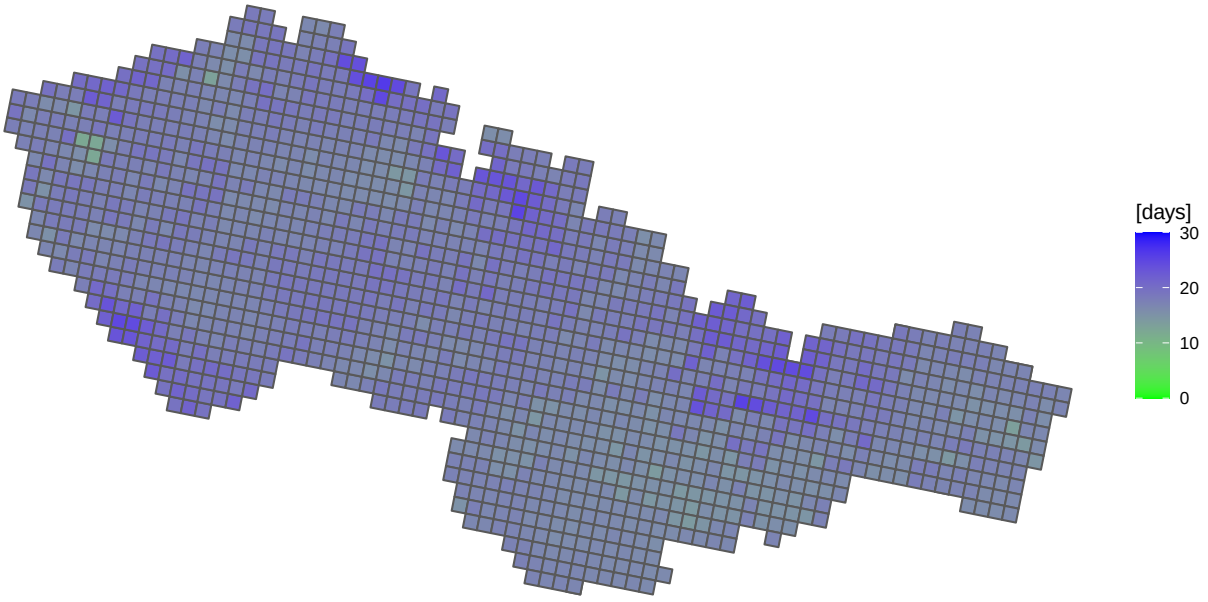


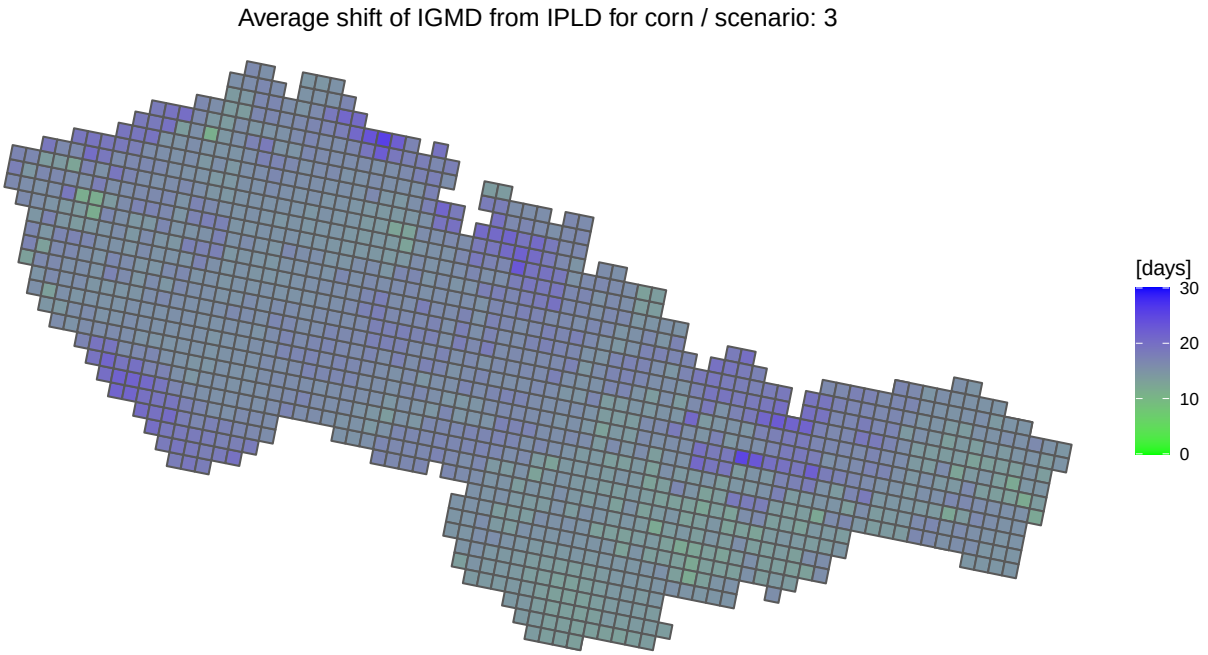
IGMD

Average shift of IGMD from IPLD for corn / scenario: 1



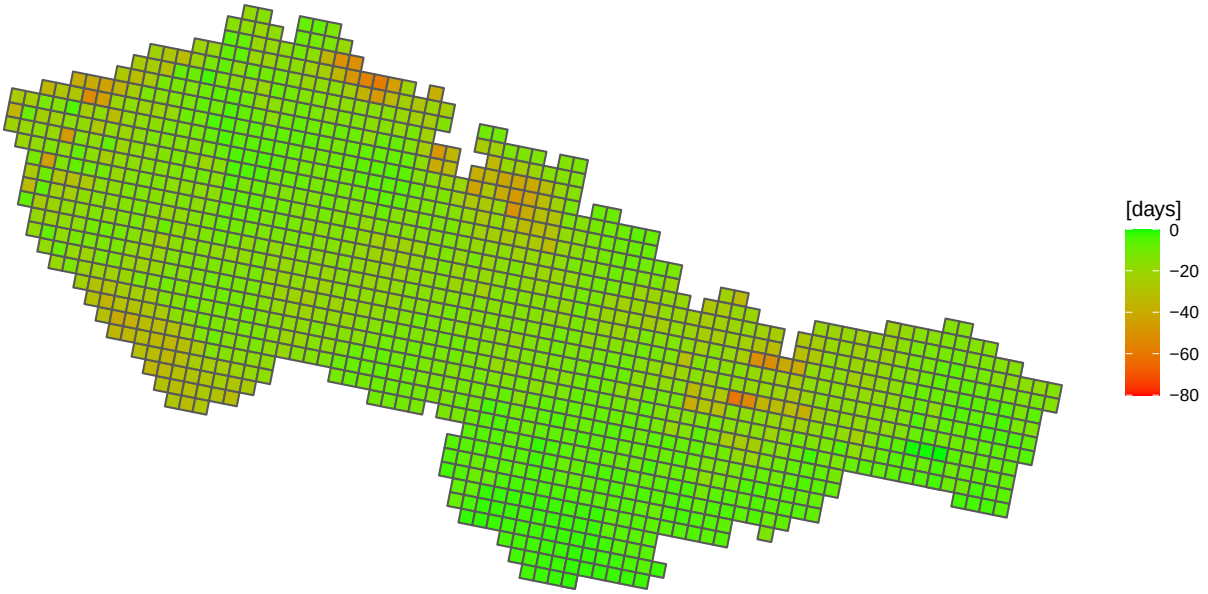
Average shift of IGMD from IPLD for corn / scenario: 2



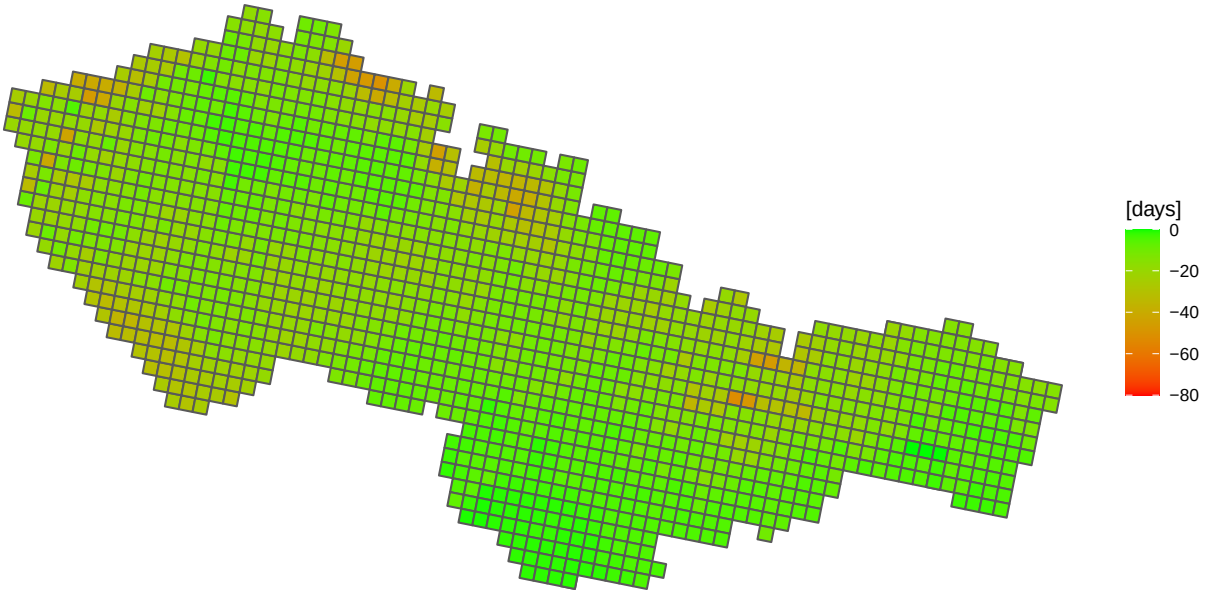

Average shift of IGMD from IPLD for corn / scenario: 3
[days]
30
20
10
0

IHVD

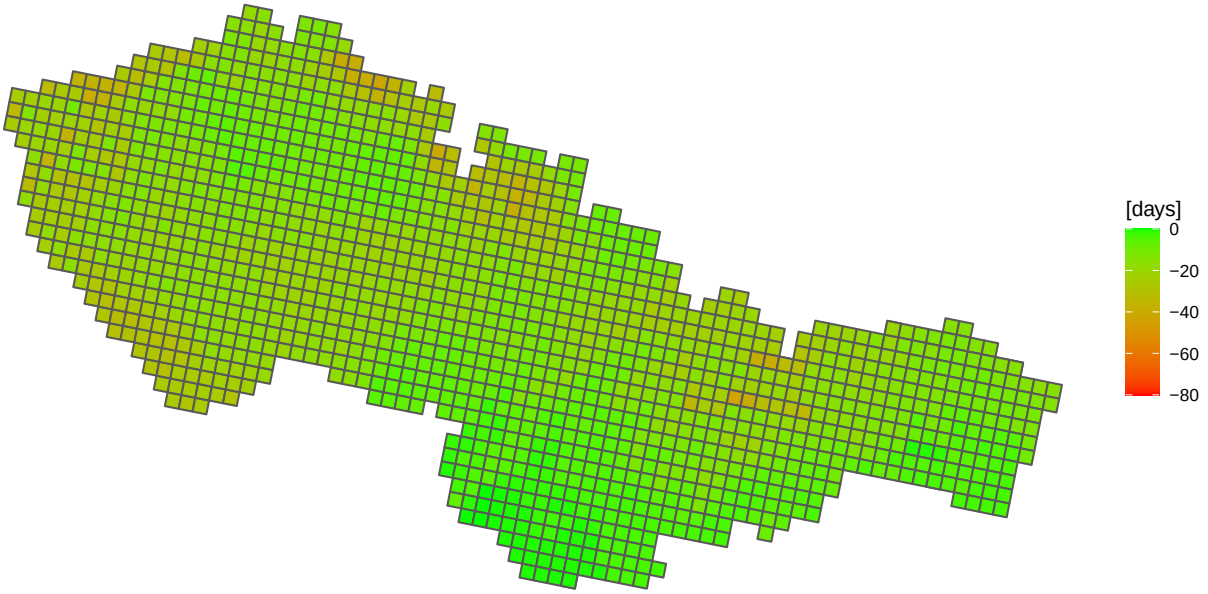
Average shift of given IHVD and actual IHVD for corn / scenario: 1



Average shift of given IHVD and actual IHVD for corn / scenario: 2



Average shift of given IHVD and actual IHVD for corn / scenario: 3



SELECTING SCENARIO

BASED ON IPLD

BASED ON IGMD

BASED ON IHVD