ZAGROŻENIA PRODUKCJI ROLNEJ NA MAZOWSZU WSKUTEK SUSZY

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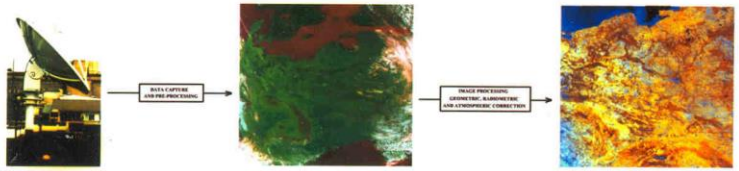
Centrum Teledetekcji
www.igik.edu.pl

REMOTE SENSING BASED SYSTEM
OF CROP CONDITION ASSESSMENT



NOAA RECEIVING STATION OPOLIS - IGiK SITE

RAW NOAA AVHRR SATELLITE IMAGE CAPTURED BY OPOLIS - IGiK STATION

RECTIFIED NOAA AVHRR IMAGE OF POLAND

MAY 21 | MAY 23 | MAY 27 | MAY 28 | MAY 30

SET OF NOAA IMAGES OF POLAND COLLECTED WITHIN 15TH DECADE OF 1999 GROWING SEASON

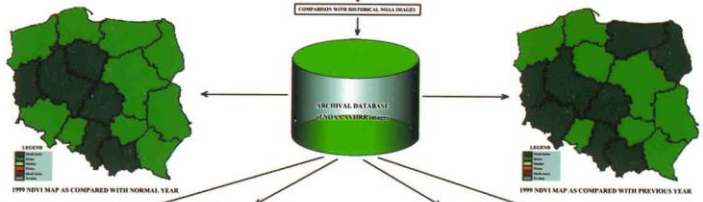
CLOUD THRESHOLDING
CROPLAND EXTRACTION
NDVI IMAGE COMPOSITING

REMOTE SENSING BASED CROP CONDITION ASSESSMENT SYSTEM FOR POLAND HAS BEEN PREPARED WITHIN JOINT PROJECT, CONDUCTED BY THE POLISH REMOTE SENSING AND SPATIAL INFORMATION CENTRE IN COOPERATION WITH THE CANADA CENTRE FOR REMOTE SENSING AND INTERMAP COMPANY. THE SYSTEM IS BASED ON USING 1 KM NOAA AVHRR DATA, WHICH ARE COLLECTED DAILY TO PRODUCE 10-DAY VEGETATION INDEX COMPOSITES. THE CUSTOMIZED SOFTWARE, BASED ON PCI PACKAGE, HAS BEEN PREPARED FOR COMPREHENSIVE PROCESSING OF RAW NOAA AVHRR IMAGES, I.E. FOR GEOMETRIC, RADIOMETRIC AND ATMOSPHERIC CORRECTION, AS WELL AS FOR CLOUD THRESHOLDING AND NDVI IMAGE COMPOSITING.

TEN-DAY VEGETATION INDEX - NDVI COMPOSITE IMAGE
Decade 15, 1999

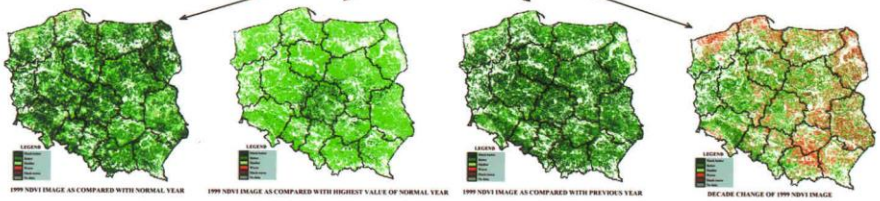
AT THE SAME TIME SPECIALIZED PROCEDURES BASED ON ARCVIEW SOFTWARE HAVE BEEN PREPARED TO PRODUCE VARIOUS FINAL OUTPUTS FROM THE SYSTEM: COMPARATIVE IMAGES, MAPS, GRAPHS AND TABLES. HISTORICAL DATABASE, CONSISTING OF 1 KM GLOBAL LAND DATA COLLECTED WITHIN IGBP PROGRAMME, WAS CONSTRUCTED FOR POLAND'S AREA.
IN THE COURSE OF 1997 - 1999 GROWING SEASONS THREE SETS OF NOAA NDVI COMPOSITES WERE PREPARED AND THE REPORTS WERE PRODUCED FOR PARTICULAR ADMINISTRATIVE UNITS IN POLAND. THE OUTPUTS FROM THE POLISH CROP CONDITION ASSESSMENT SYSTEM WERE OPERATIONALLY DELIVERED TO THE CENTRAL STATISTICAL OFFICE, TO BE FURTHER ANALYZED BY DECISION MAKERS AND STATISTICAL SPECIALISTS.

COMPARISON WITH HISTORICAL NOAA IMAGES



1999 NDVI MAP AS COMPARED WITH NORMAL YEAR

1999 NDVI MAP AS COMPARED WITH PREVIOUS YEAR



1999 NDVI IMAGE AS COMPARED WITH NORMAL YEAR

1999 NDVI IMAGE AS COMPARED WITH HIGHEST VALUE OF NORMAL YEAR

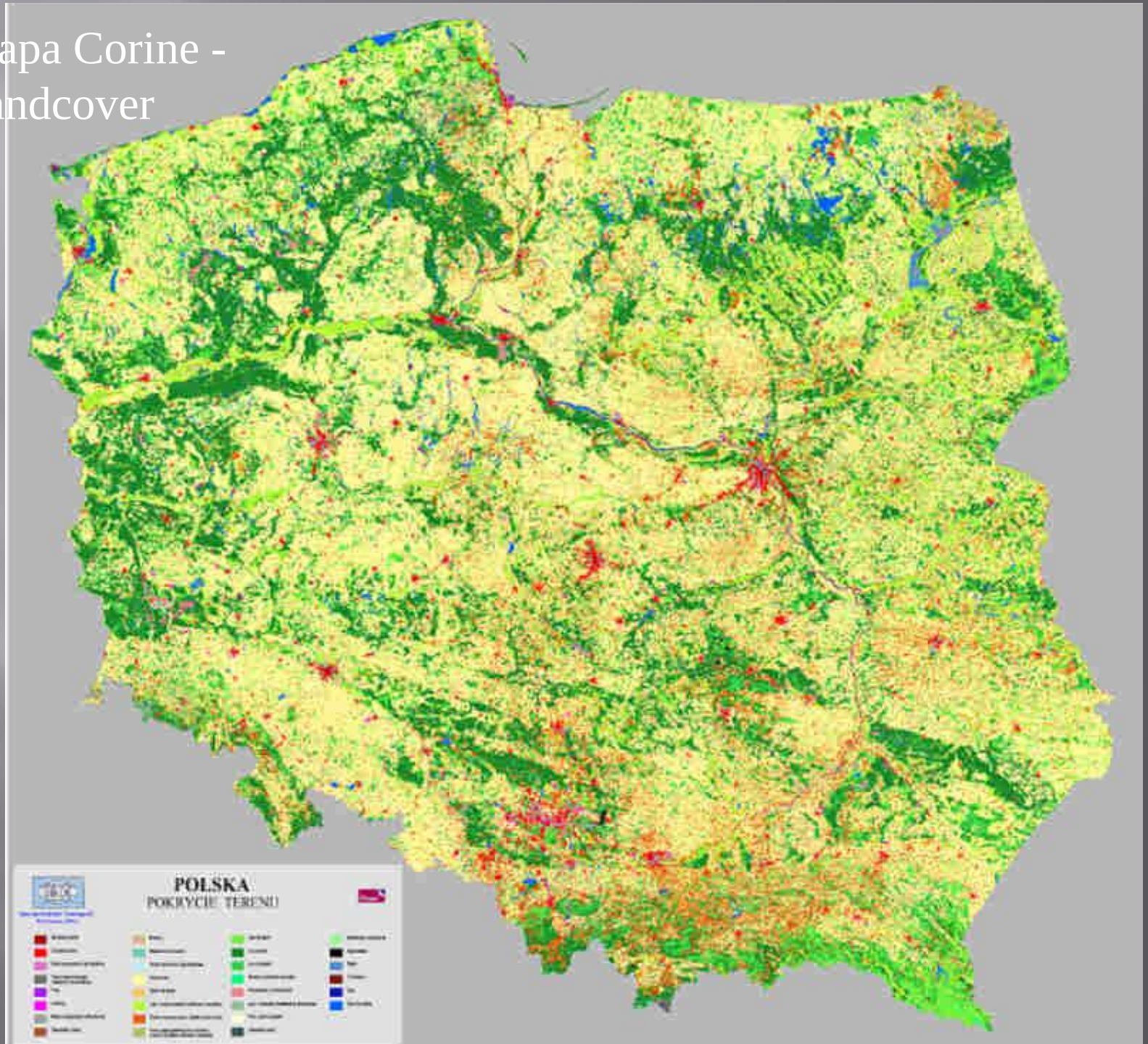
1999 NDVI IMAGE AS COMPARED WITH PREVIOUS YEAR

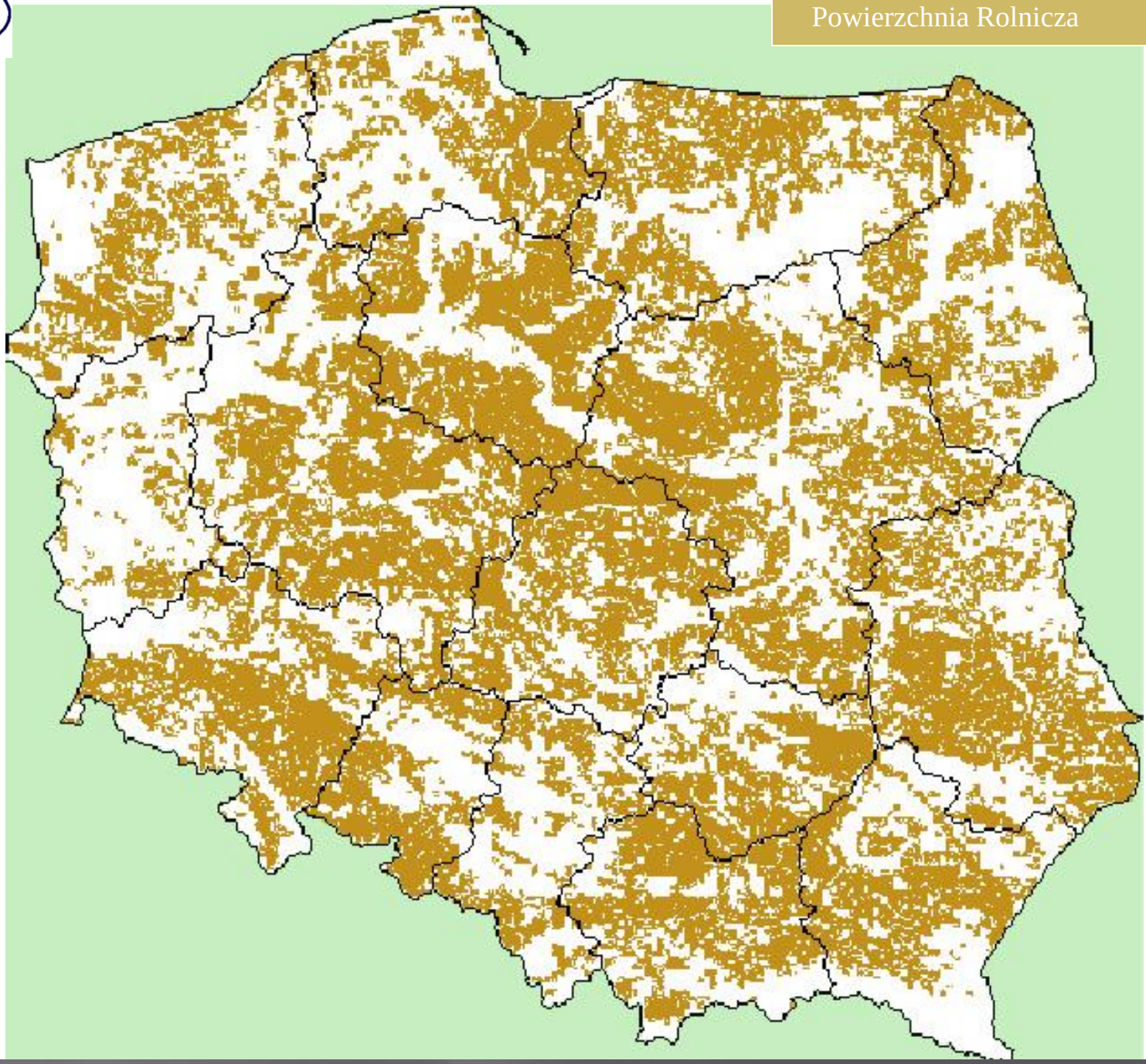
DECADE CHANGE OF 1999 NDVI IMAGE

INSTITUTE OF GEODESY AND CARTOGRAPHY
REMOTE SENSING AND SPATIAL INFORMATION CENTRE
Jasna 2/4, 00-950 WARSAW, POLAND

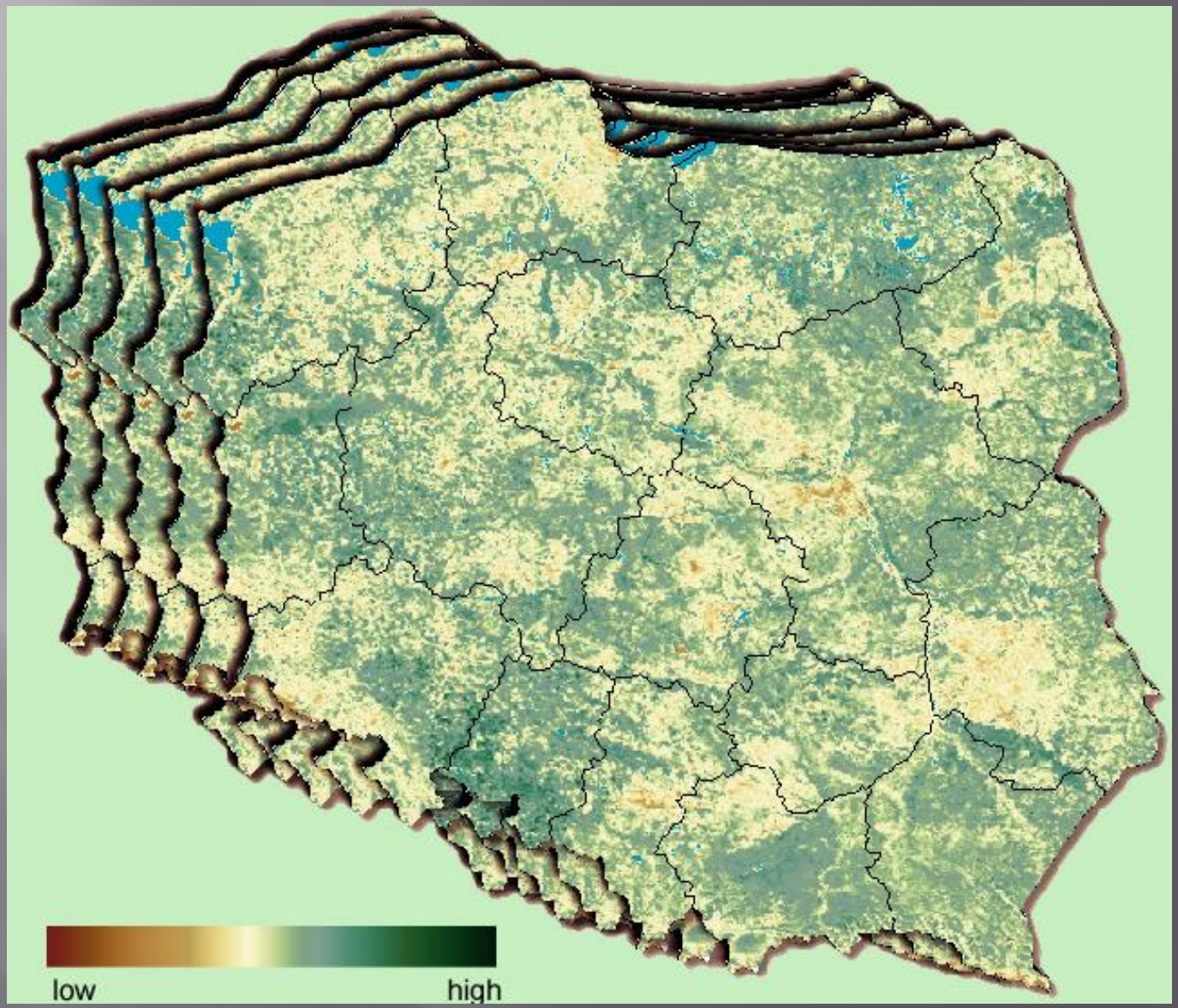
POLISH - CANADIAN REMOTE SENSING PROJECT FOR AGRICULTURE

Mapa Corine - Landcover

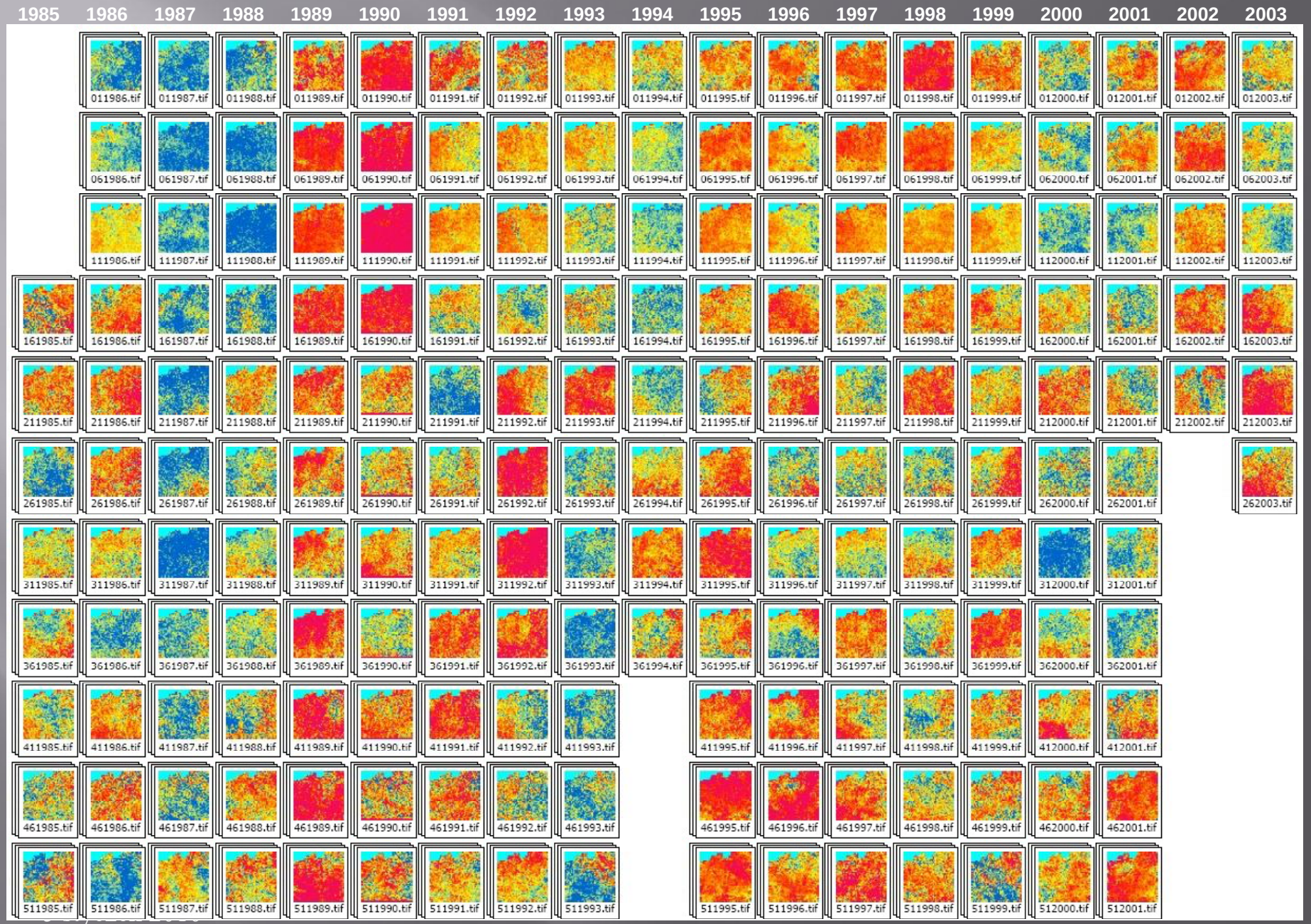




BAZA ZAWIERA INFORMACJE O ROZWOJU ROŚLIN W CZASIE WEGETACJI



Wskaźnik temperatury powierzchni TCI (NOAA/AVHRR)



Termiczny Wskaźnik Kondycji Roślin – TWKR

Thermal Condition Index – TCI

$$TCI = 100 \times \frac{T_{max} - T_{akt}}{T_{max} - T_{min}}$$

T_{akt} – temperatura roślin obliczona na podstawie aktualnie wykonanego zdjęcia.

T_{max} – maksymalna temperatura roślin w danym w okresie

T_{min} – minimalna temperatura roślin w danym okresie

Wskaźnik Kondycji Roślin – WKR

Vegetation Condition Index – VCI

$$VCI = 100 \times \frac{NDVI - NDVI_{min}}{NDVI_{max} - NDVI_{min}}$$

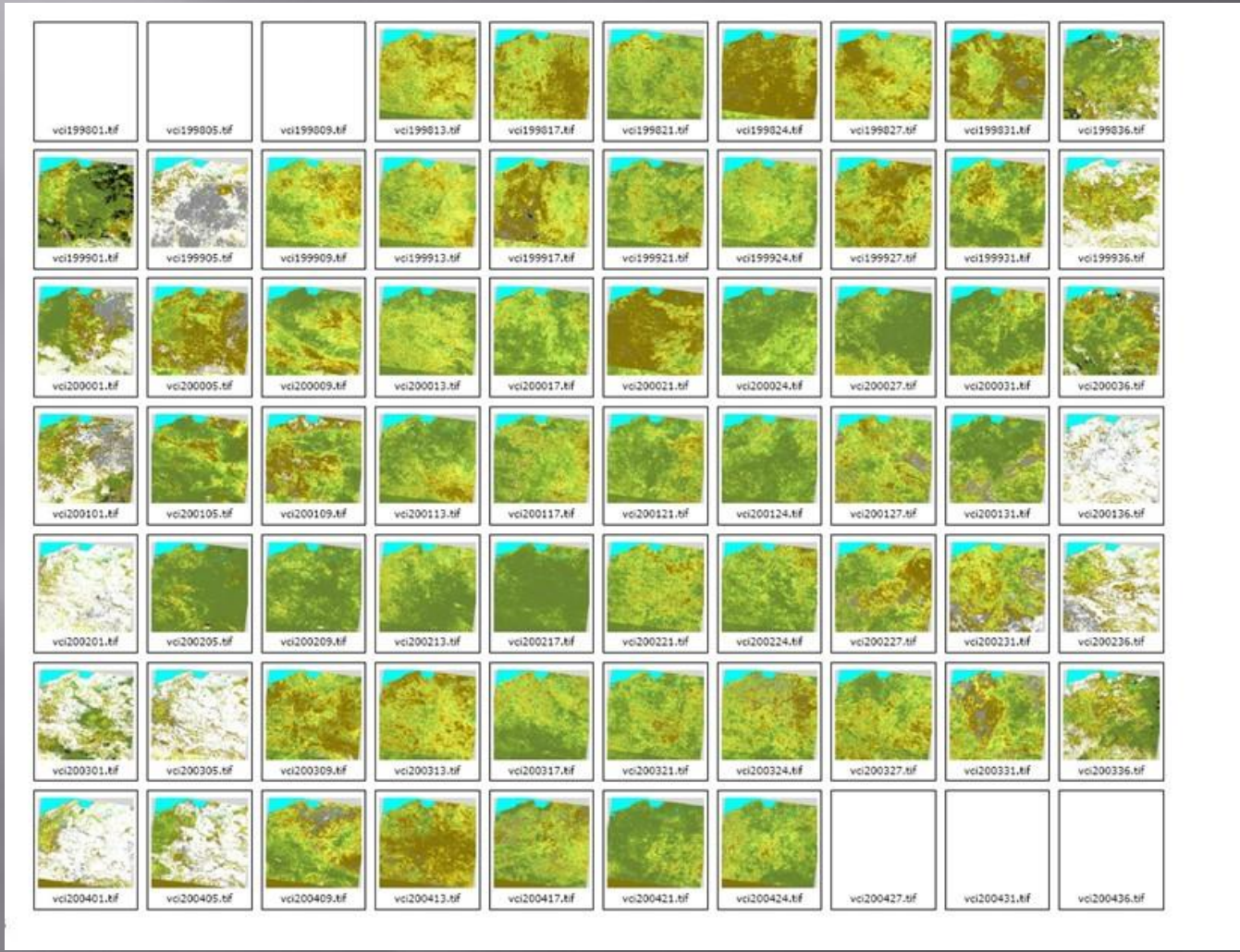
NDVI – aktualna wartość znormalizowanego wskaźnika zieleni

$NDVI_{min}$ – minimalna wartość znormalizowanego wskaźnika zieleni w danym okresie

$NDVI_{max}$ – maksymalna wartość znormalizowanego wskaźnika zieleni w danym okresie

SPOT–VEGETATION VCI

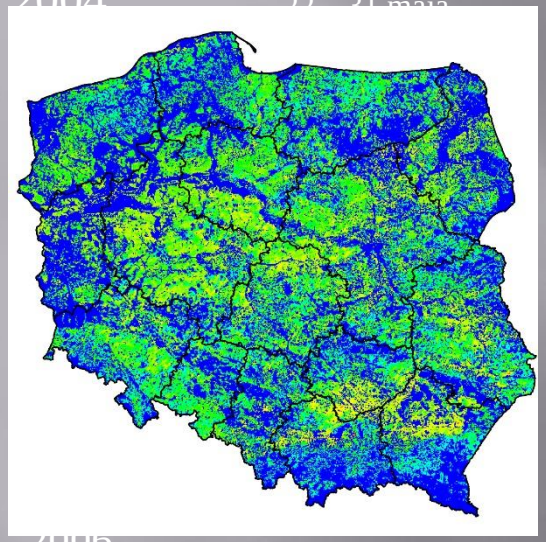
1998

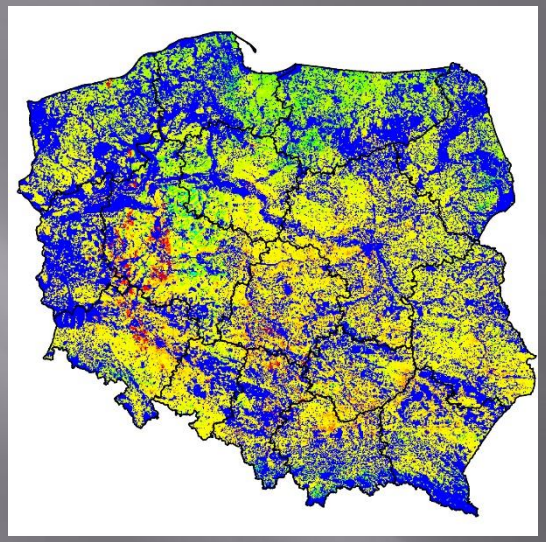


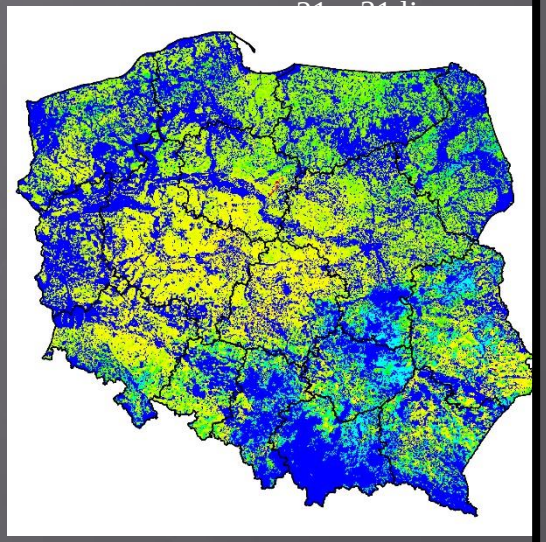
IGiK

Rozkład przestrzenny maksymalnej temperatury powierzchni roślin

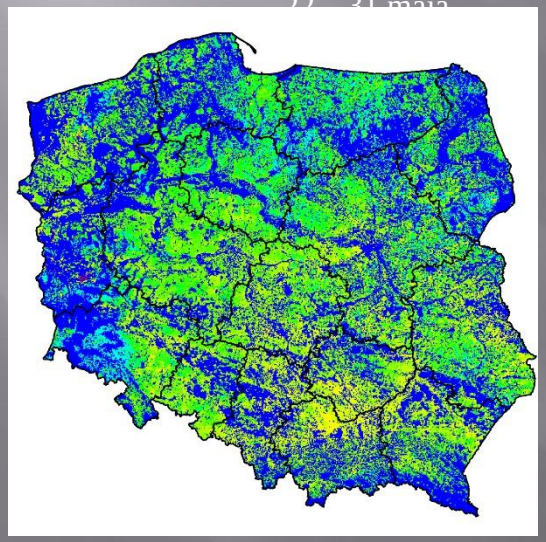
2004

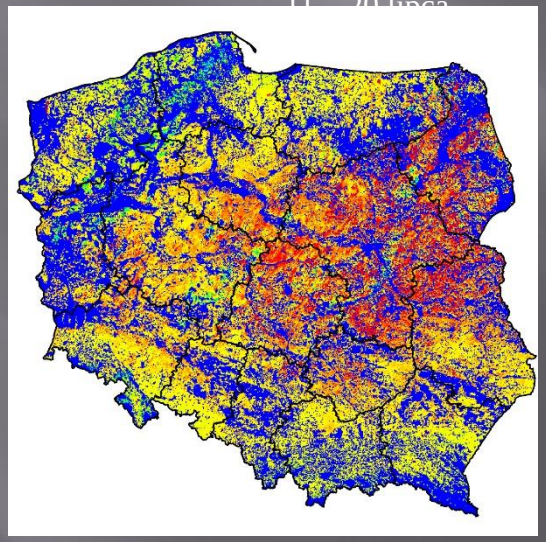


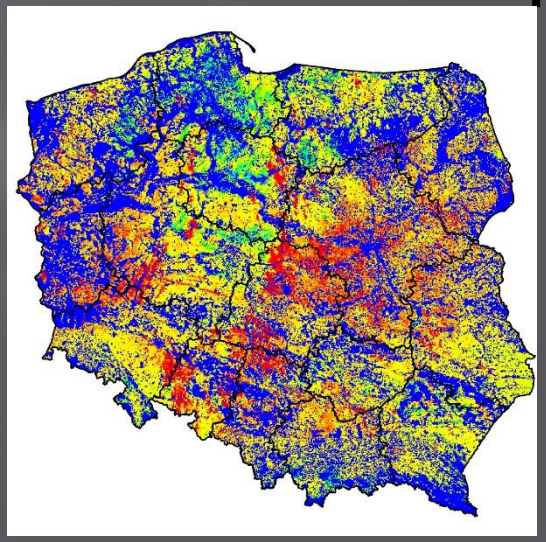


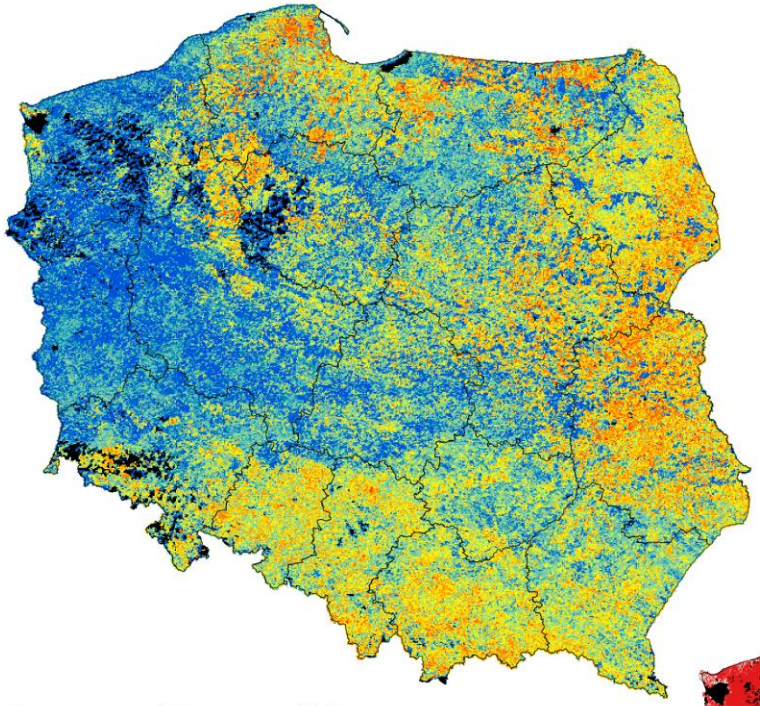


2006



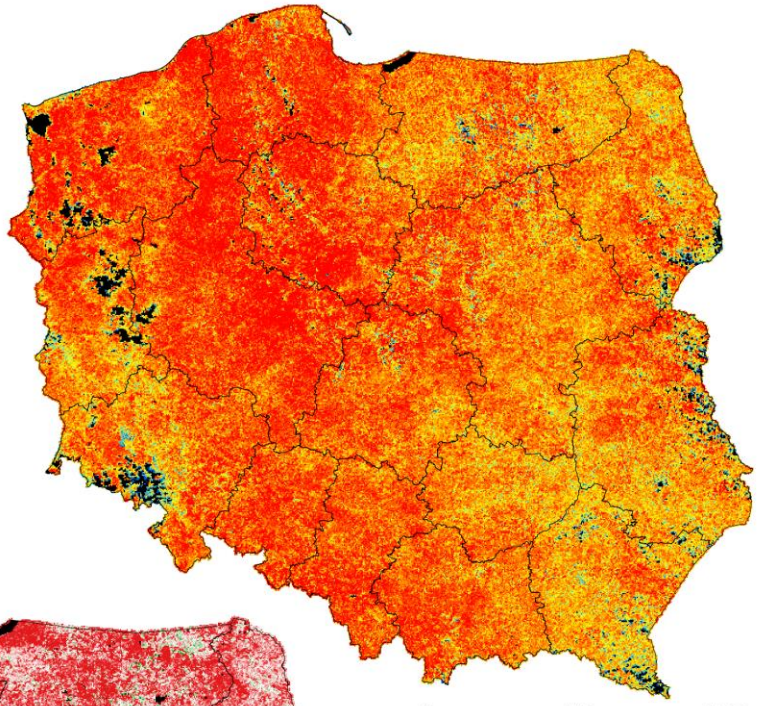






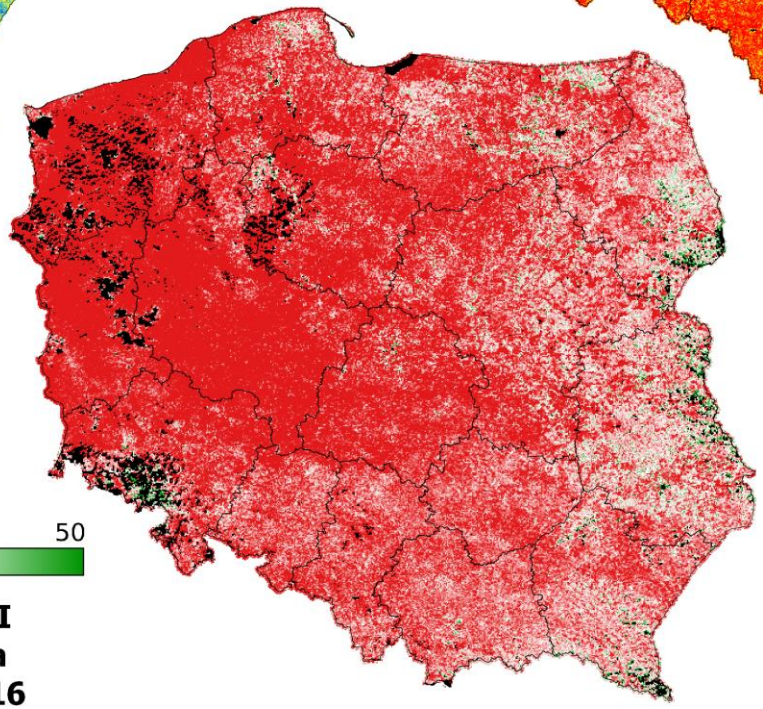
0 50 100

Wskaźnik TCI
15. dekada 2010



0 50 100

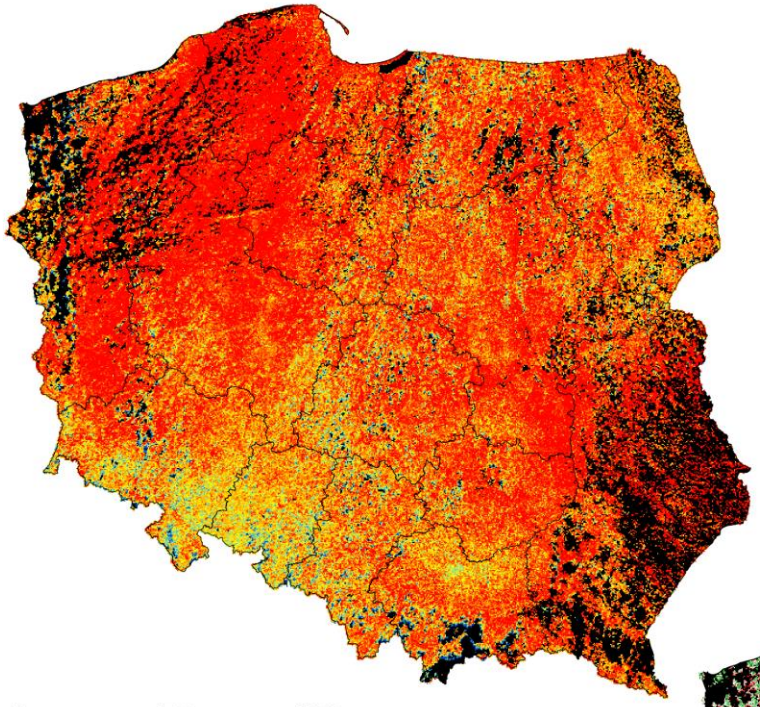
Wskaźnik TCI
15. dekada 2016



-50 0 50

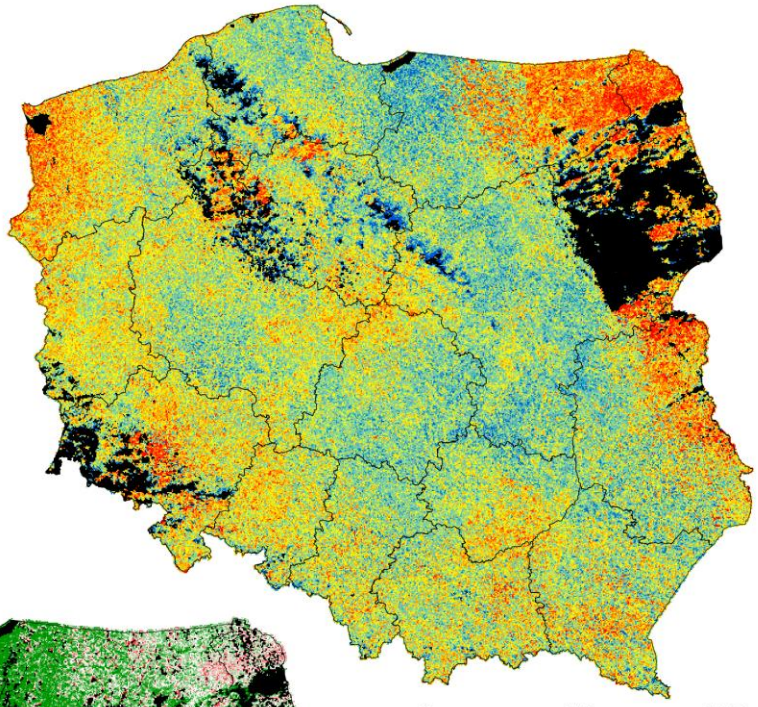
Zmiana TCI
15. dekada
2010 vs 2016

IGiK



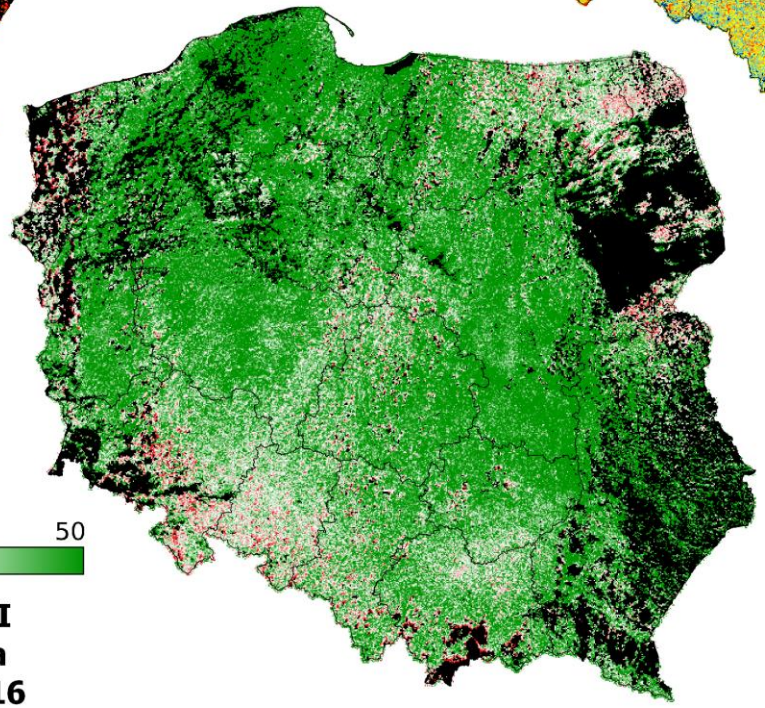
0 50 100

Wskaźnik TCI
21. dekada 2010



0 50 100

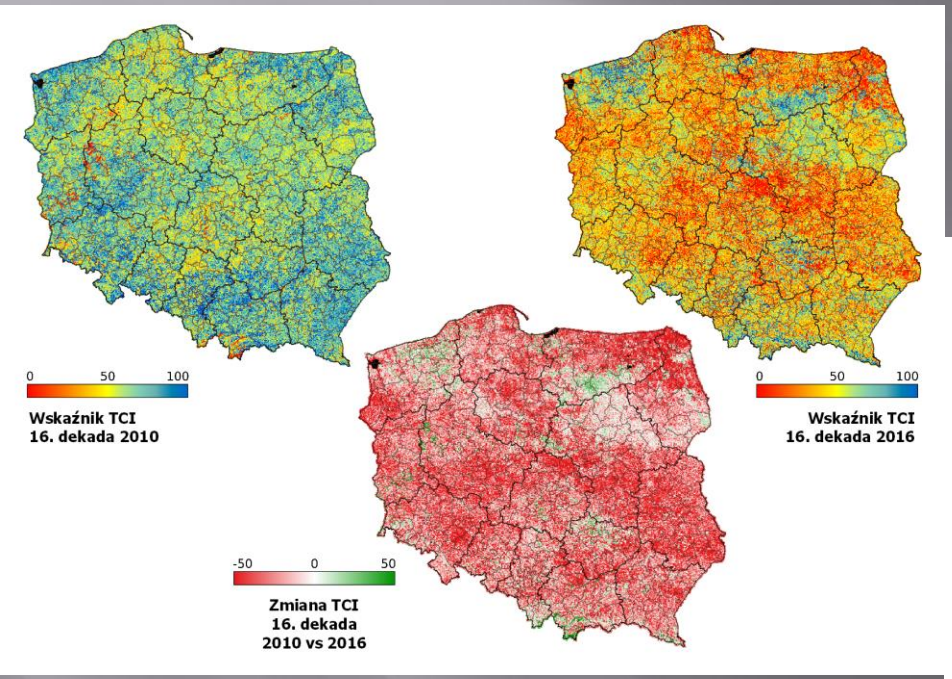
Wskaźnik TCI
21. dekada 2016

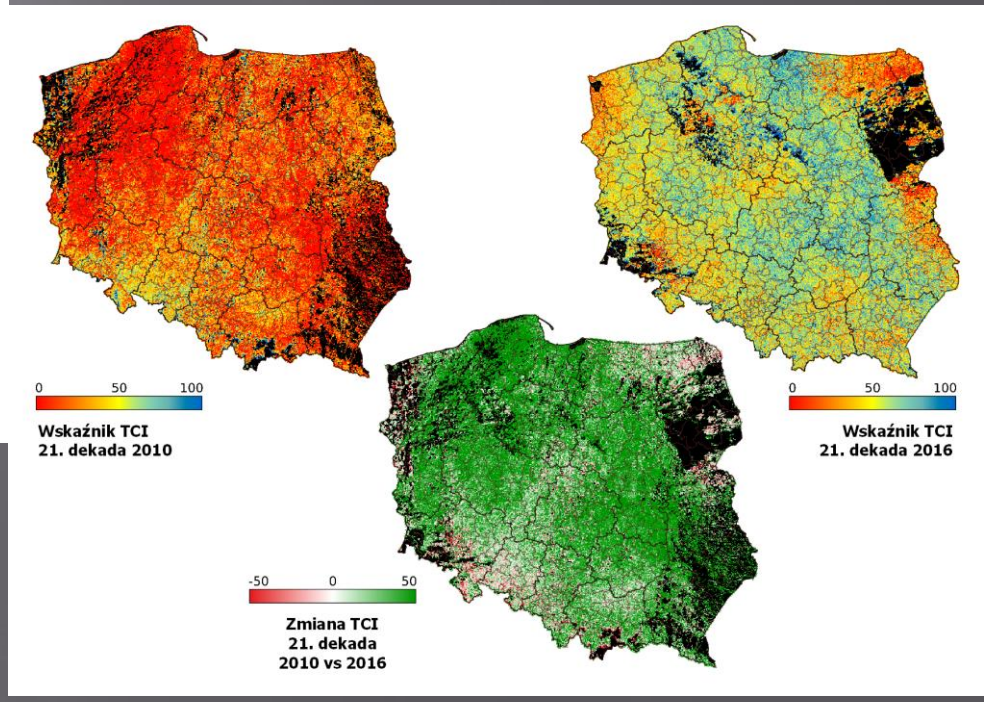


-50 0 50

Zmiana TCI
21. dekada
2010 vs 2016

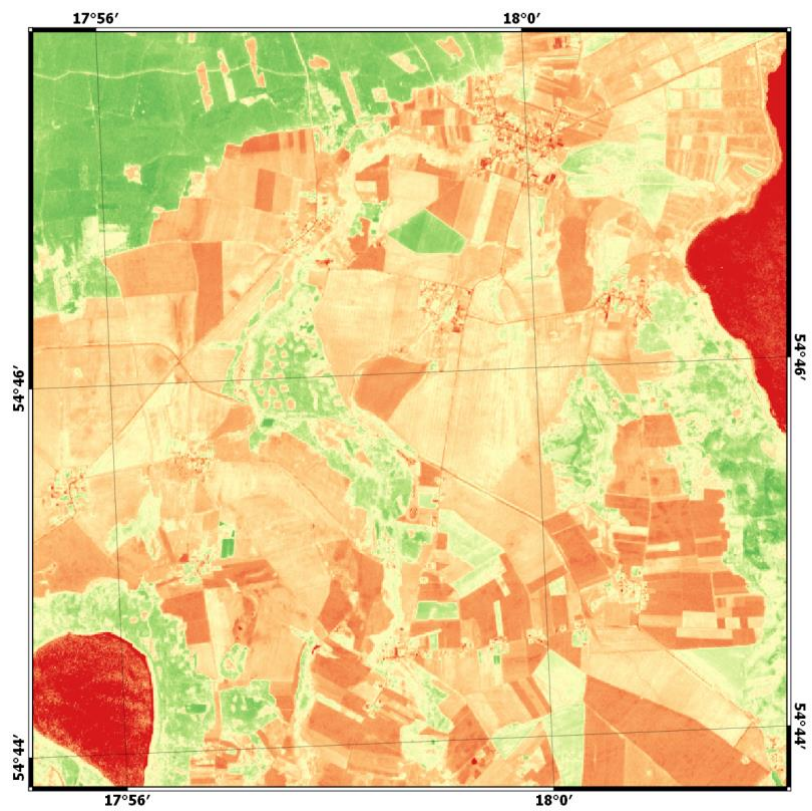
IGiK

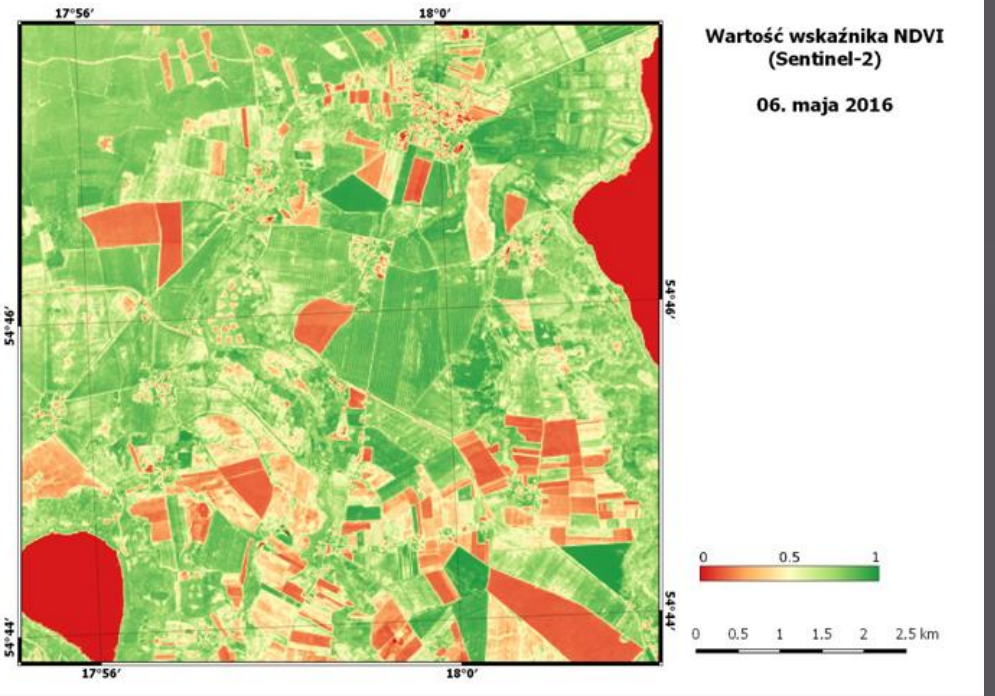

0 50 100
Wskaźnik TCI
16. dekada 2010
0 50 100
Wskaźnik TCI
16. dekada 2016
-50 0 50
Zmiana TCI
16. dekada
2010 vs 2016


0 50 100
Wskaźnik TCI
21. dekada 2010
0 50 100
Wskaźnik TCI
21. dekada 2016
-50 0 50
Zmiana TCI
21. dekada
2010 vs 2016

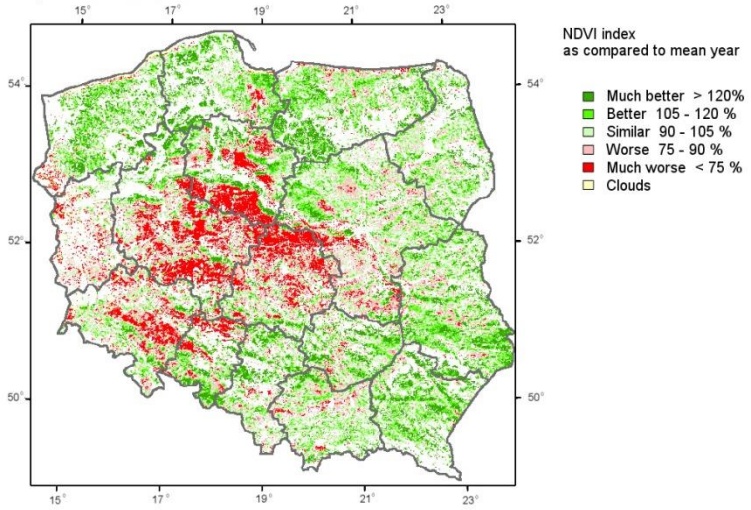
IGiK

SENTINEL2

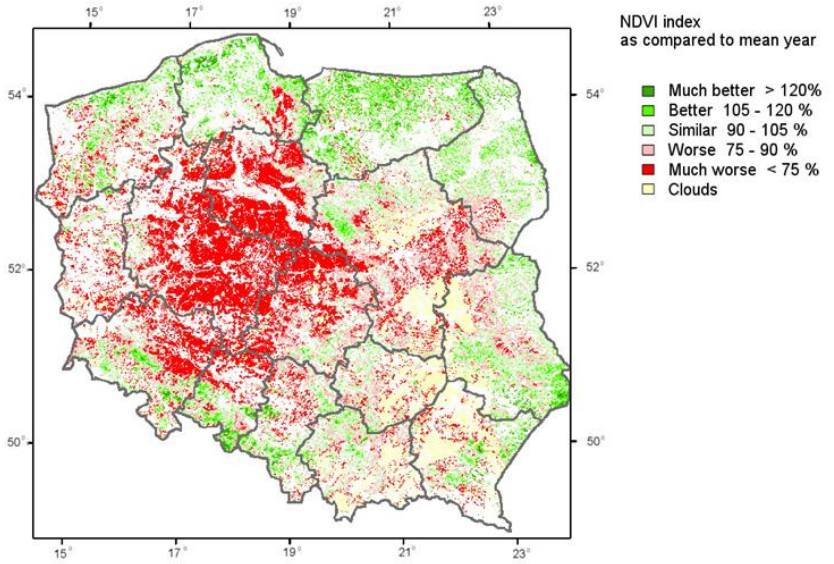

17°56′
18°0′
54°46′
54°44′
Wartość wskaźnika NDVI
(Sentinel-2)
27. marca 2016
0
0.5
1
0
0.5


17°56′
18°0′
54°46′
54°44′
Wartość wskaźnika NDVI
(Sentinel-2)
06. maja 2016
0
0.5
1
0
0.5
1
1.5
2
2.5 km

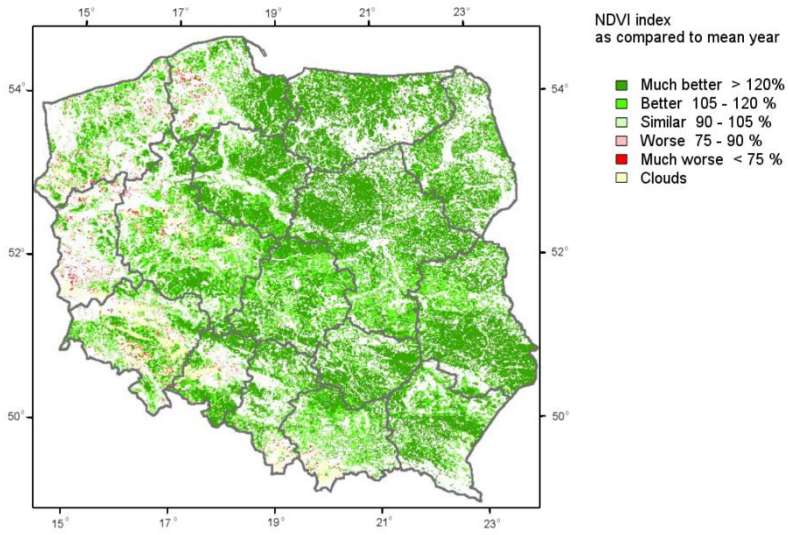
Comparison of crop growth development
Decade 10, April 1 - 10, 2012



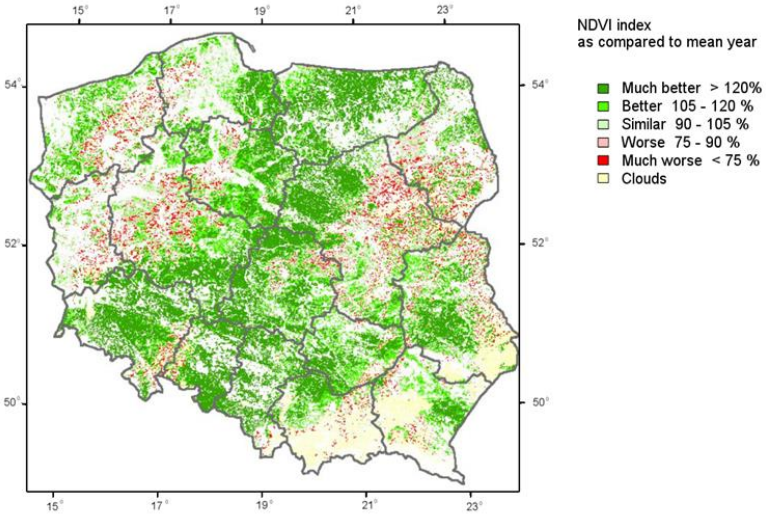
Comparison of crop growth development
Decade 11, April 11 - 20, 2012

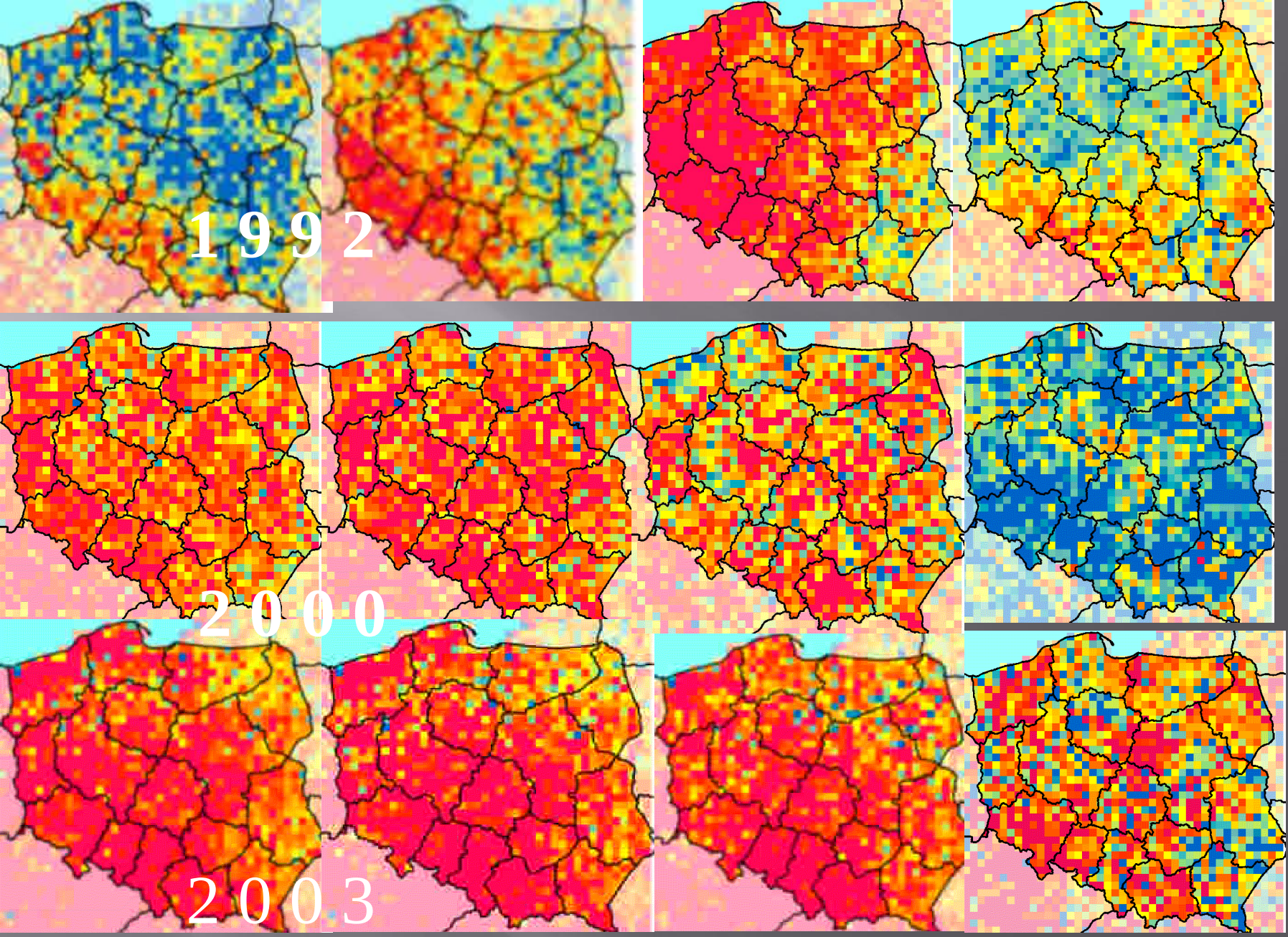


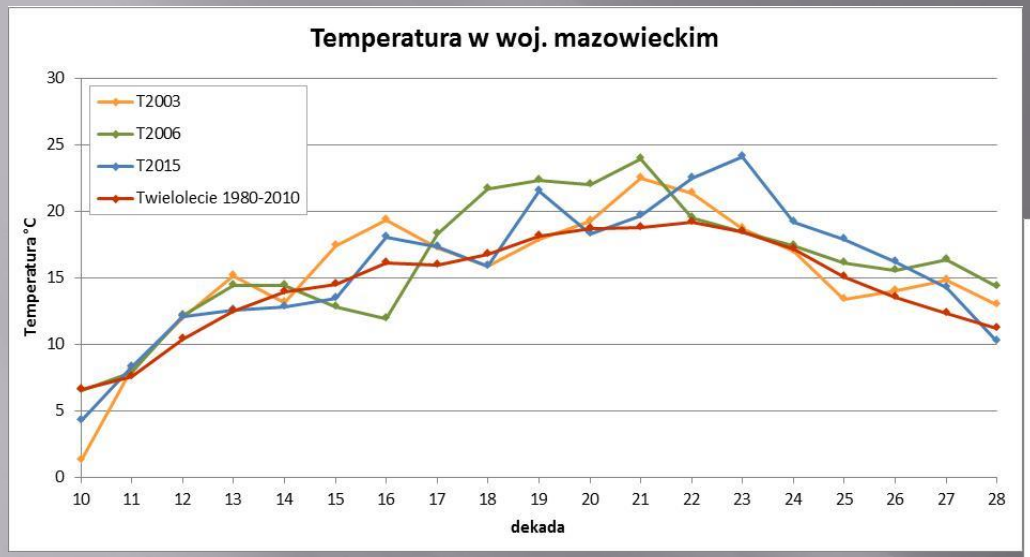
Comparison of crop growth development
Decade 10, April 1 - 10, 2014

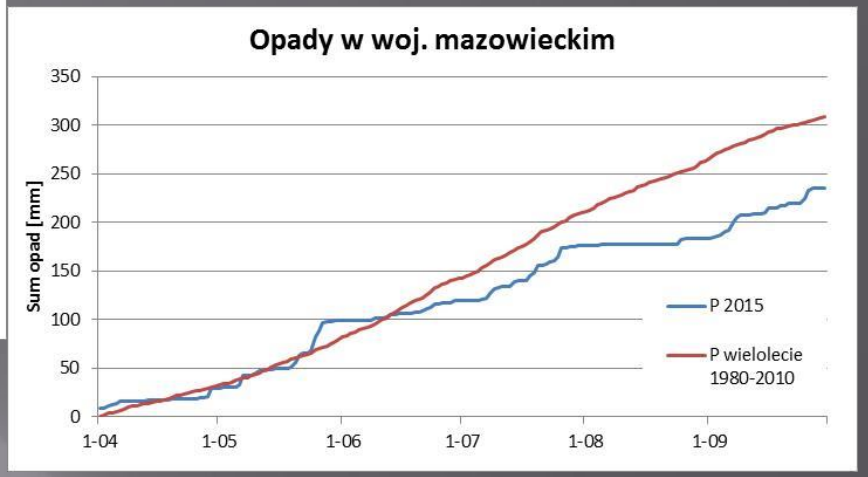


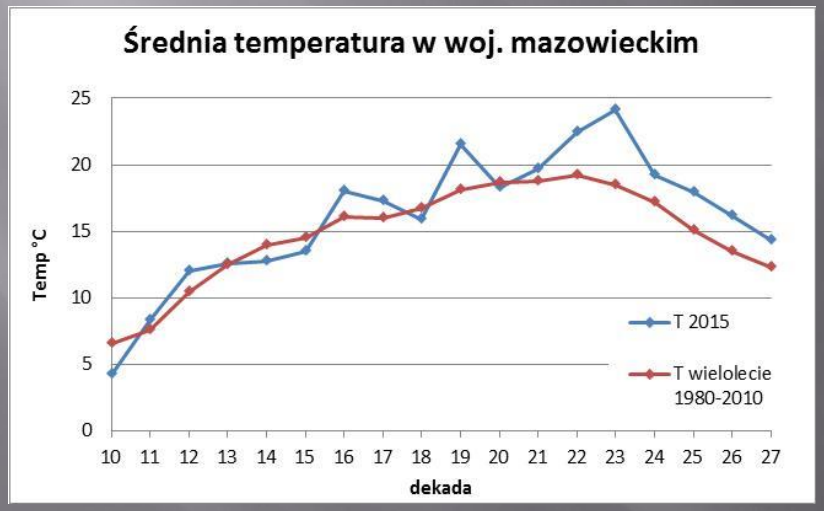
Comparison of crop growth development
Decade 11, April 11 - 20, 2014

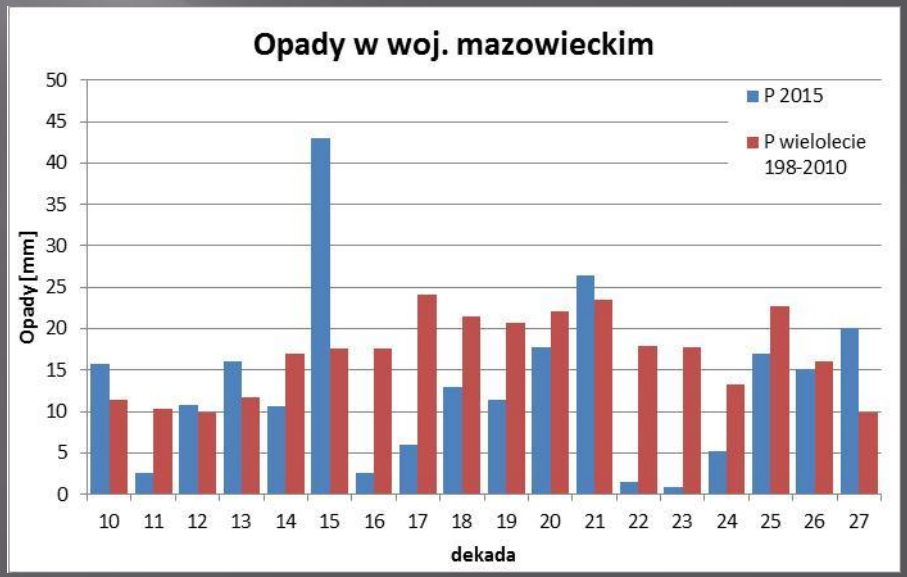



1992
2000
2003
Week 18
20
22
32

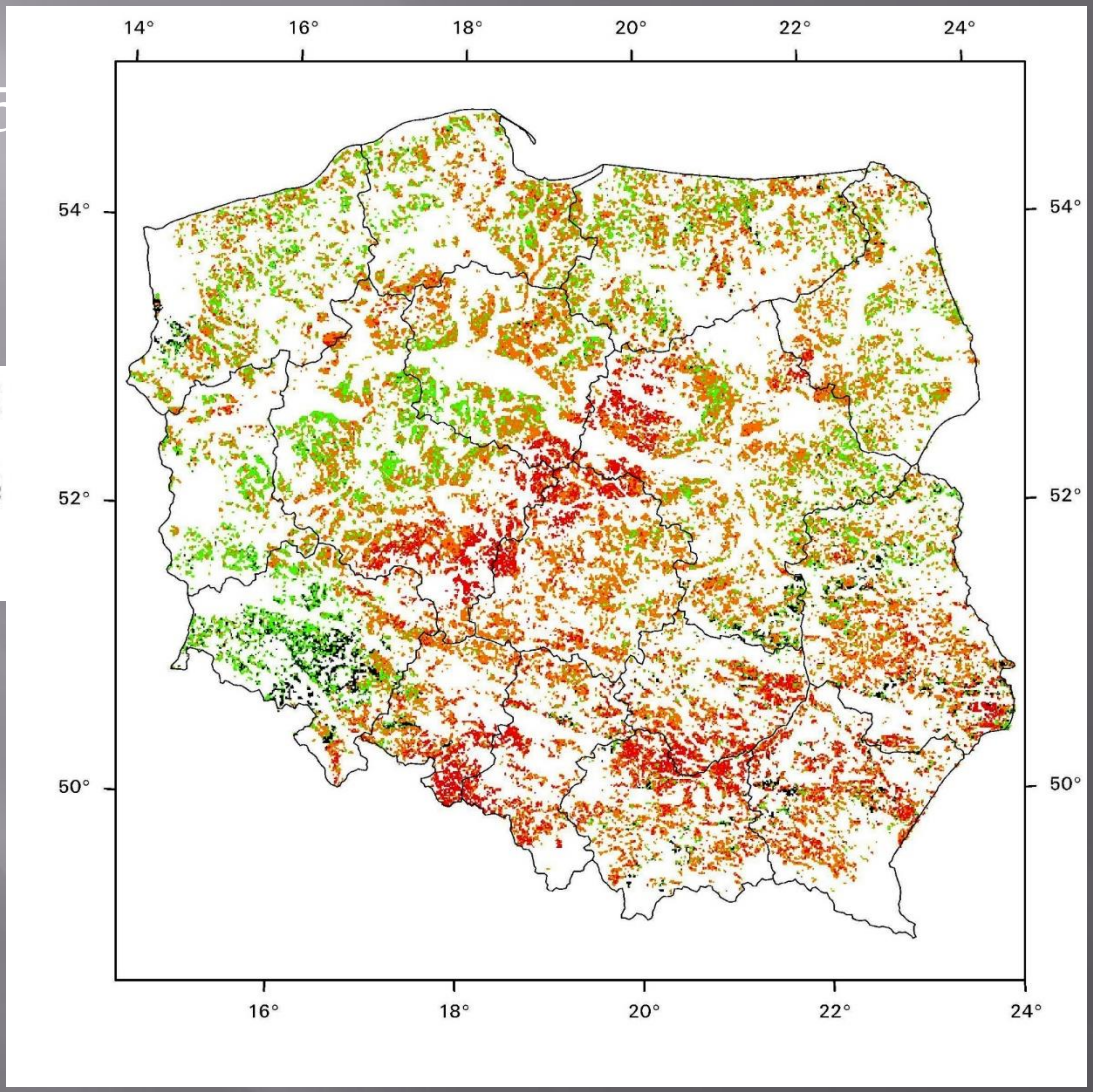

Temperatura w woj. mazowieckim
T2003
T2006
T2015
Twielolecie 1980-2010
Temperatura °C
dekada


Opady w woj. mazowieckim
Sum opad [mm]
P 2015
P wielolecie 1980-2010


Średnia temperatura w woj. mazowieckim
Temp °C
T 2015
T wielolecie 1980-2010
dekada


Opady w woj. mazowieckim
Opady [mm]
P 2015
P wielolecie 198-2010
dekada

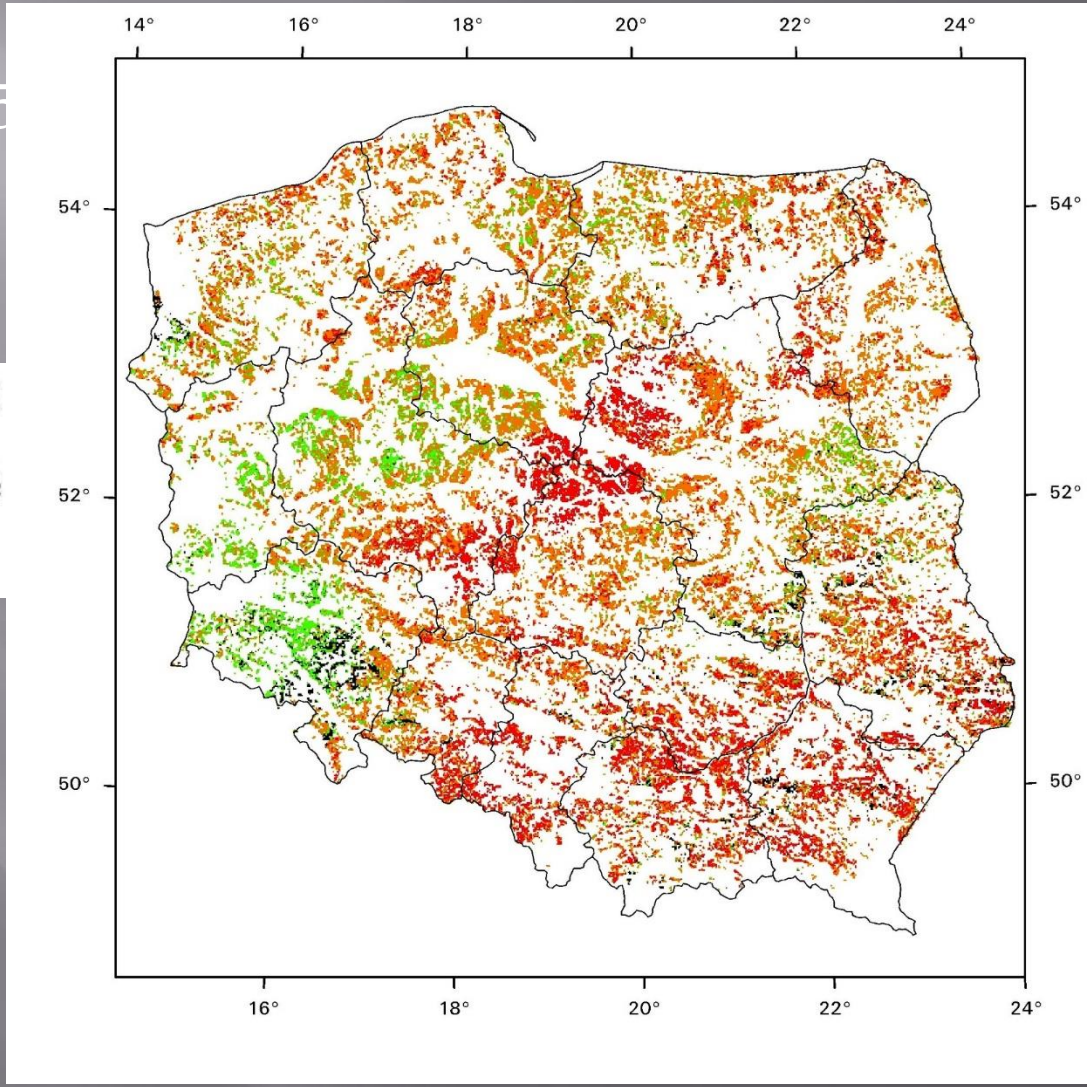
SUSZA 2015
dekada 18



76 %

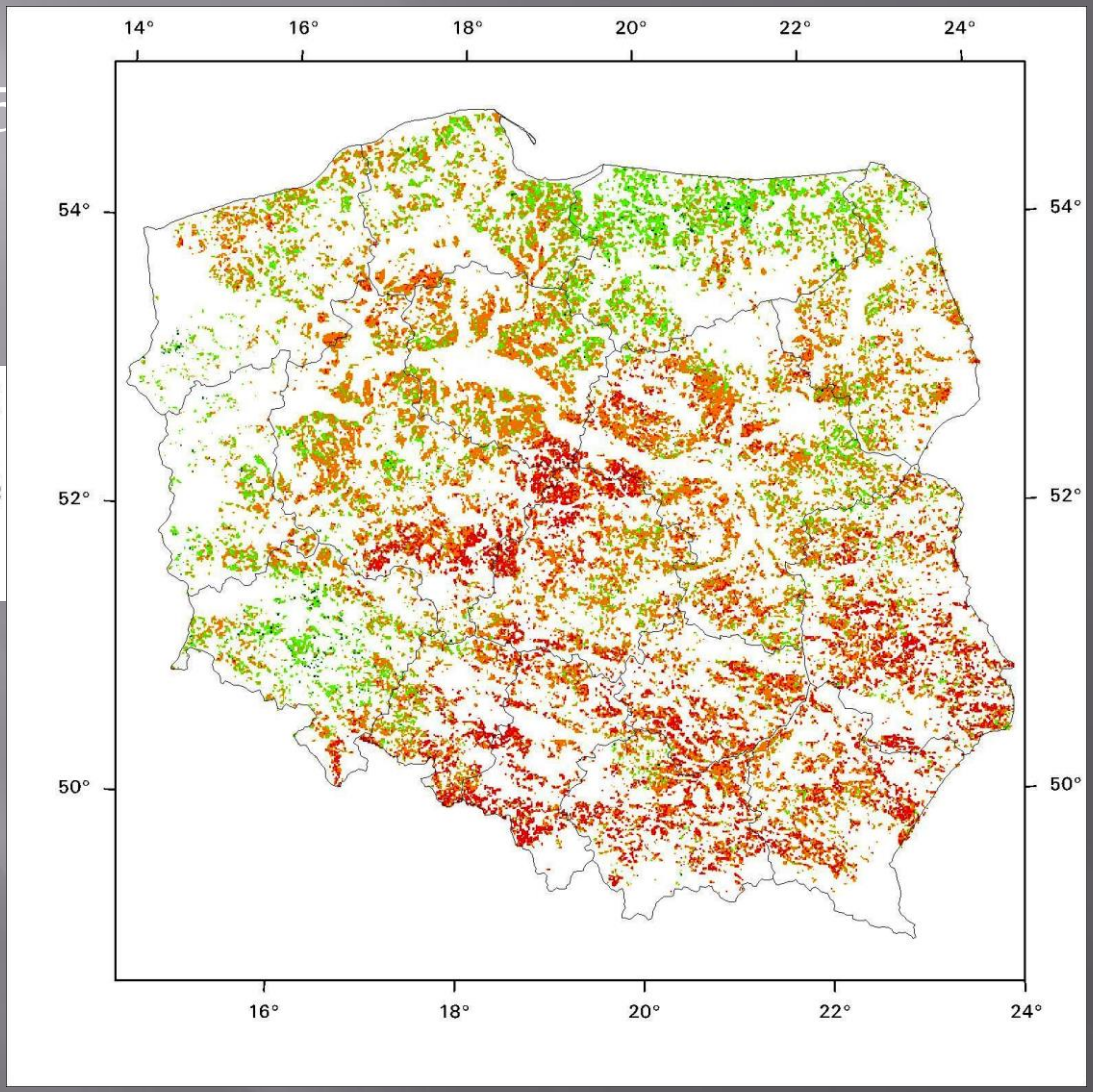
IGiK

SUSZA 2015
dekada 19



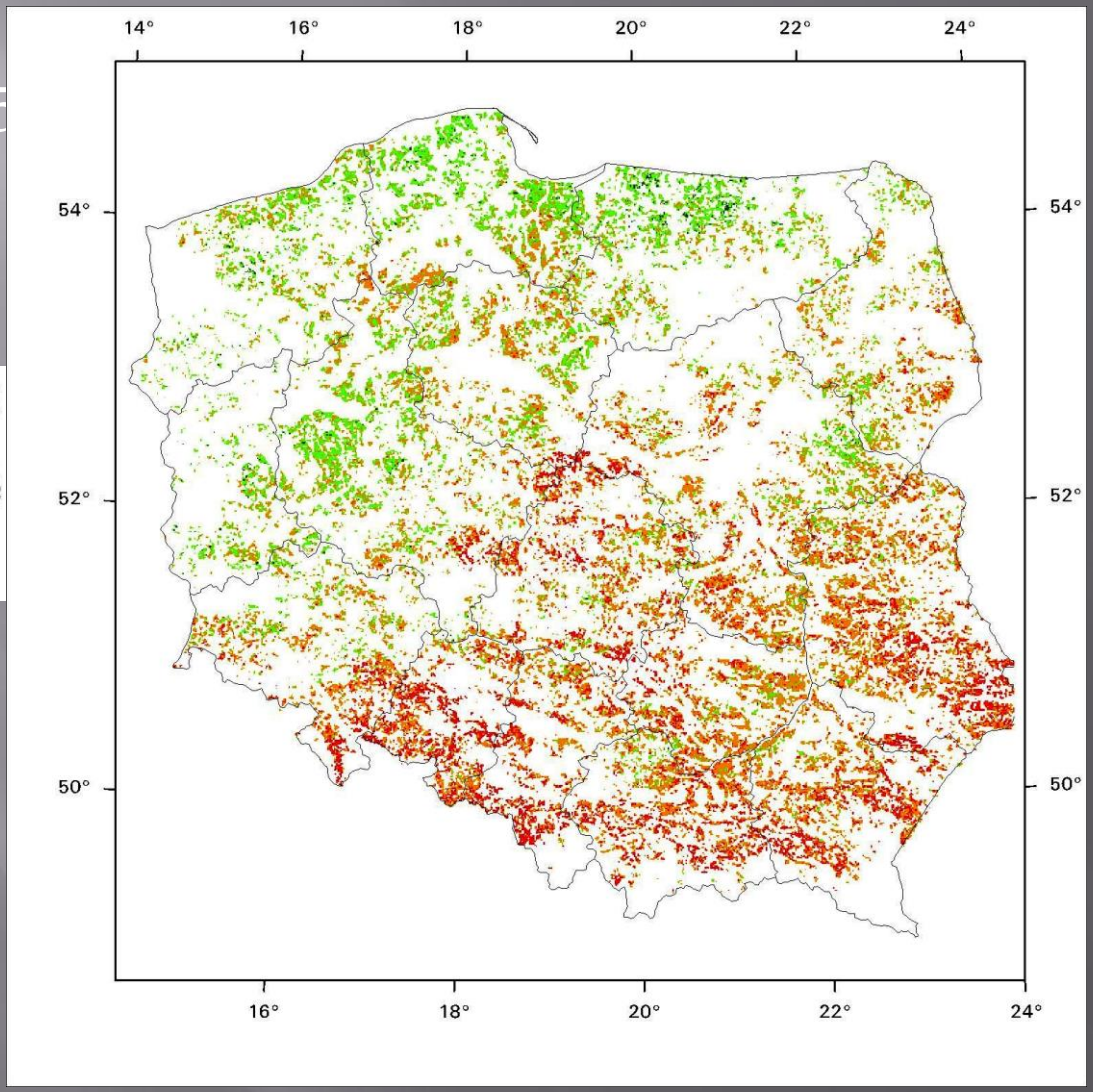
84 %

SUSZA 2015
dekada 20



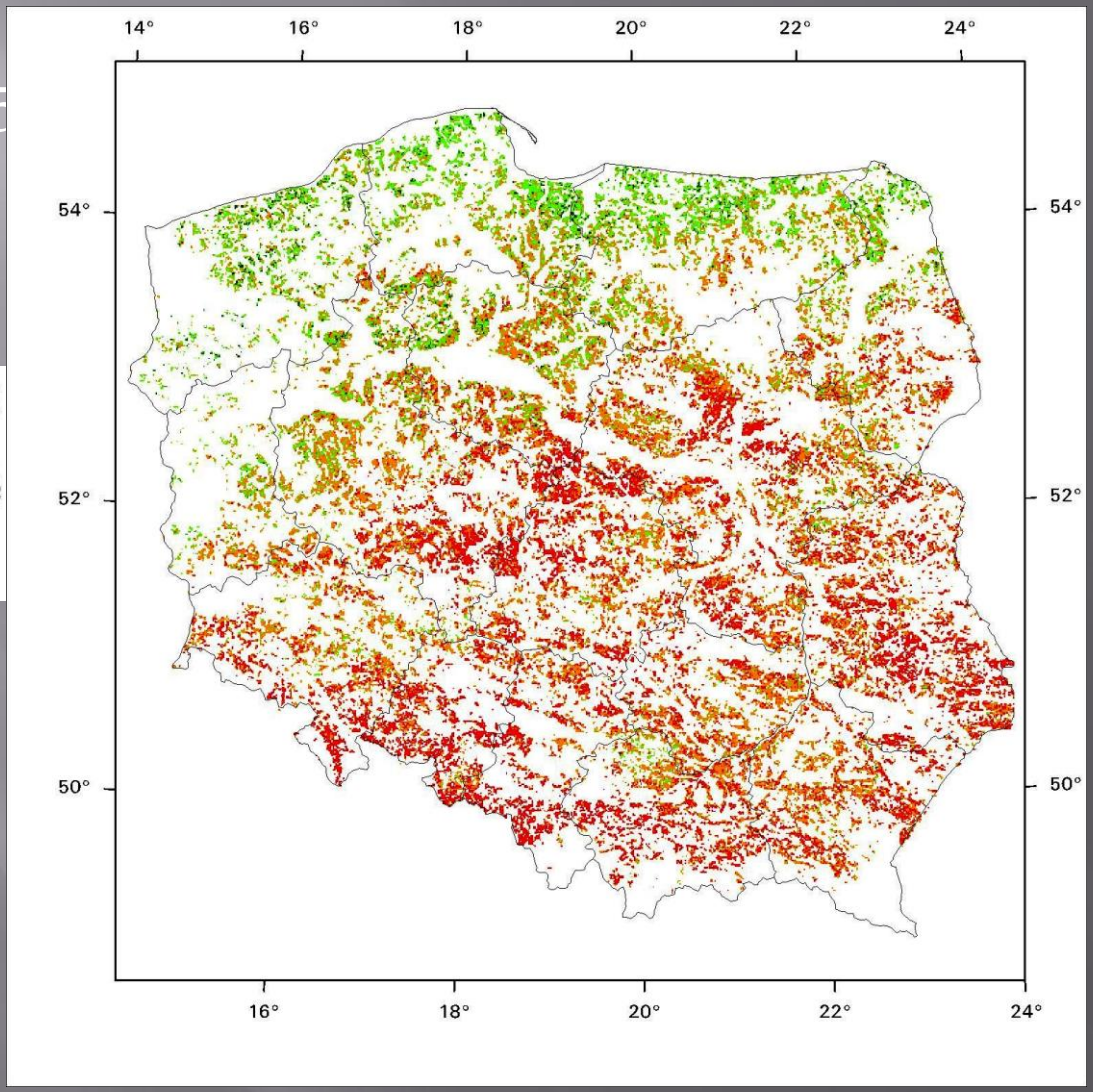
72 %

SUSZA 2015
dekada 21



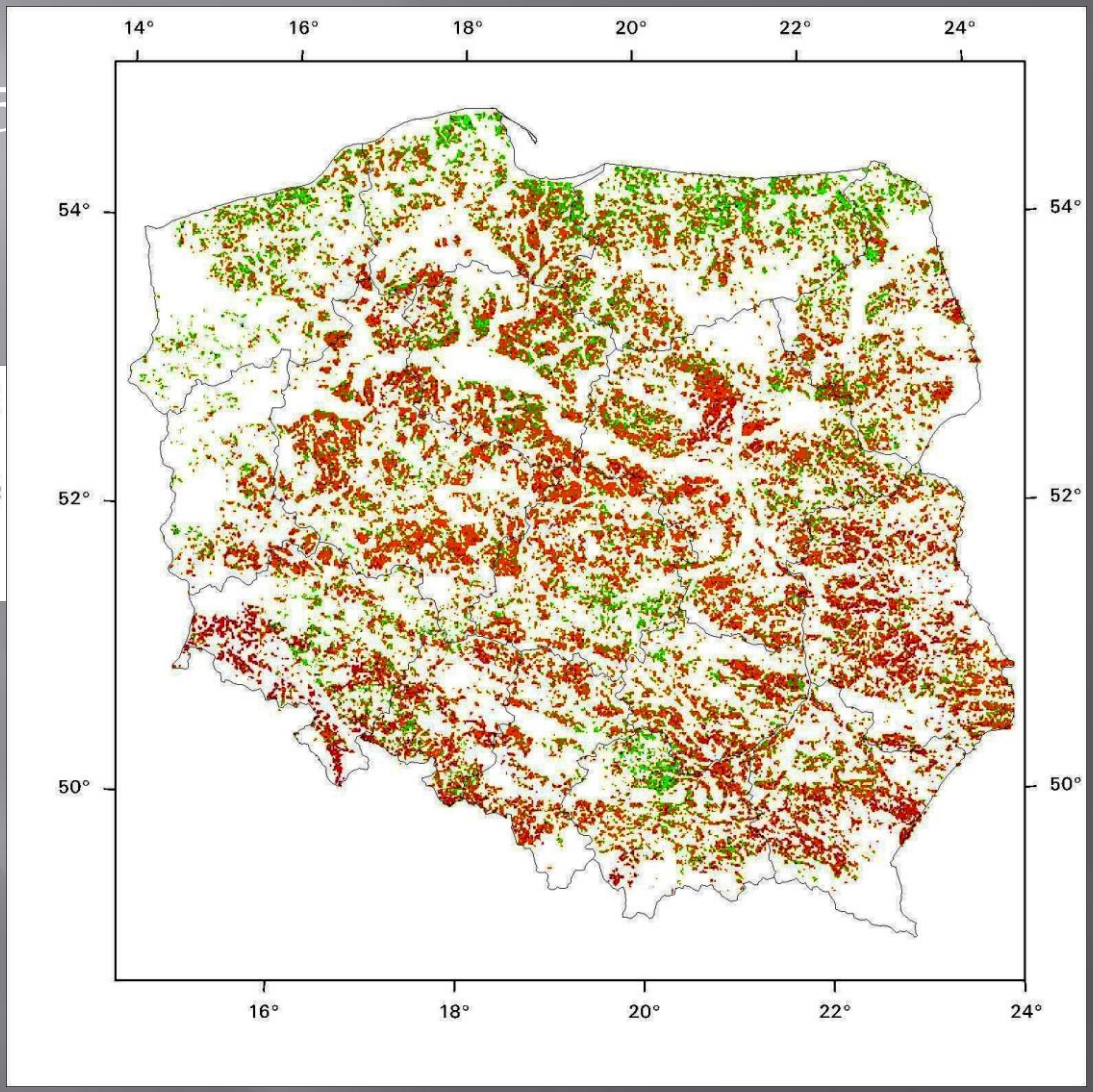
54 %

SUSZA 2015
dekada 22



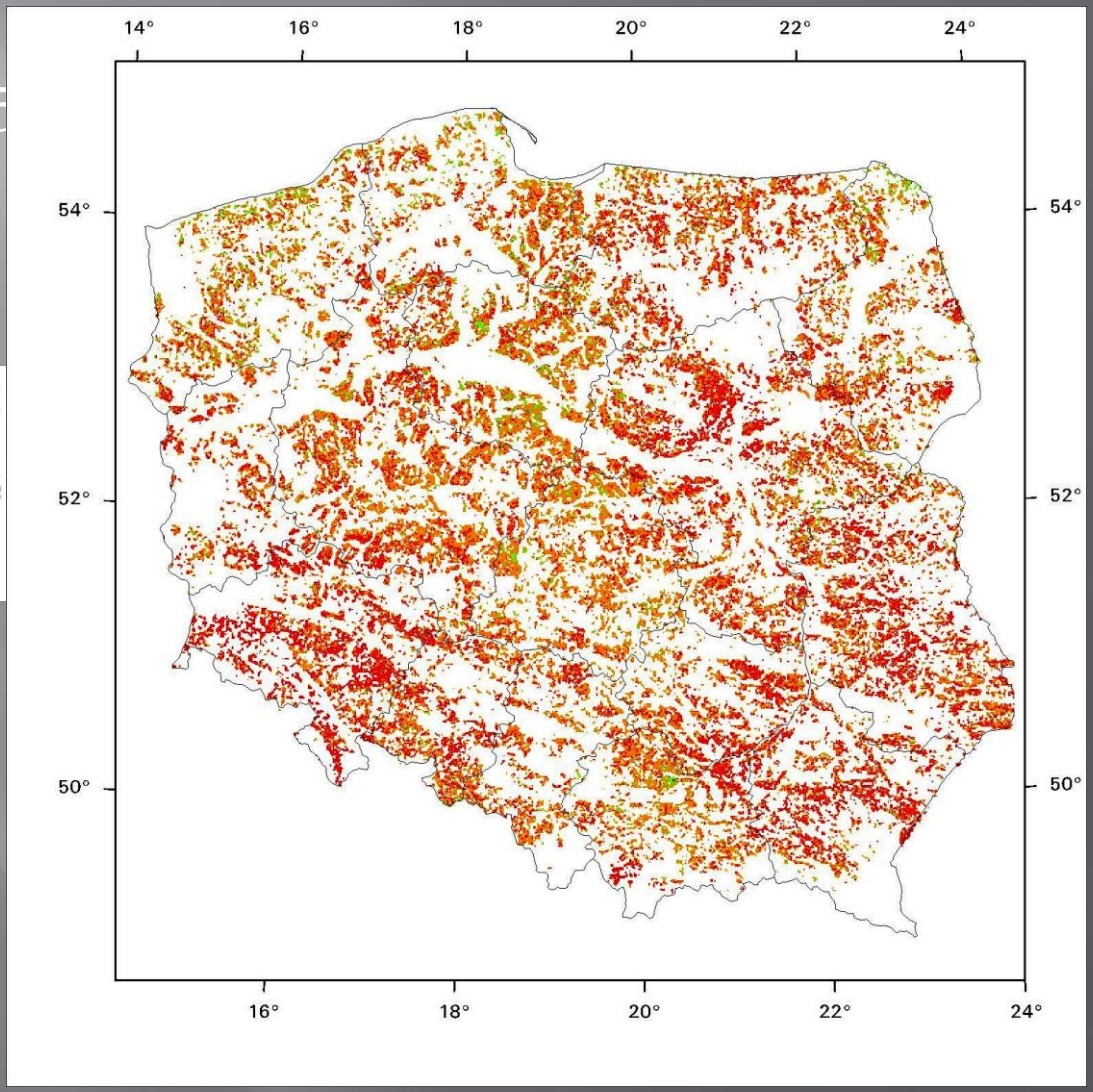
72 %

SUSZA 2015
dekada 23



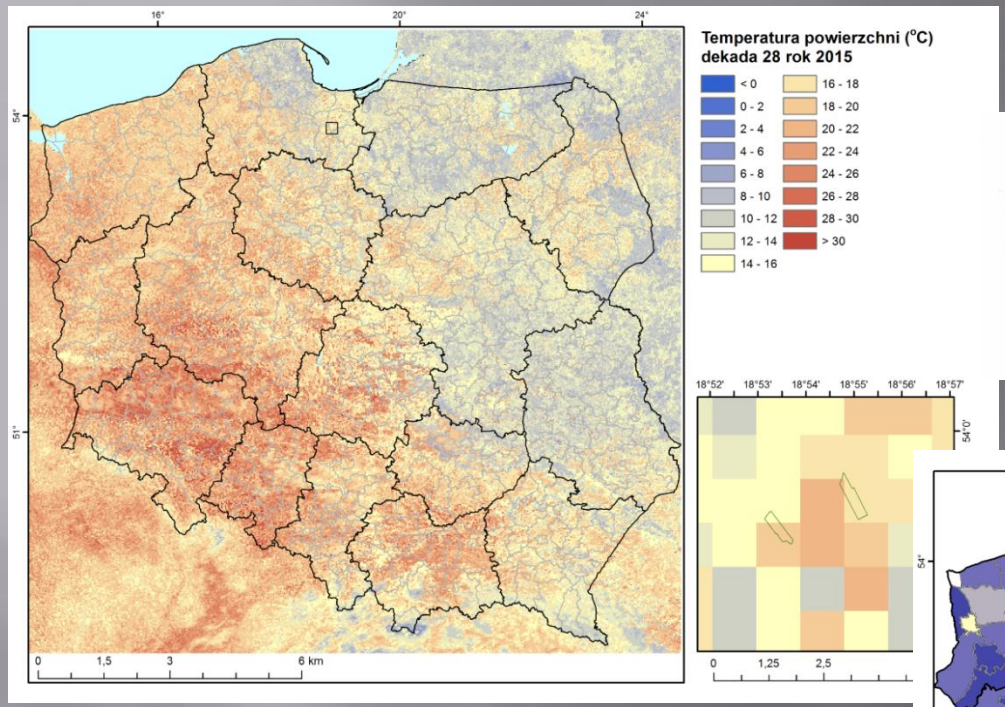
80 %

SUSZA 2015
dekada 24



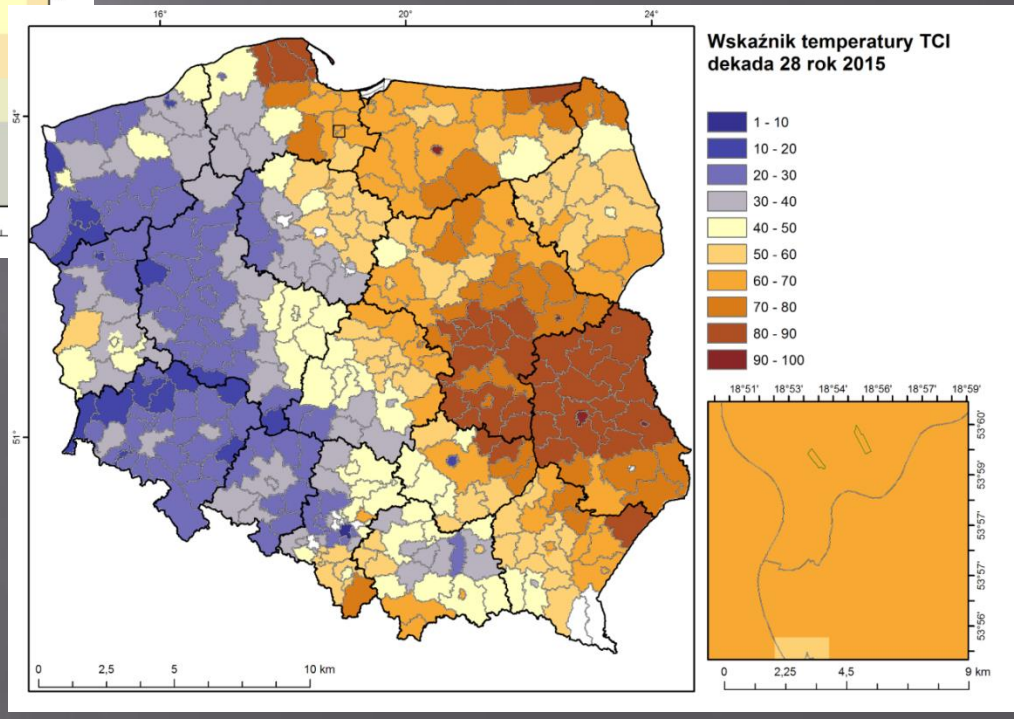
95 %

Termiczny wskaźniki kondycji roślin (TCI) (Thermal Condition Index)



$$TCI = 100 \times \frac{T_{max} - T_{akt}}{T_{max} - T_{min}}$$

TCI dla powiatów (km²)

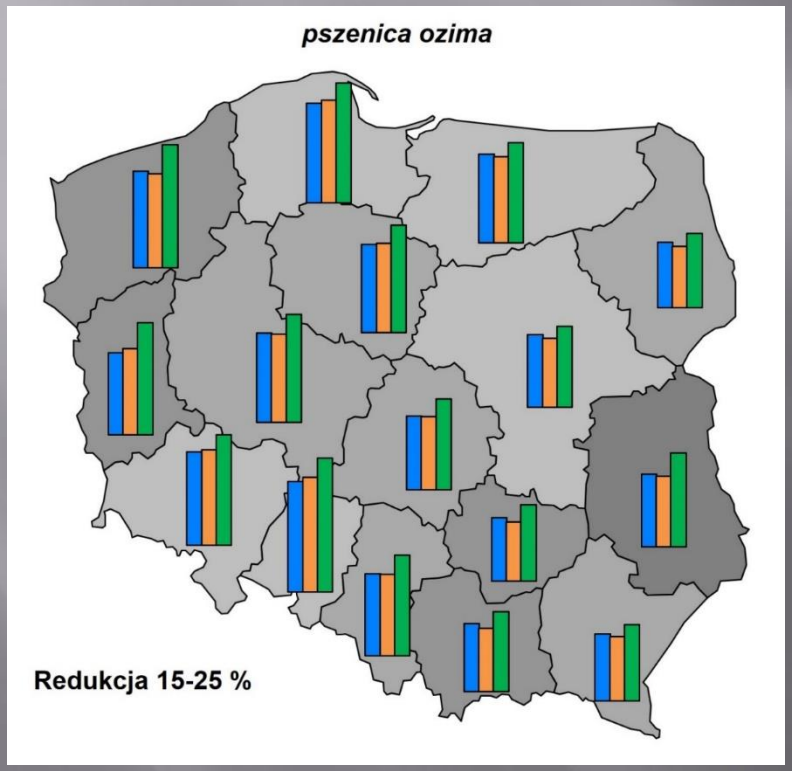


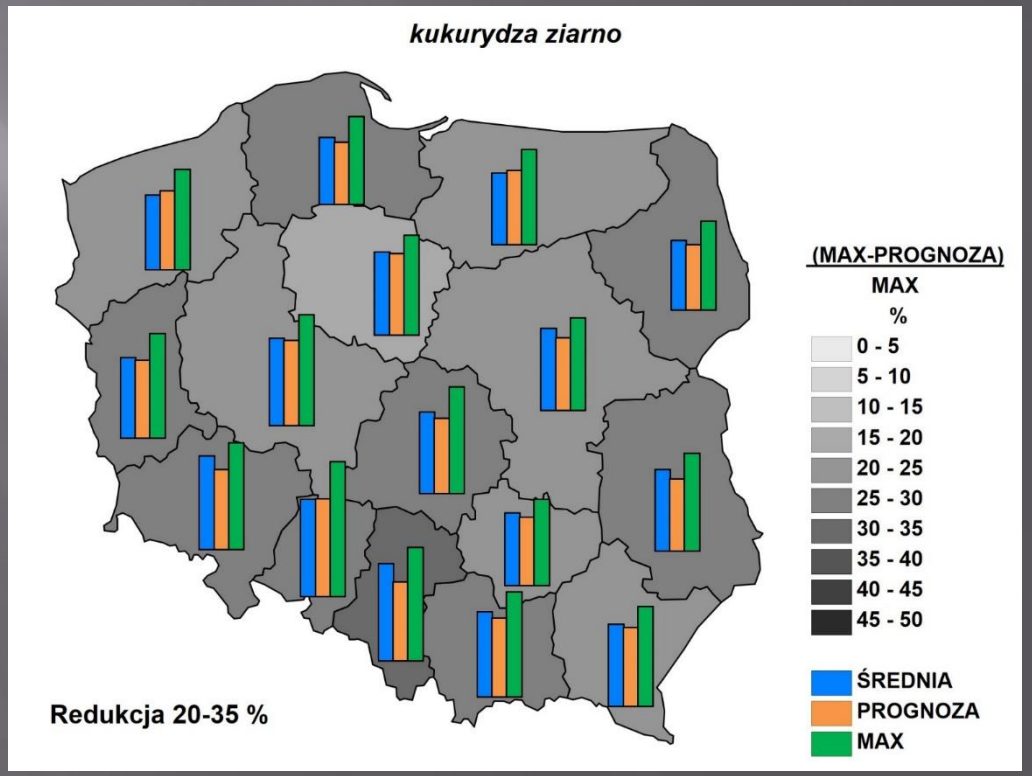
T_{akt} – temperatura roślin obliczona na podstawie aktualnie wykonanego zdjęcia.

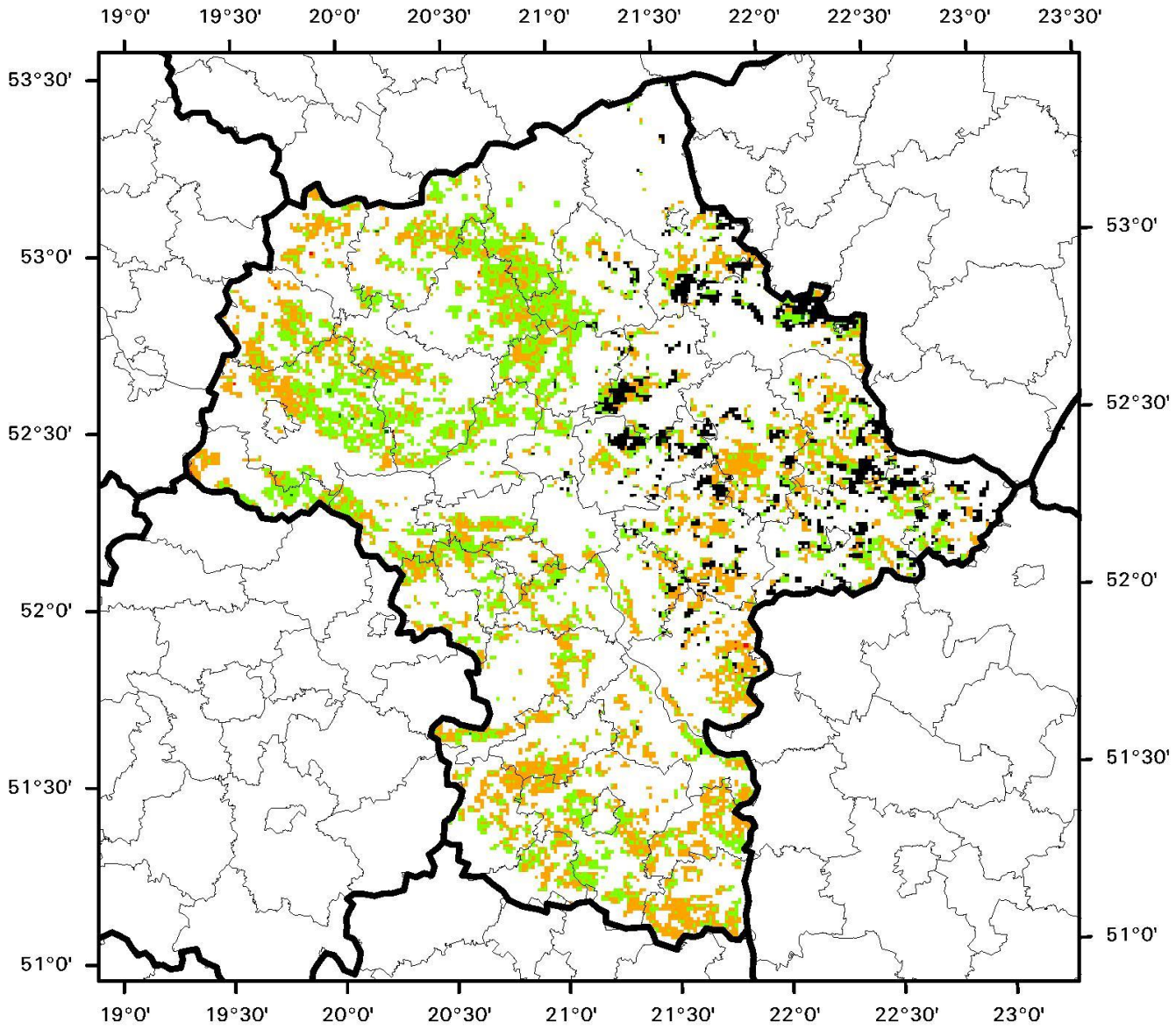
T_{max} – maksymalna temperatura roślin w danym w okresie

T_{min} – minimalna temperatura roślin w danym okresie

Prognozy plonów 2015.

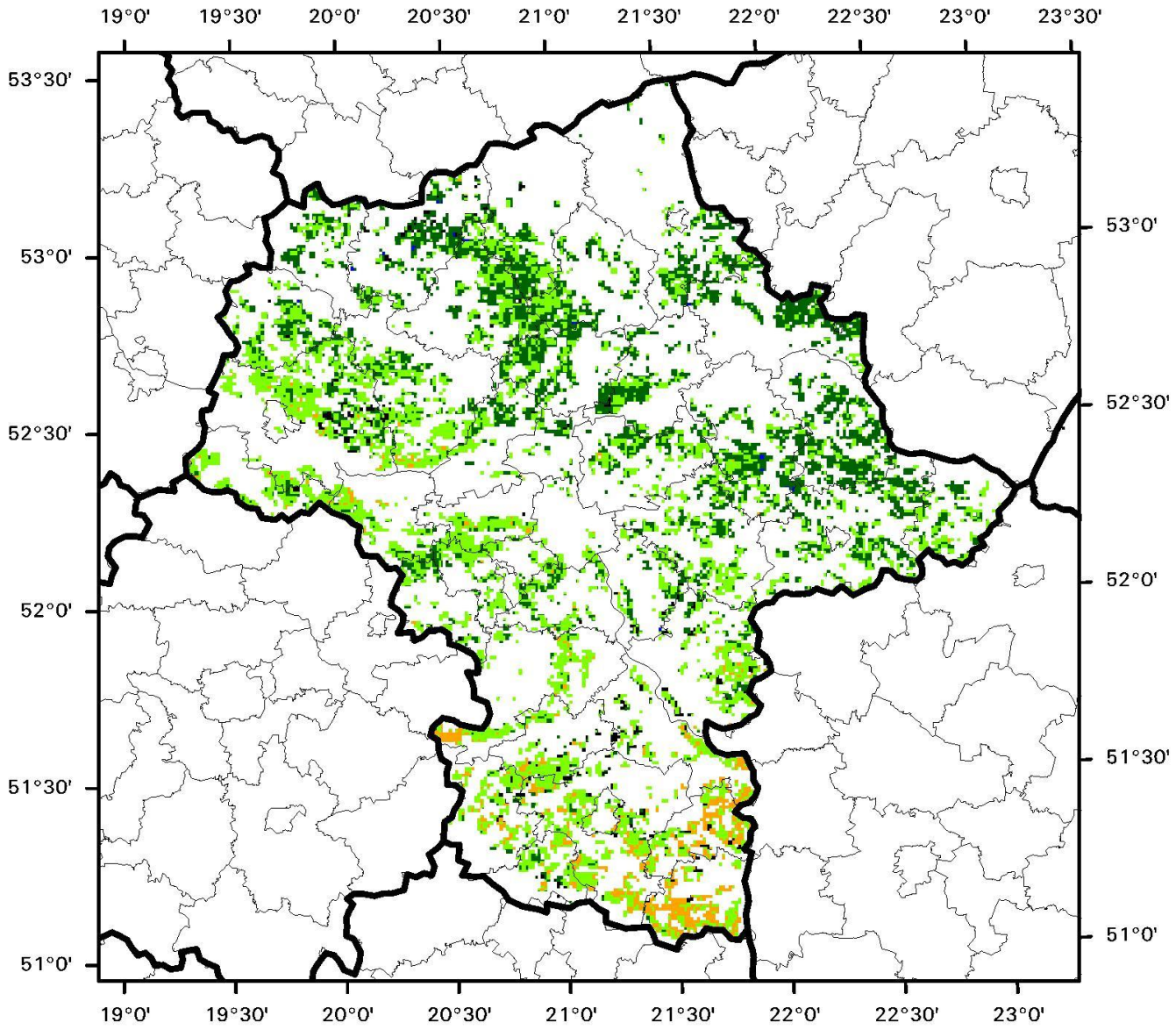






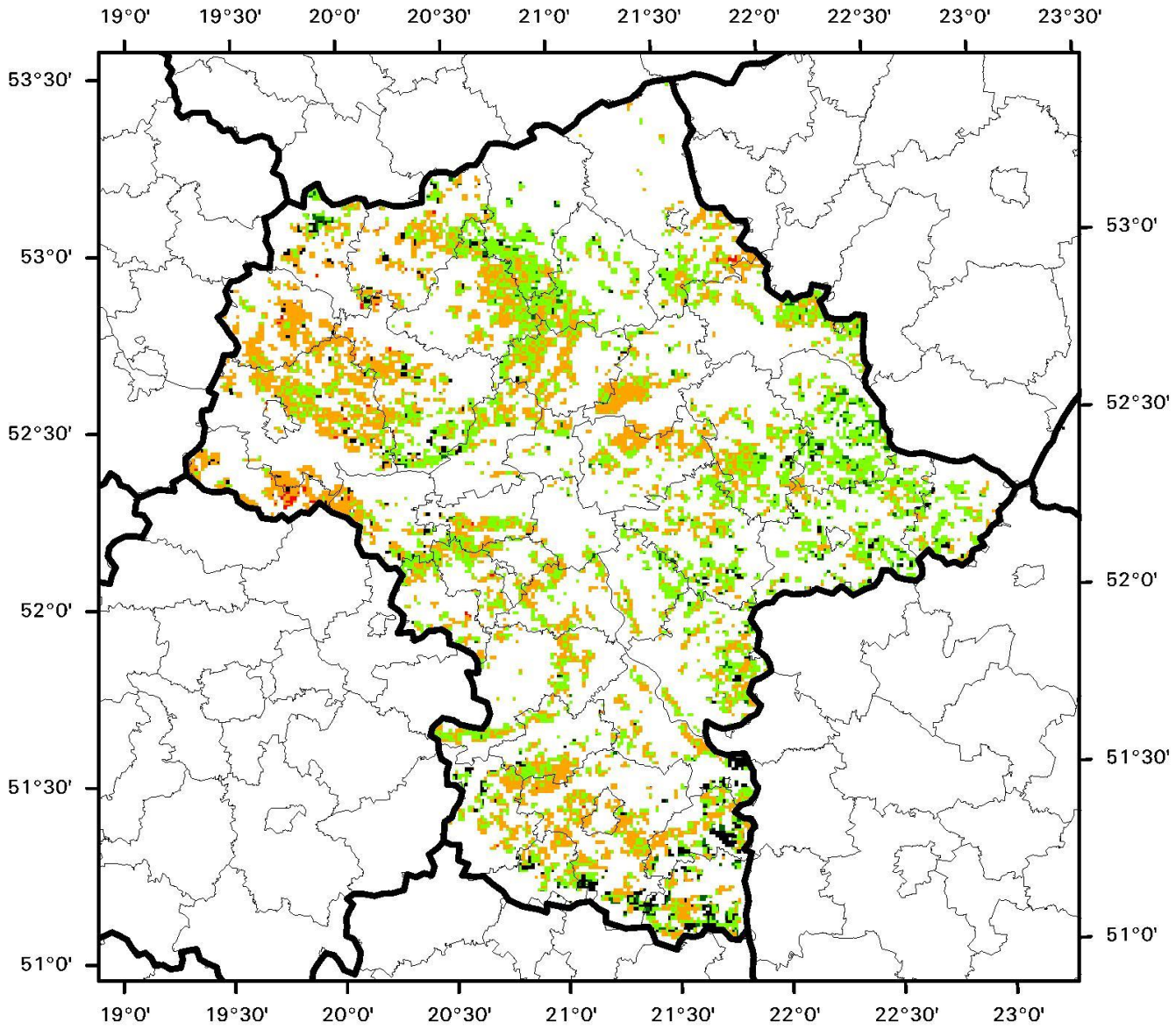
Województwo Mazowieckie

MAJ 2012



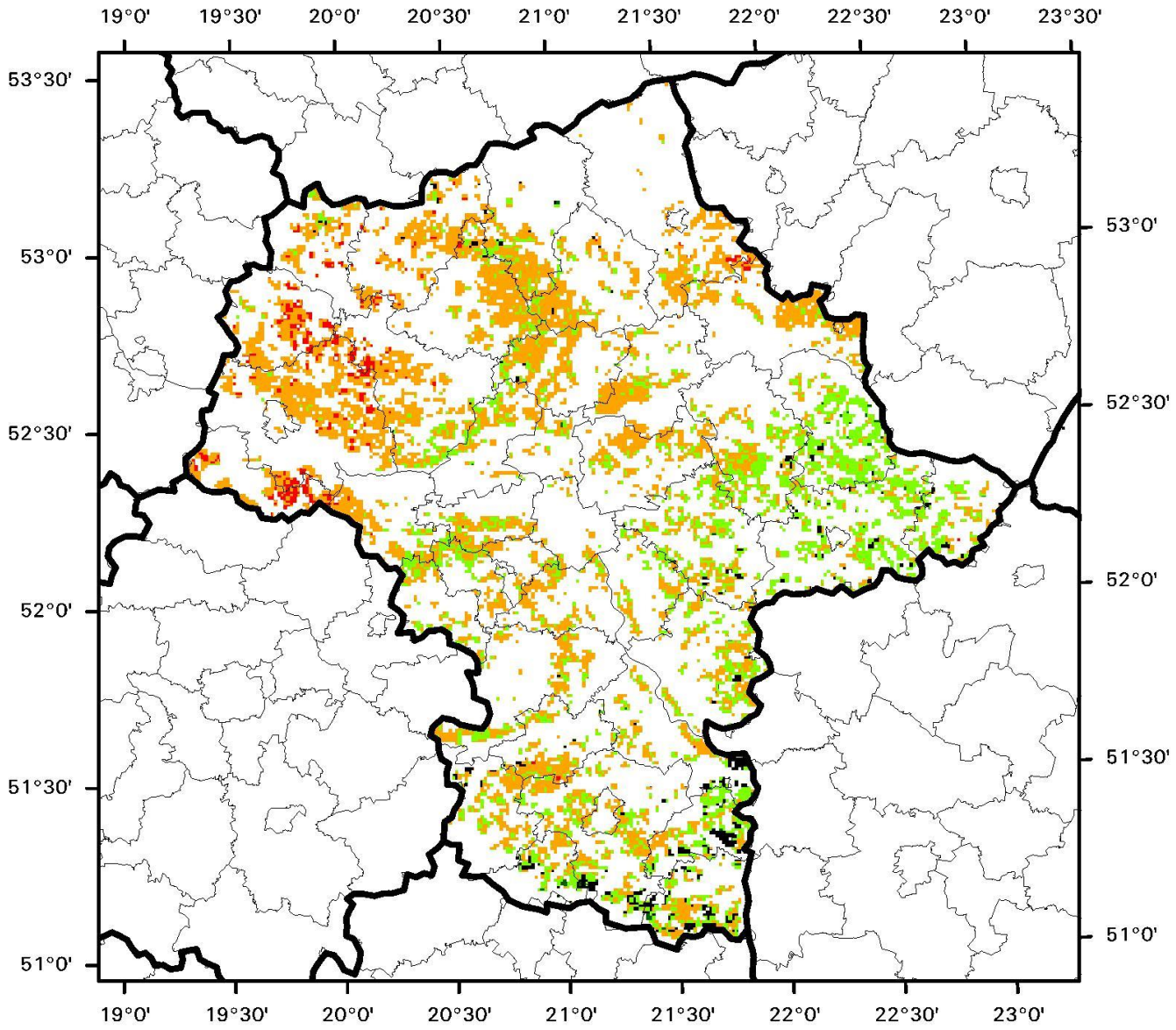
Województwo Mazowieckie

Lipiec 2012



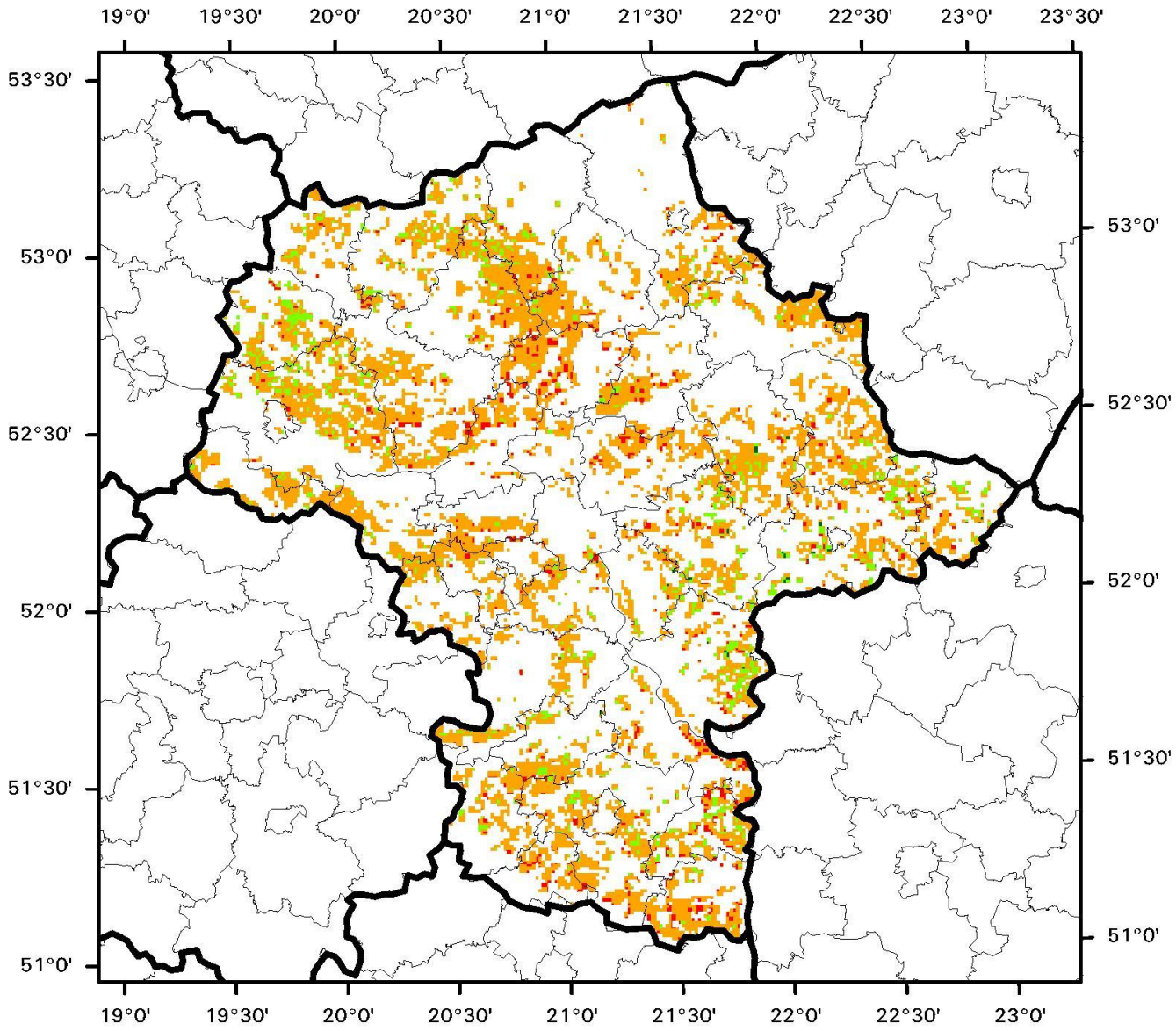
Województwo Mazowieckie

Lipiec 2015



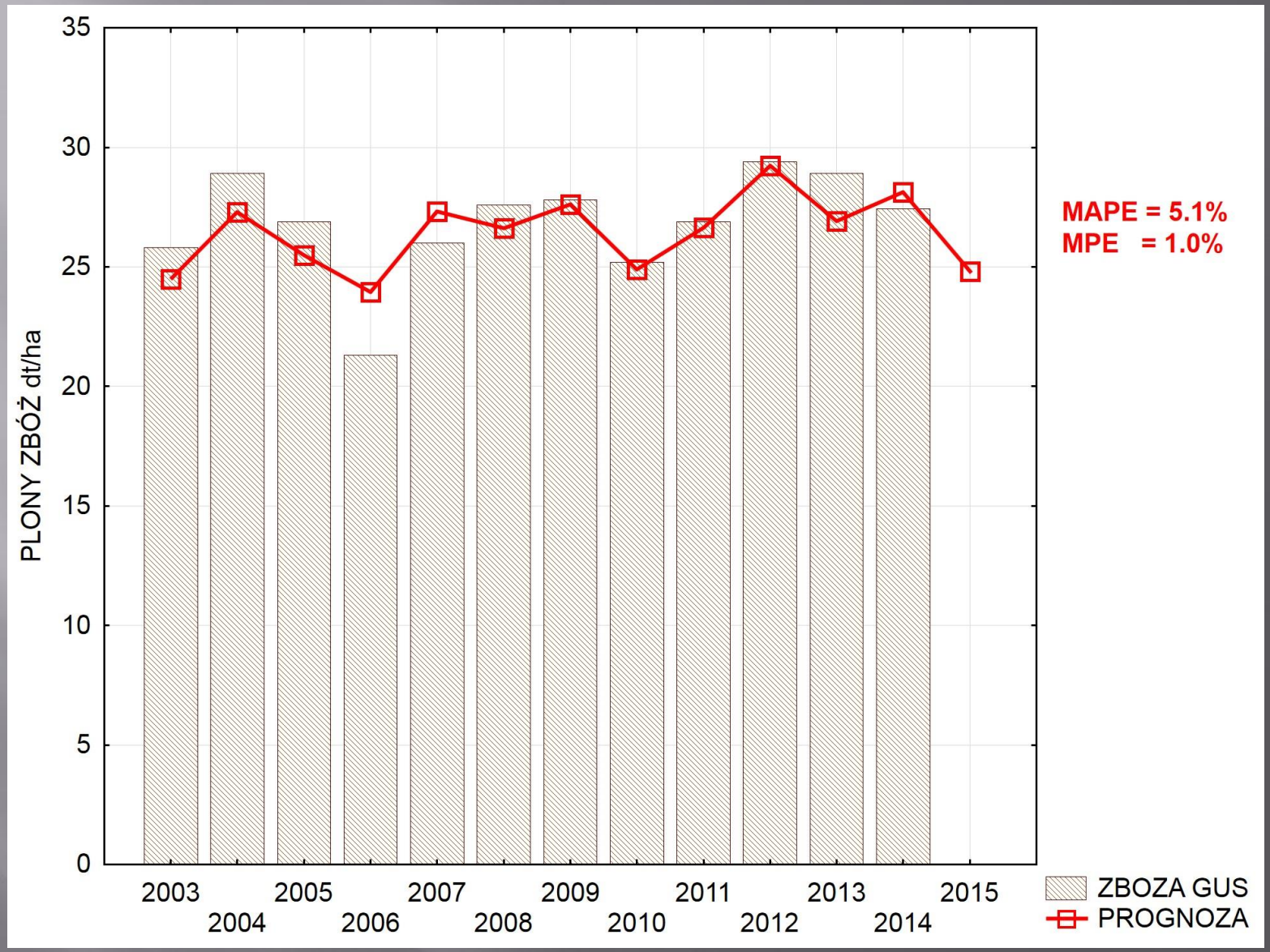
Województwo Mazowieckie

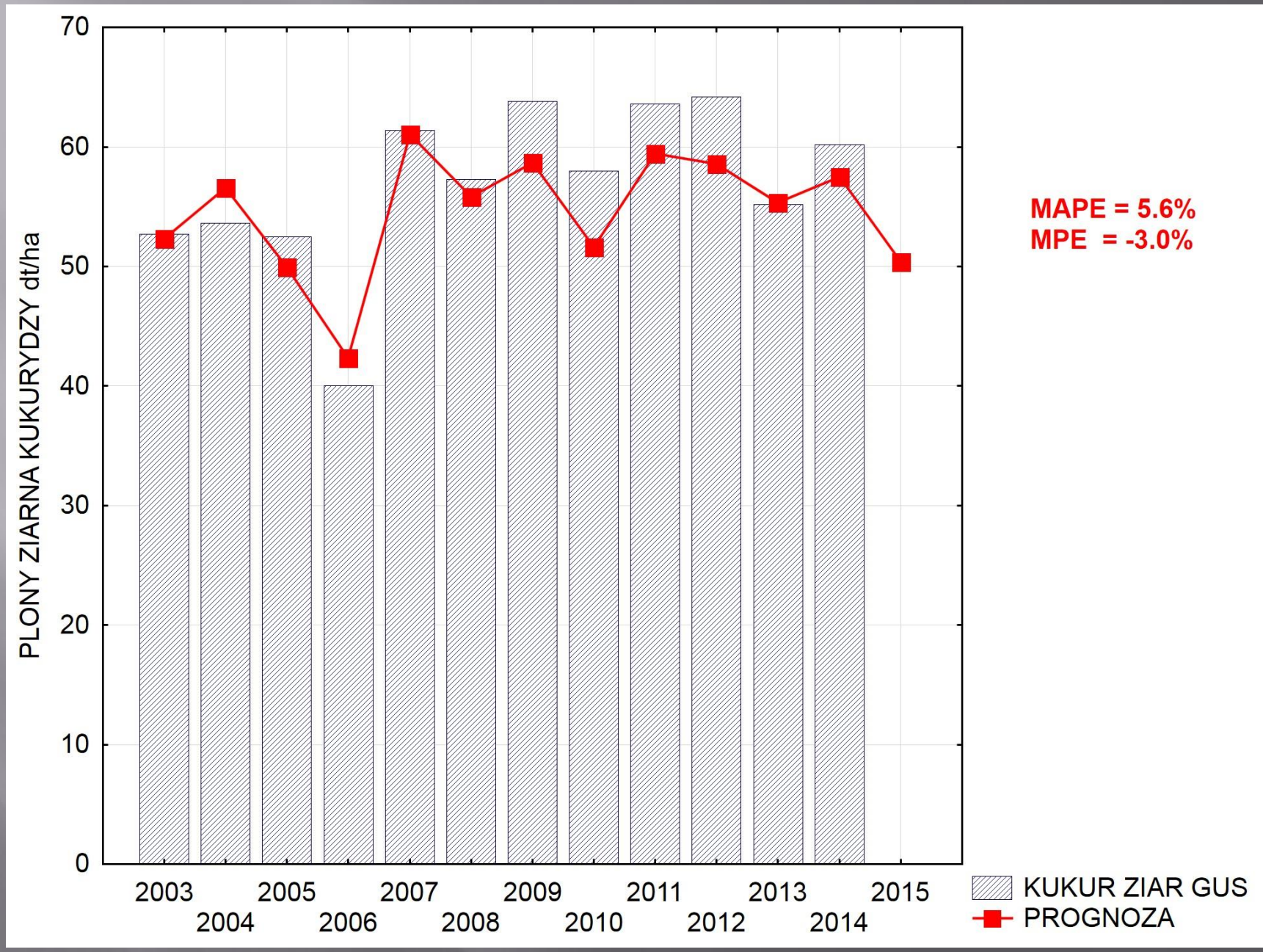
Czerwiec 2015



Województwo Mazowieckie

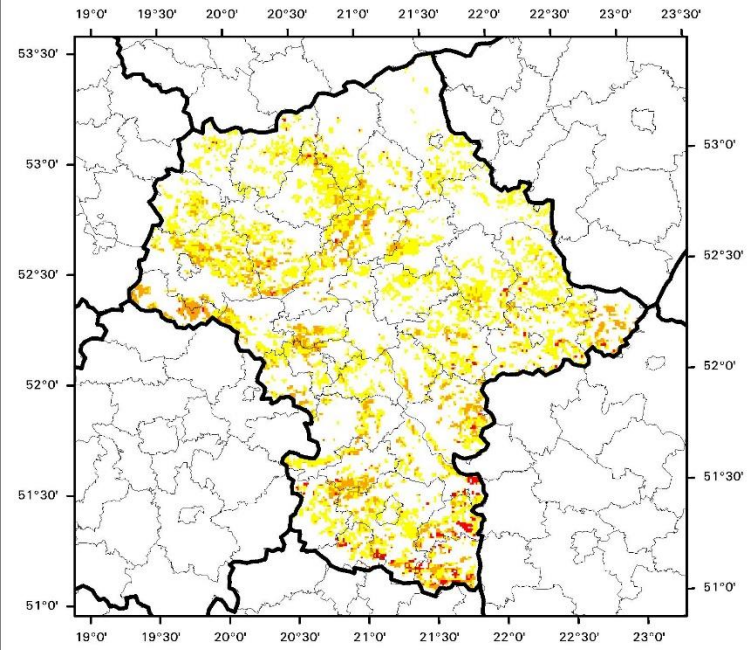
Susza 2015sierpień


PLONY ZBÓŻ dt/ha
35
30
25
20
15
10
5
0
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
2013
2014
2015
MAPE = 5.1%
MPE = 1.0%
ZBOZA GUS
PROGNOZA

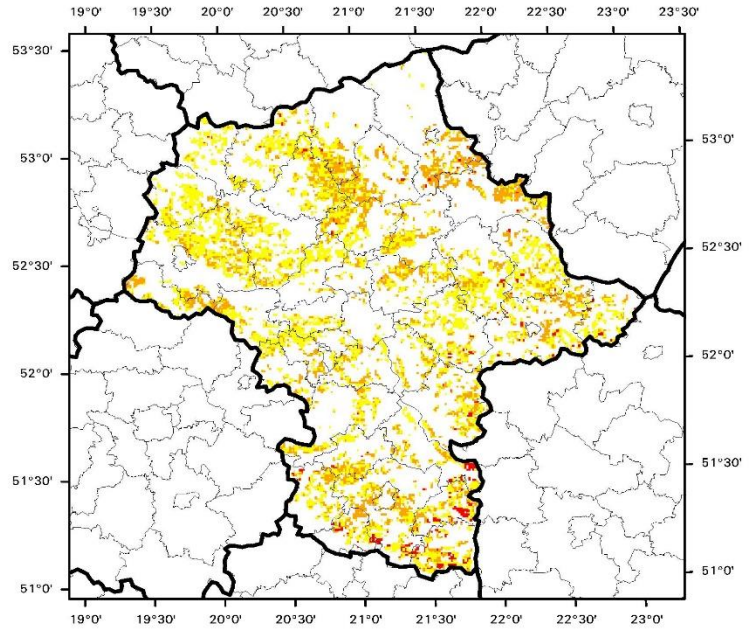

PLONY ZIARNA KUKURYDZY dt/ha
70
60
50
40
30
20
10
0
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
2013
2014
2015
MAPE = 5.6%
MPE = -3.0%
KUKUR ZIAR GUS
PROGNOZA

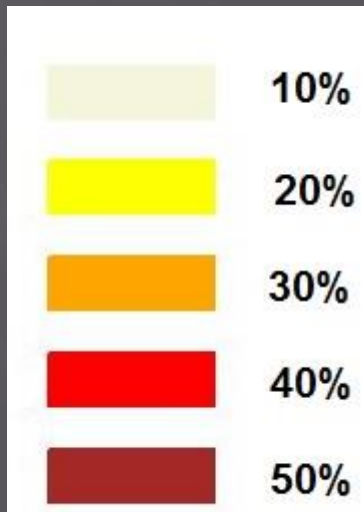
REDUKCJA PLONÓW

KUKURYDZA

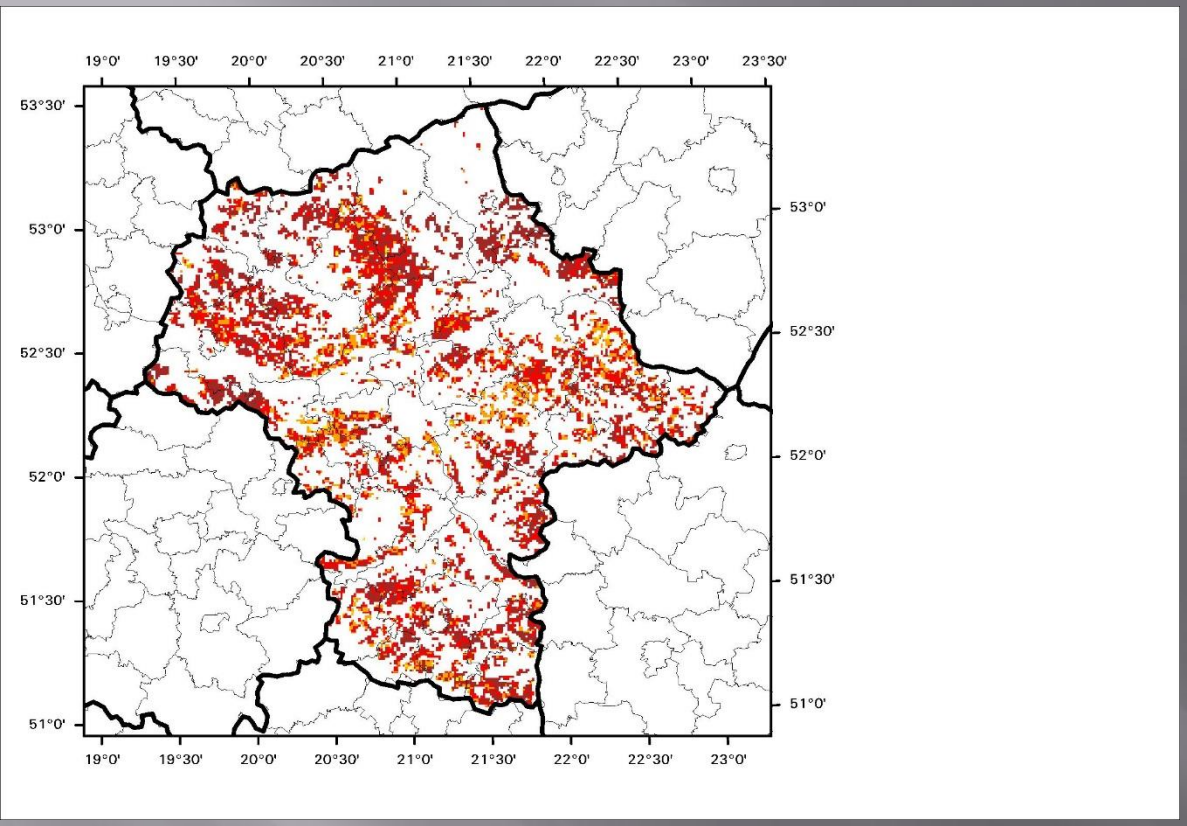


ZBOŻA

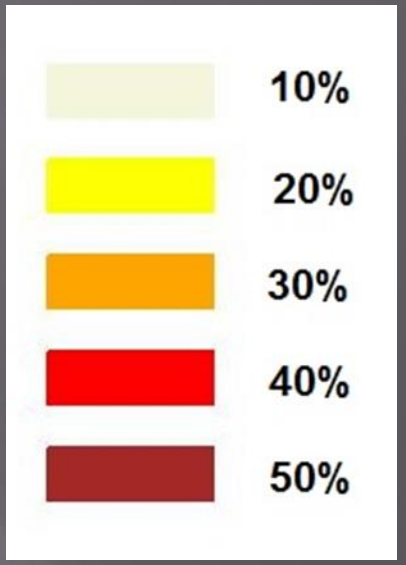


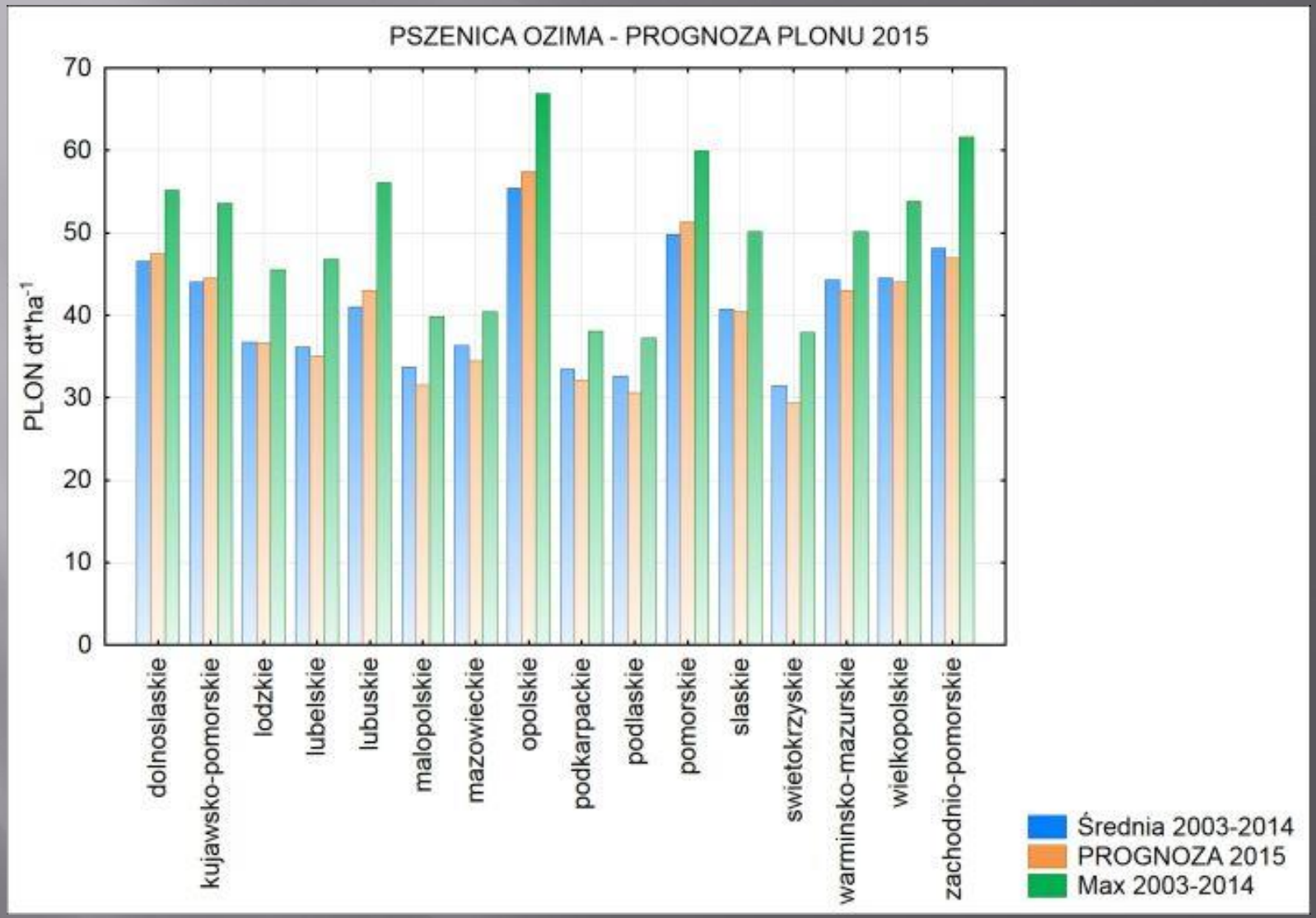


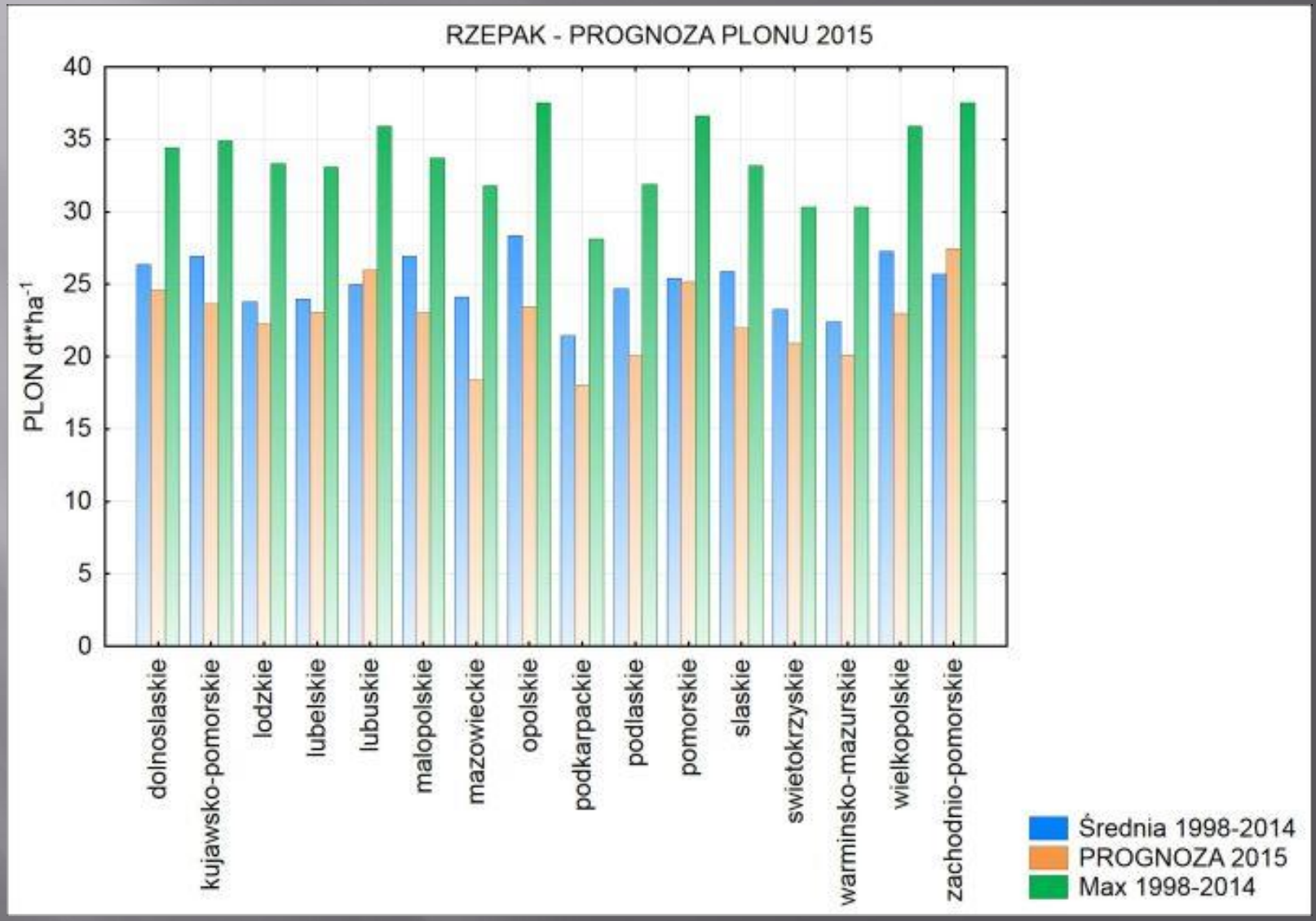
2015



Rzepak –
Redukcja plonów

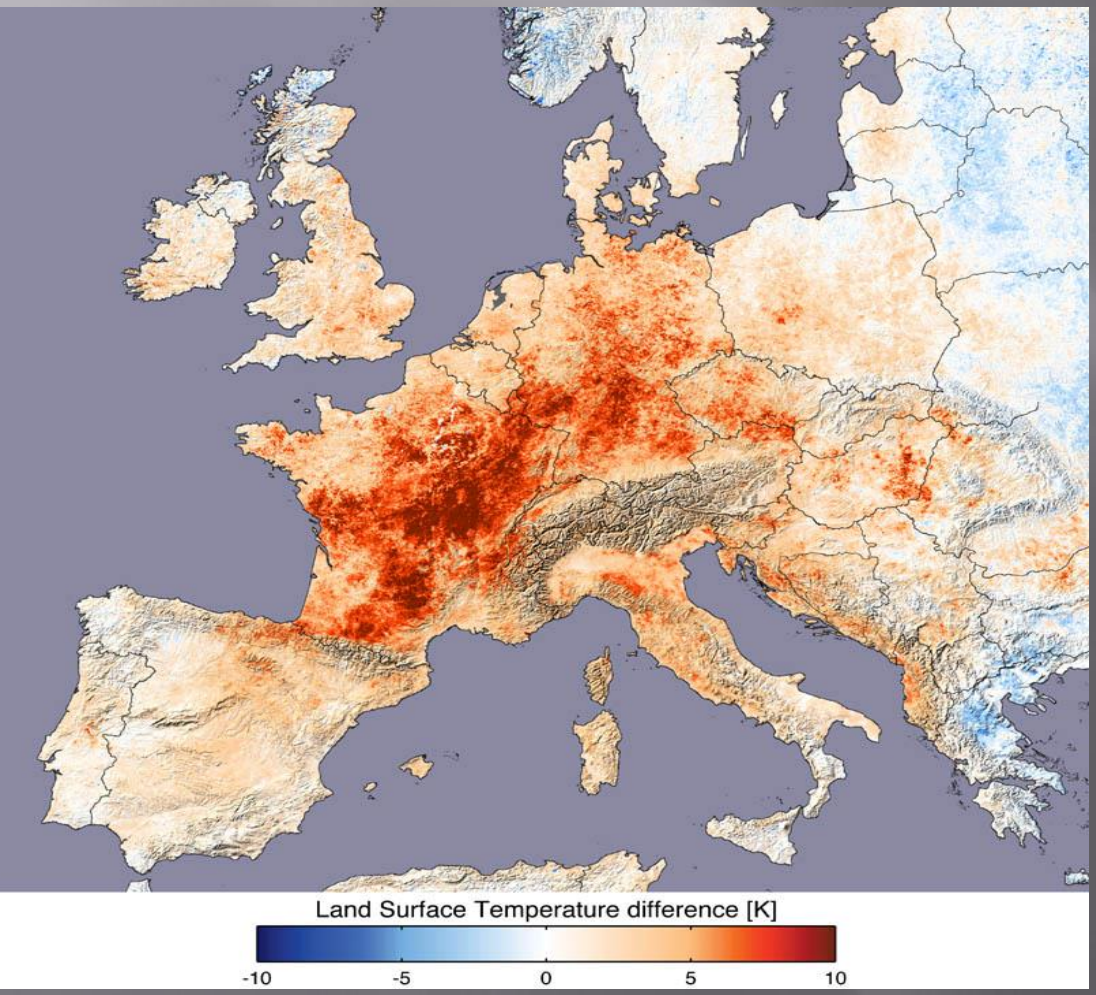



PSZENICA OZIMA - PROGNOZA PLONU 2015
PLON dt*ha-1
70
60
50
40
30
20
10
0
dolnoslaskie
kujawsko-pomorskie
lodzkie
lubelskie
lubuskie
malopolskie
mazowieckie
opolskie
podkarpackie
podlaskie
pomorskie
slaskie
swietokrzyskie
warminsko-mazurskie
wielkopolskie
zachodnio-pomorskie
Średnia 2003-2014
PROGNOZA 2015
Max 2003-2014


RZEPAK - PROGNOZA PLONU 2015
PLON dt*ha-1
40
35
30
25
20
15
10
5
0
dolnoslaskie
kujawsko-pomorskie
lodzkie
lubelskie
lubuskie
malopolskie
mazowieckie
opolskie
podkarpackie
podlaskie
pomorskie
slaskie
swietokrzyskie
warminsko-mazurskie
wielkopolskie
zachodnio-pomorskie
Średnia 1998-2014
PROGNOZA 2015
Max 1998-2014

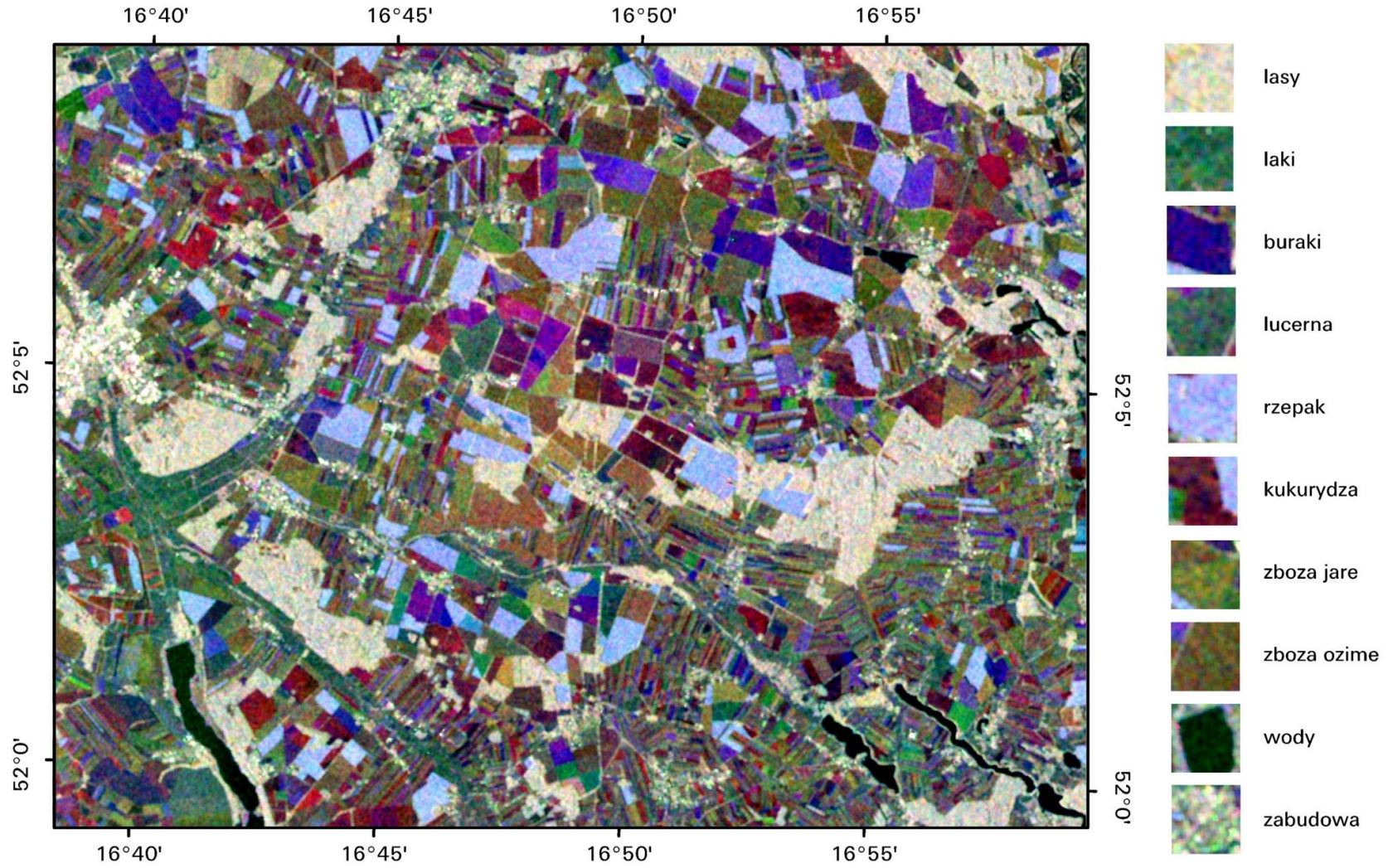
Sierpień 2003

TEMPERATURA POWIERZCHNI

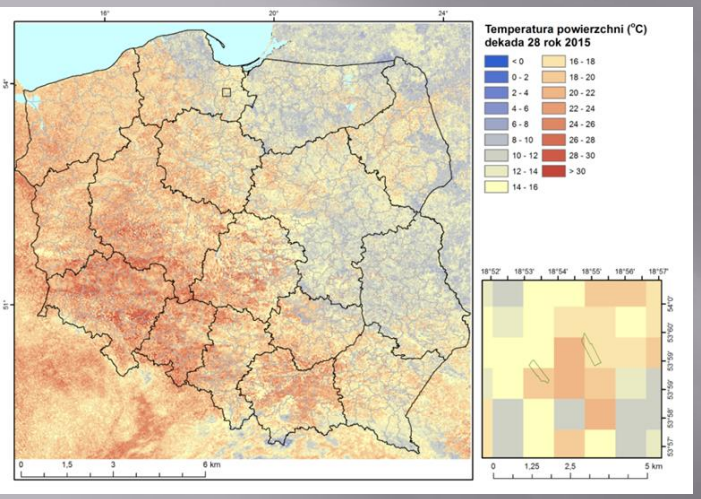


Obszar rolniczy - Wielkopolska

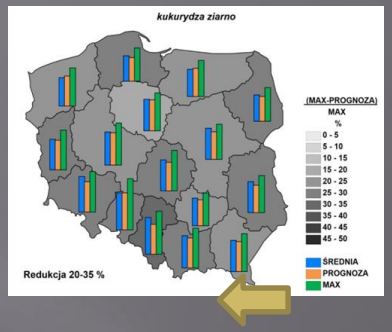
SENTINEL 1: R - 03.04.2015 VH, G - 02.05.2015 VH, B - 02.06.2015 VH



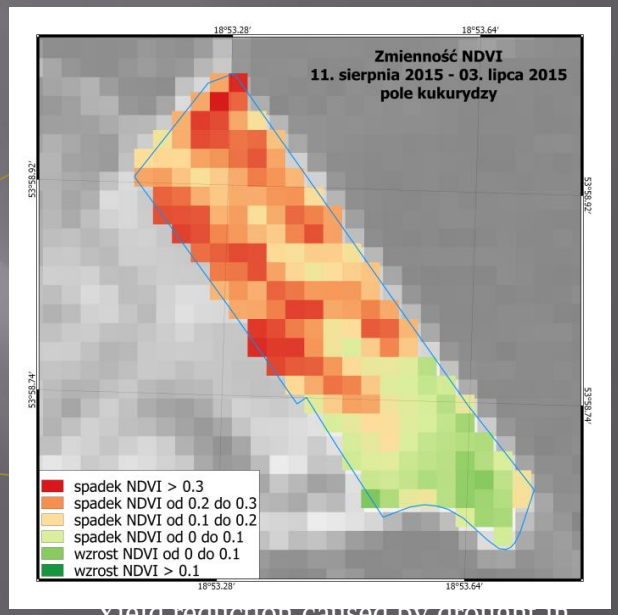
ANALIZY DLA POLA

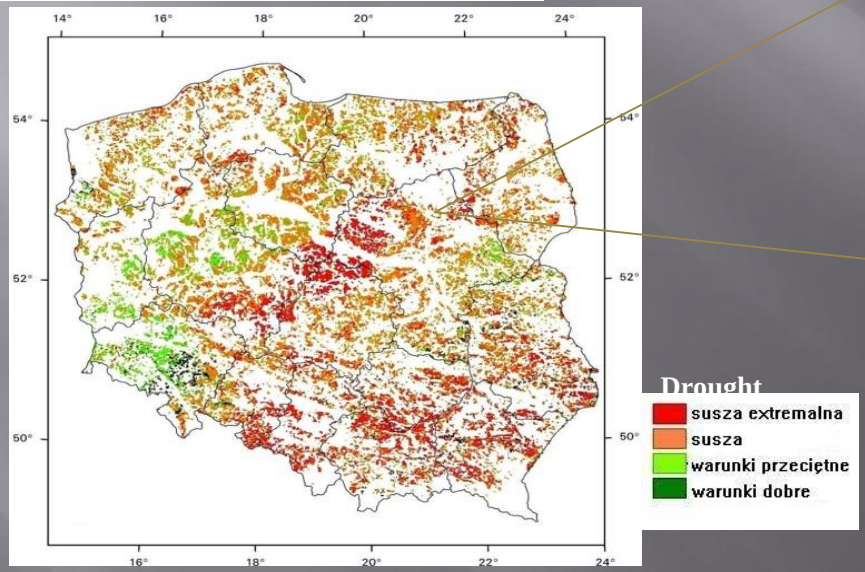


Surface temperature



YIELD reduction

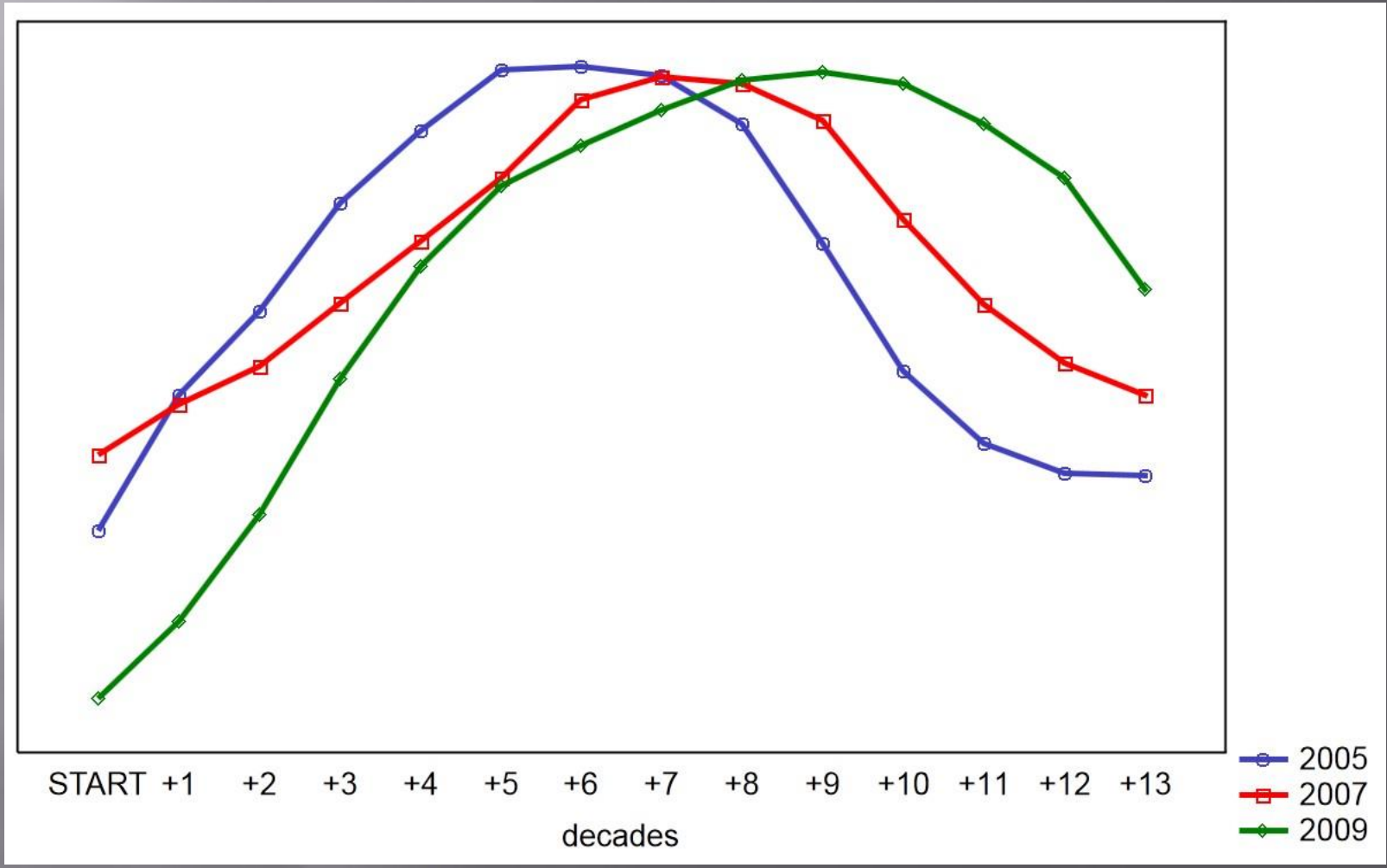




Drought

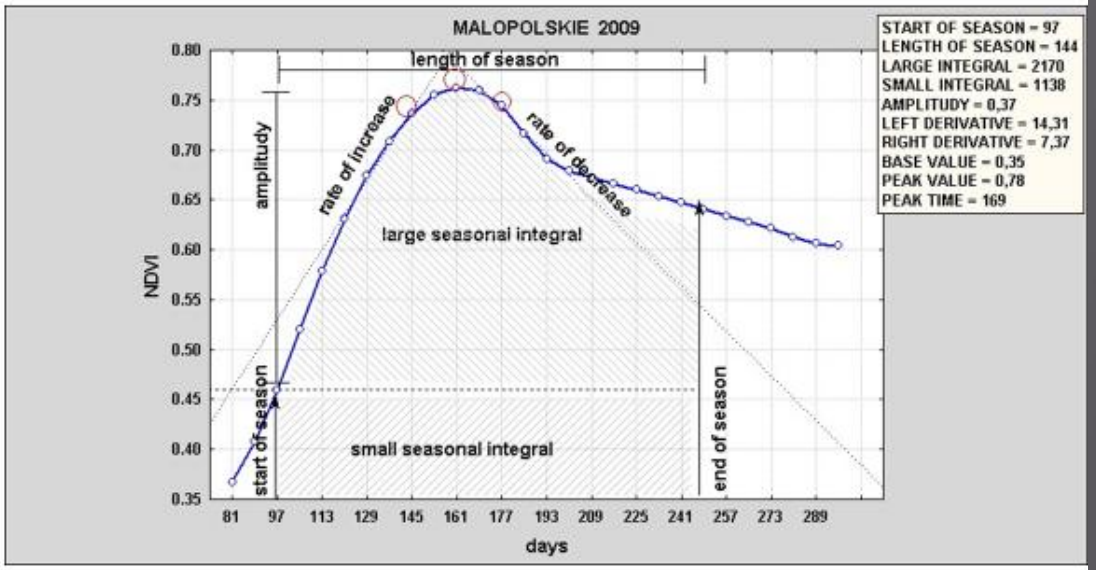
Yield reduction caused by drought in the Field

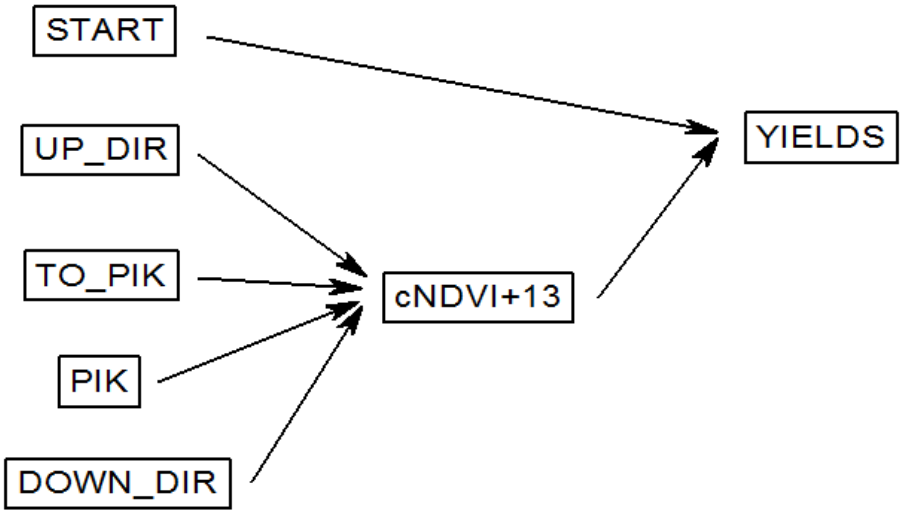
Wartość wskaźnika - Wybór powiatu lub pola



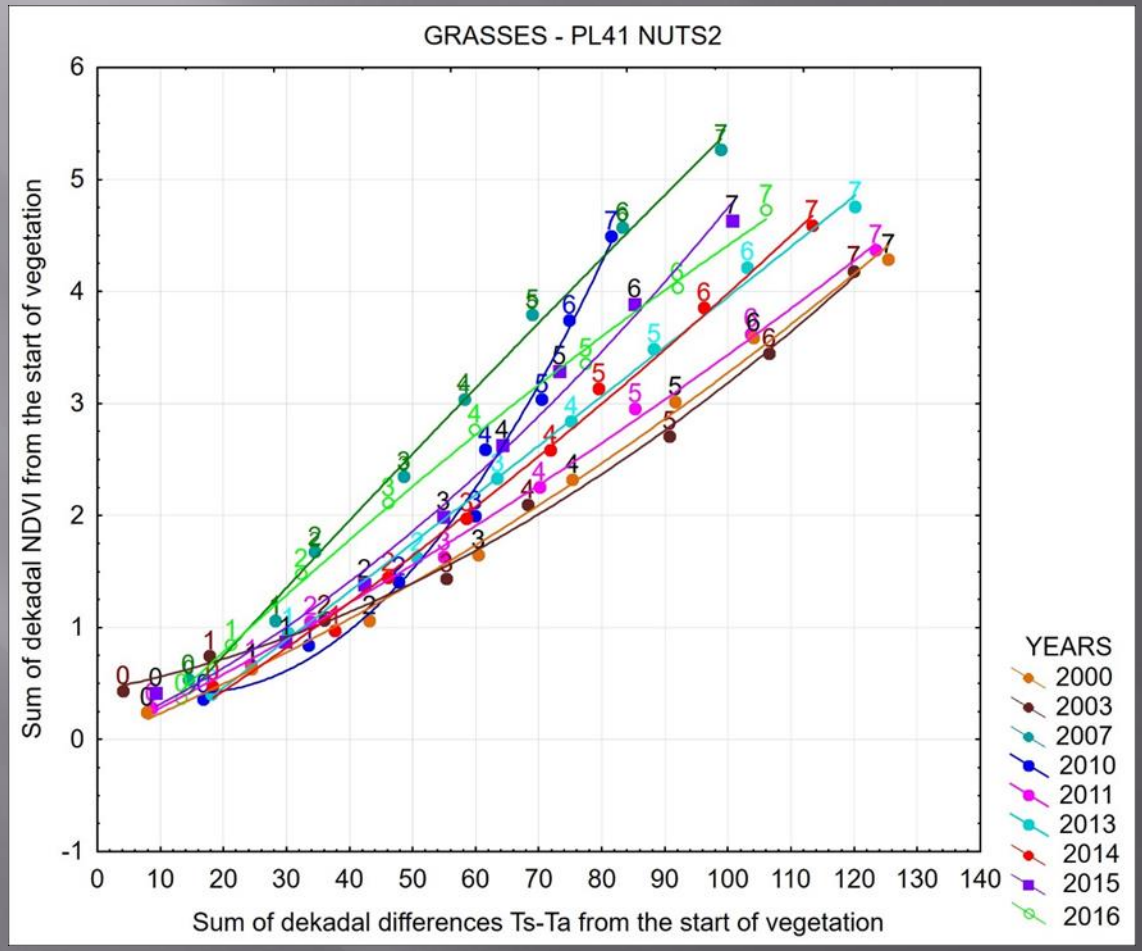
ANALIZA DLA POLA

SEASONAL PARAMETERS



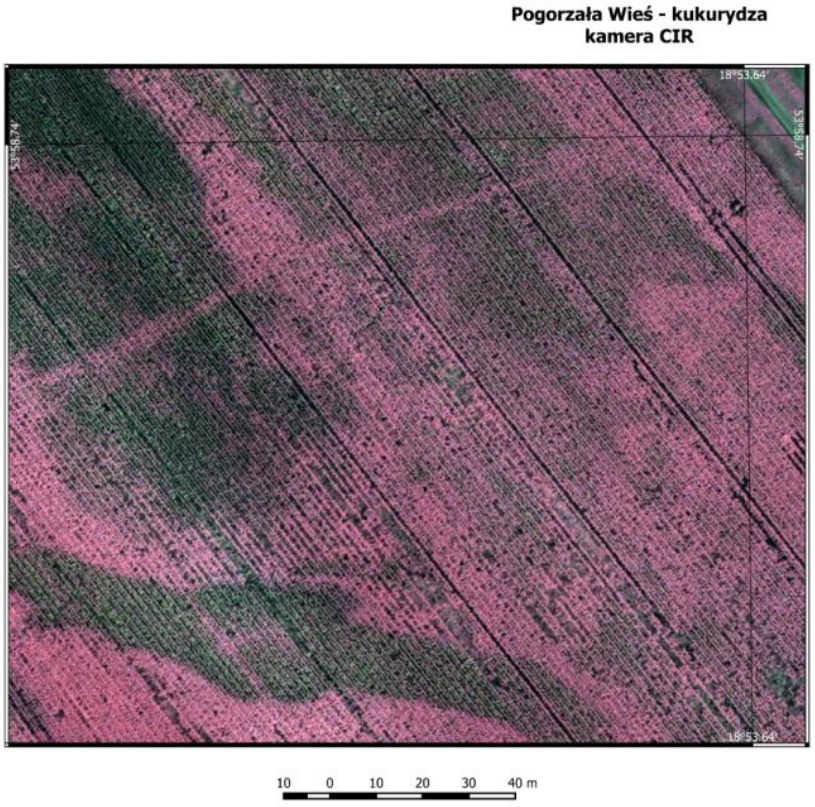


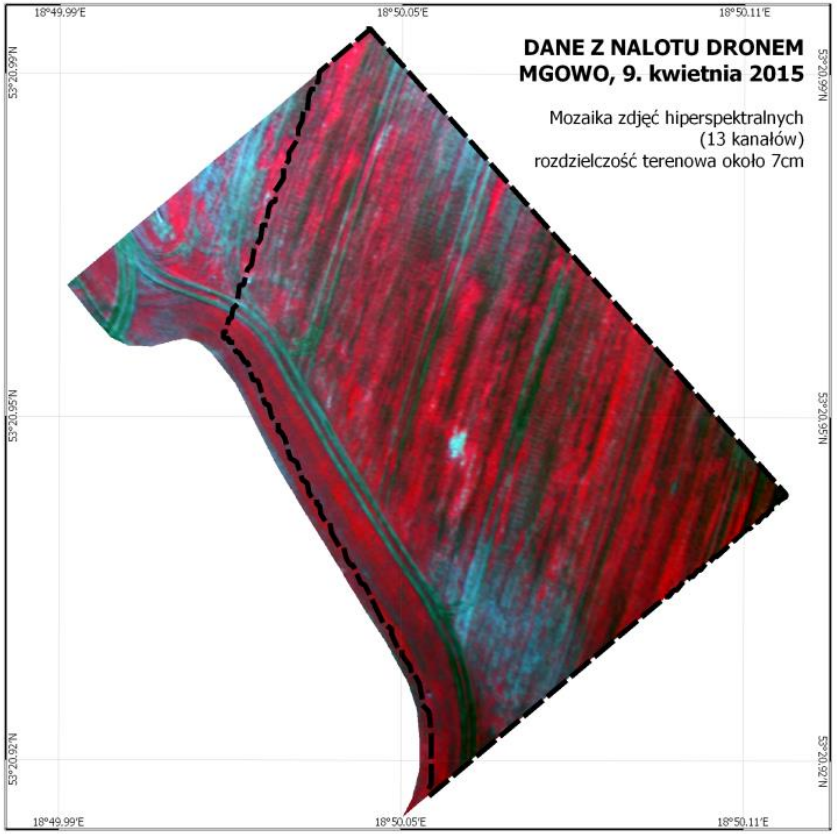
Akumulowana różnica temperatur (Ts – Ta) versus akumulowany wskaźnik NDVI

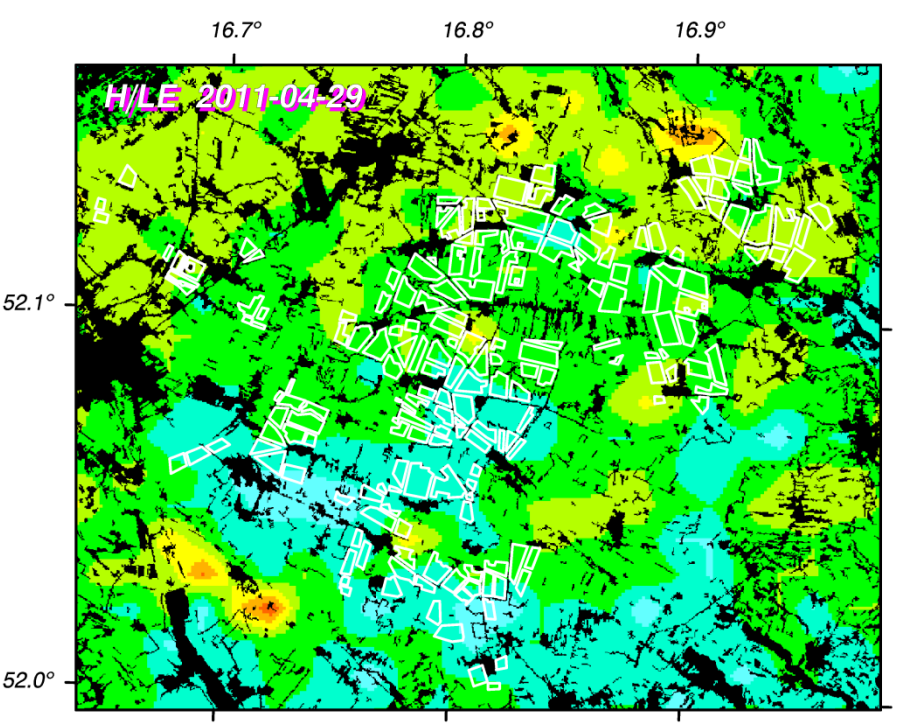


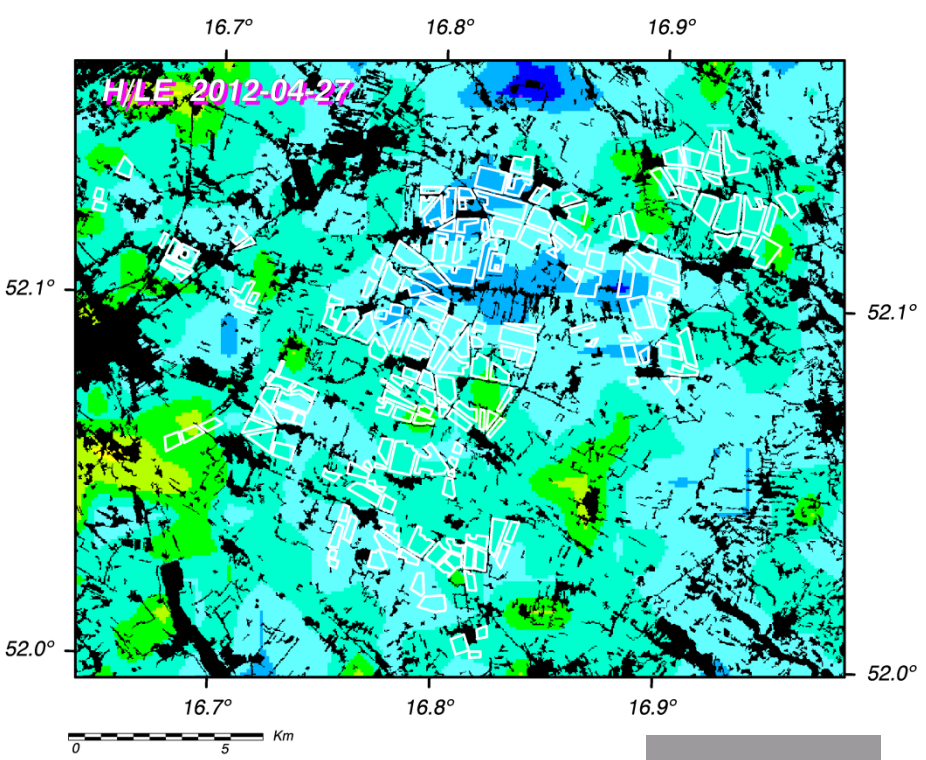
Pola upraw z pułapu dronu

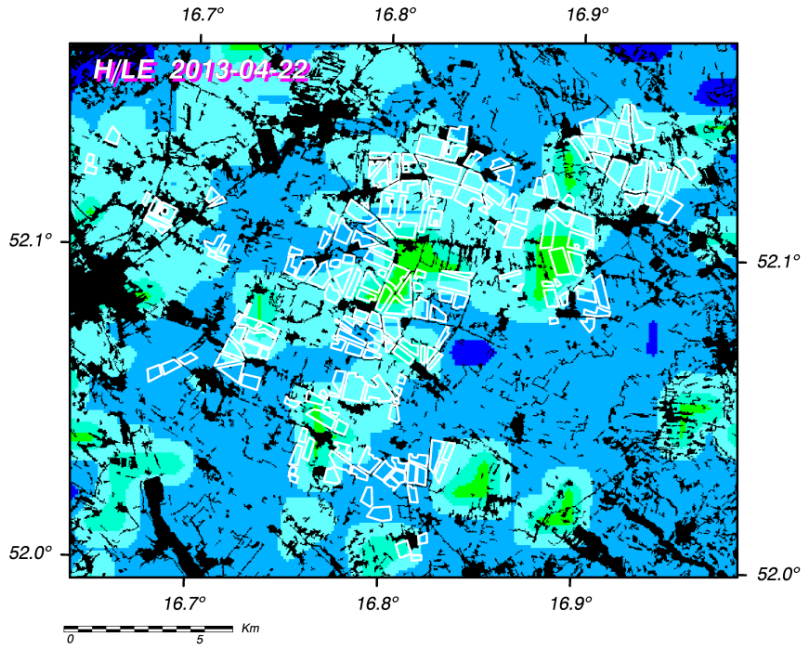
kukurydza 2015





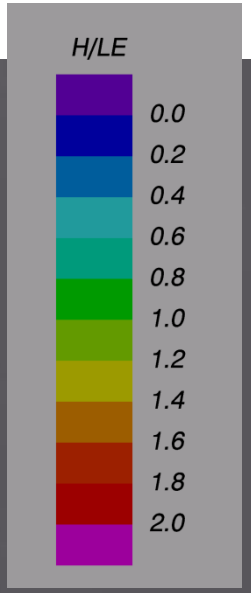




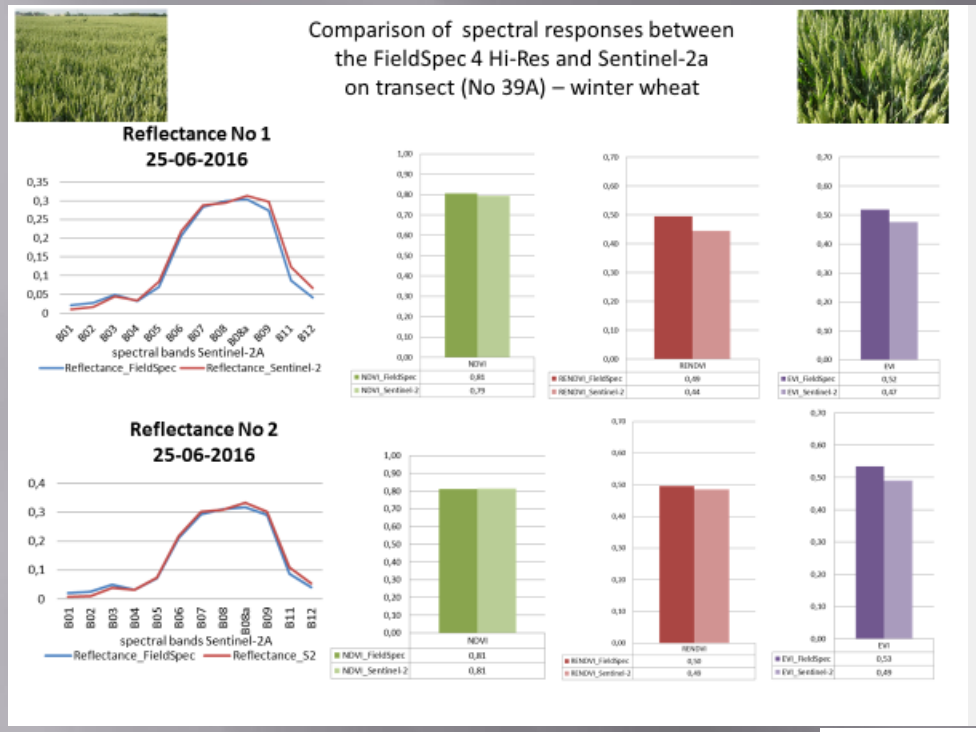


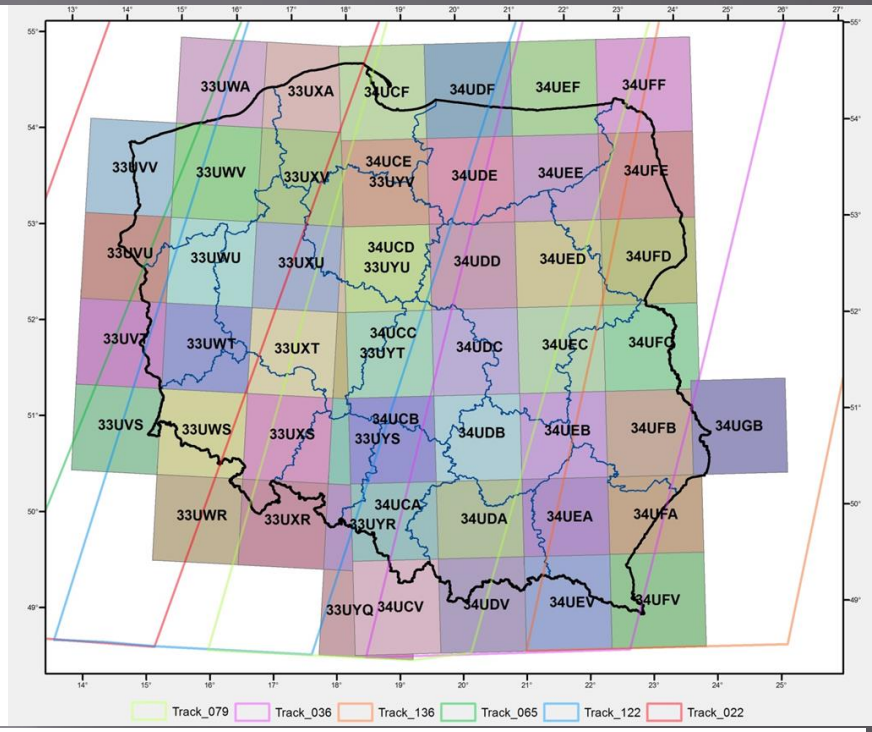
Wskaźnik wilgotności – zdjęcia satelitarne zakres optyczny

H/LE



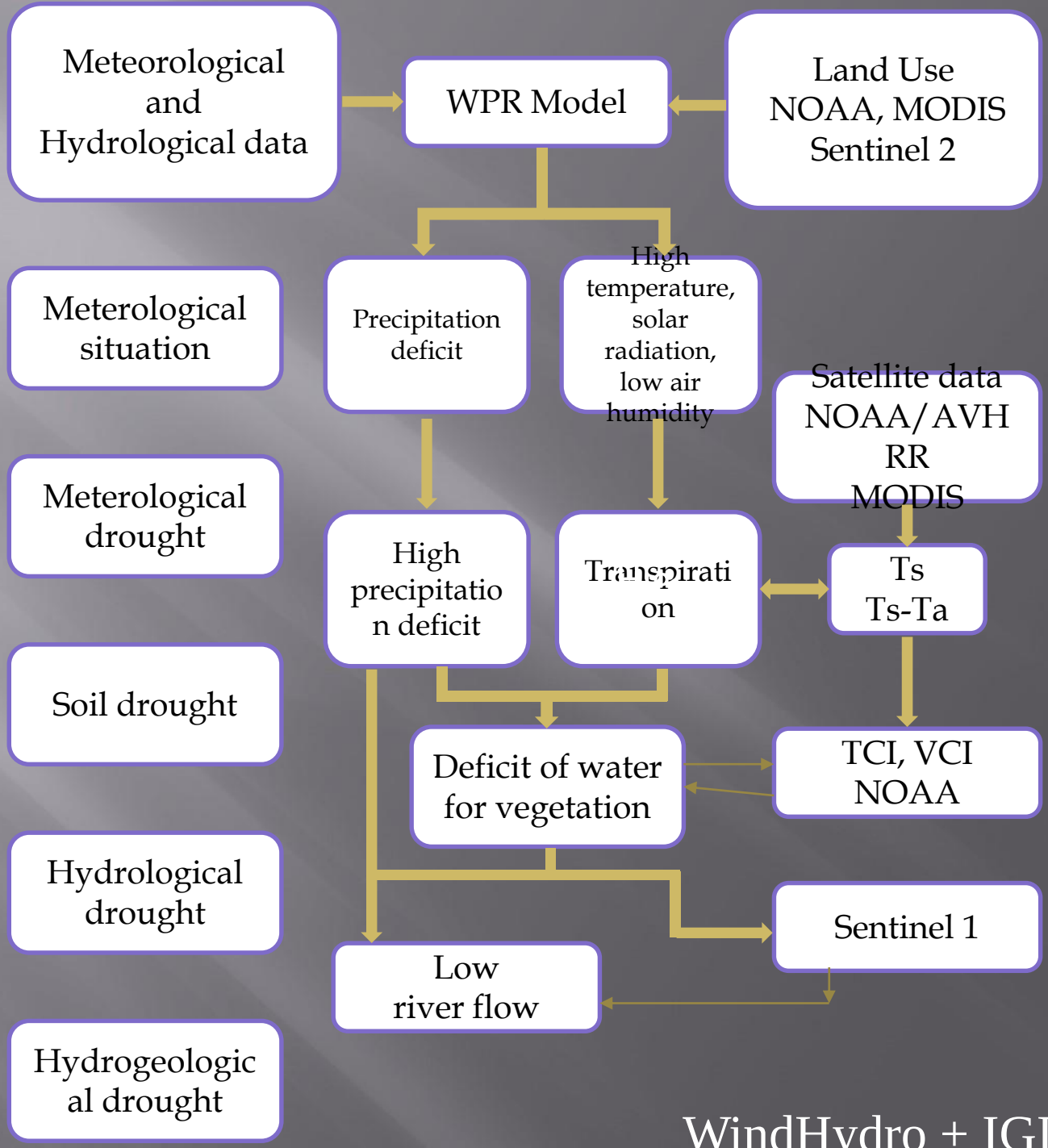
NOWE OBSERWACJE WARUNKOW WZROSTU ROŚLIN - SUSZA





Projekt ESA – Kalibracja danych Sentinel2
Analiza hiperspektralna

IGiK


Meteorological and Hydrological data
WPR Model
Land Use NOAA, MODIS Sentinel 2
Meterological situation
Precipitation deficit
High temperature, solar radiation, low air humidity
Satellite data NOAA/AVHRR MODIS
Meterological drought
High precipitation deficit
Transpiration
Ts Ts-Ta
Soil drought
Deficit of water for vegetation
TCI, VCI NOAA
Hydrological drought
Sentinel 1
Low river flow
Hydrogeological drought
WindHydro + IGIK

DZIĘKUJĘ ZA UWAGĘ