INSTITUTE OF TECHNOLOGY AND LIFE SCIENCES

Vulnerability of Polish agriculture to meteorological drought

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Global Water Partnership Project

„Drought Risk Management in Central and Eastern Europe”

Agricultural drought risk

(1) ***drought hazard H***

(2) ***exposure E***

(3) ***vulnerability to drought V***

$$R = H \cdot E \cdot V$$

The aim of the study:

to determine the effect of meteorological drought on crop yield reduction in different agro-climatic regions of Poland

(1) **H:** a climatic factor (hazard factor) defined as meteorological drought and quantified by the standardized precipitation index *SPI*

(2) **V:** a vulnerability factor defined as potential crop yield reduction due to meteorological drought

A linear crop-water production function is used to predict the reduction in crop yield *YR*

$$YR = \left(1 - \frac{Y_{re}}{Y_p}\right) = k_Y \left(1 - \frac{ET}{ET_p}\right) = k_Y CDI$$

(Doorenbos, Kassam 1979)

$$CDI = \left(1 - \frac{ET}{ET_p}\right)$$

CDI - Crop Drought Index (an agricultural drought index)

$$CDI = a + b \cdot SPI$$

40 meteorological stations in Poland

meteorological data from 1970-2004

Bąk (2006), Łabędzki i Bąk (2006), Łabędzki i in. (2008)

Prediction of reduction in crop yield was calculated for the values of *SPI*:

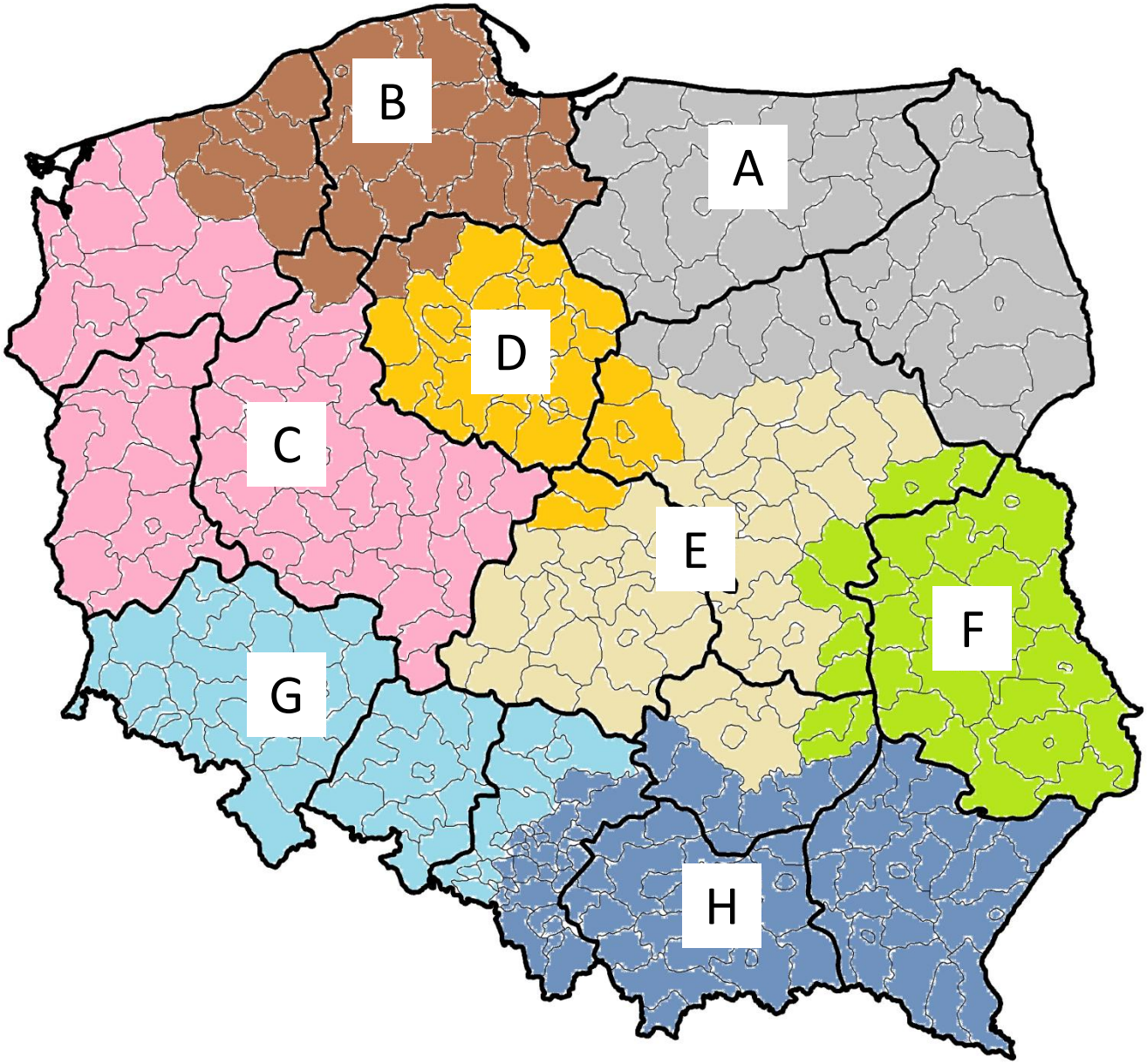
-1.0 ≥ *SPI* > -1.5	moderate meteorological drought
-1.5 ≥ *SPI* > -2.0	severe meteorological drought
SPI ≤ -2.0	extreme meteorological drought

- field crops
  - late potato, sugar beet, winter wheat, winter rape, maize
  - two mineral soils (light and heavy soil):

    TASW=120 mm and *TASW*=200 mm (0-100 cm)

- permanent grasslands (meadows)
  - two mineral-organic soils:

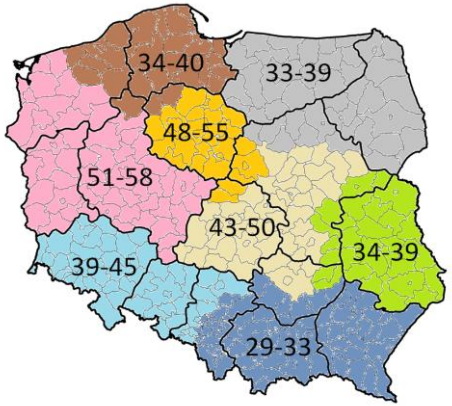
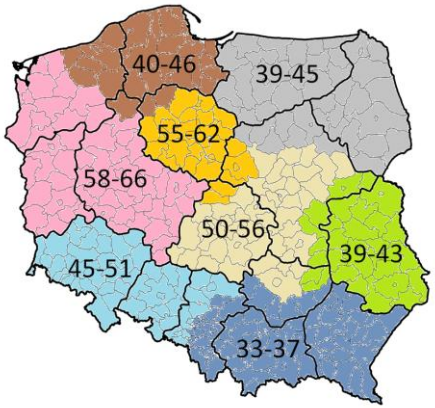
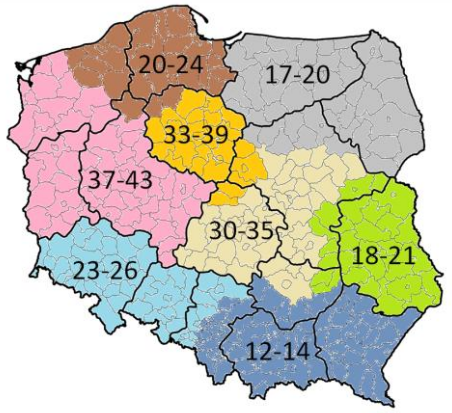
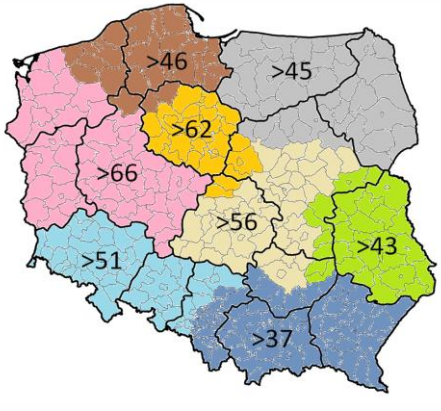
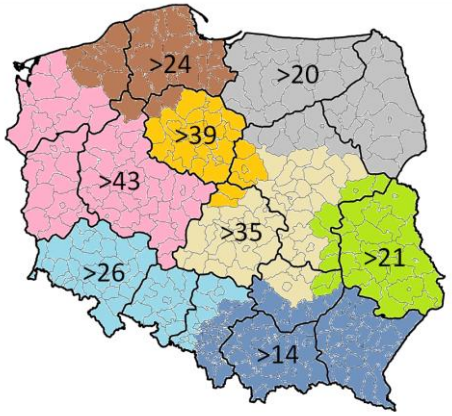
    TASW=50 mm and *TASW*=80 mm (0-30 cm)



8 regions on the basis of diversity of agro-climatic conditions

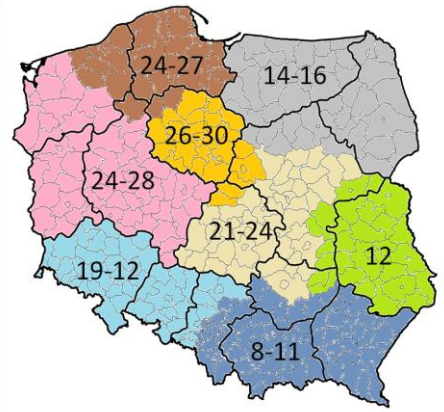
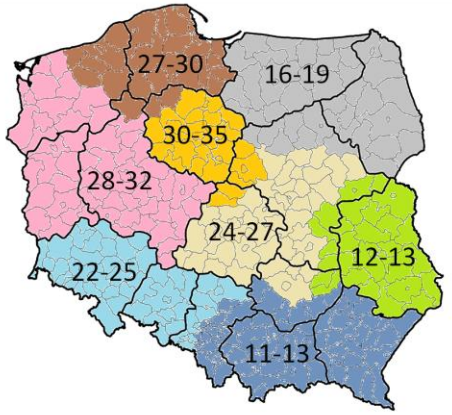
Yield reduction (%)

Late potato

Meteorological drought	TASW = 120 mm	TASW = 200 mm
Moderate -1.0≥ SPI>-1.5		
Severe -1.5≥ SPI>-2.0		
Extreme SPI≤-2.0		

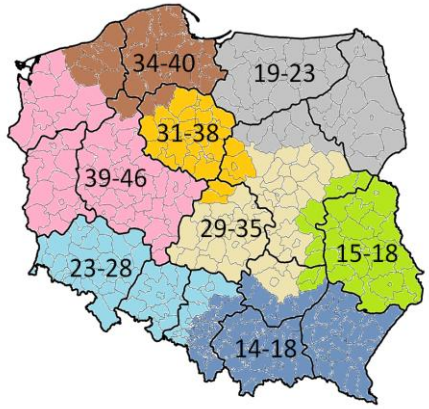
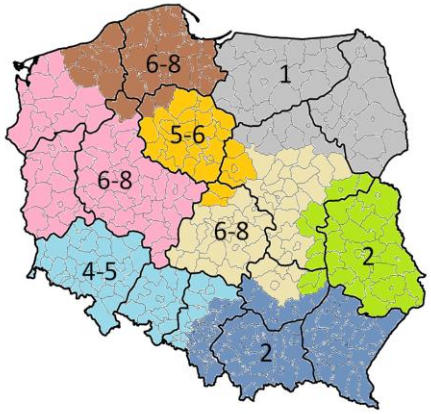
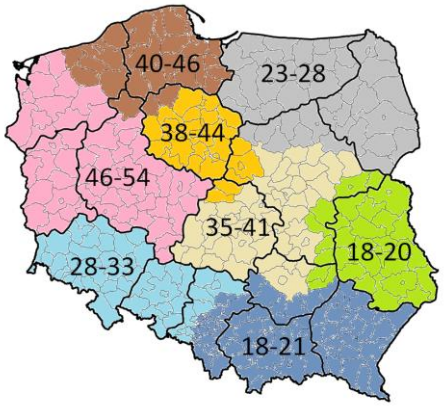
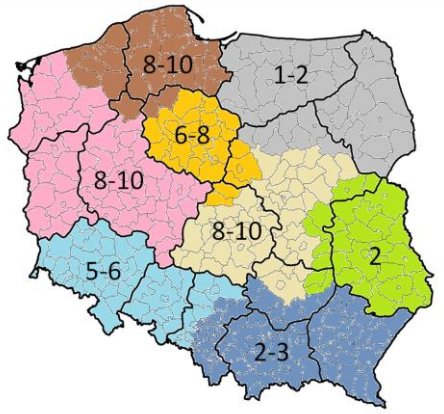
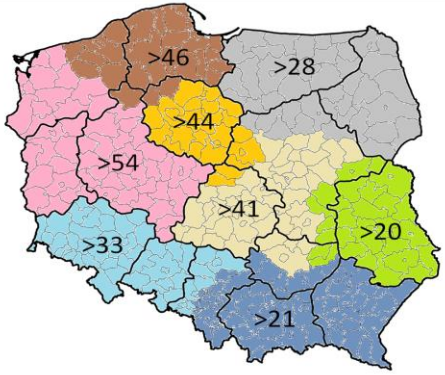
Yield reduction (%)

Winter wheat

Meteorological drought	TASW = 120 mm	TASW = 200 mm
Moderate -1.0≥ SPI>-1.5		
Severe -1.5≥ SPI>-2.0		
Extreme SPI≤-2.0		

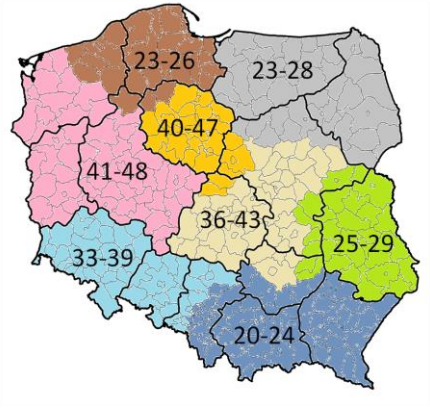
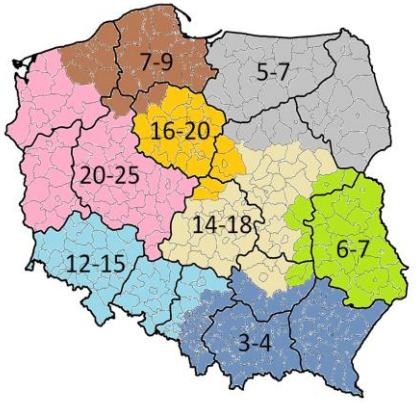
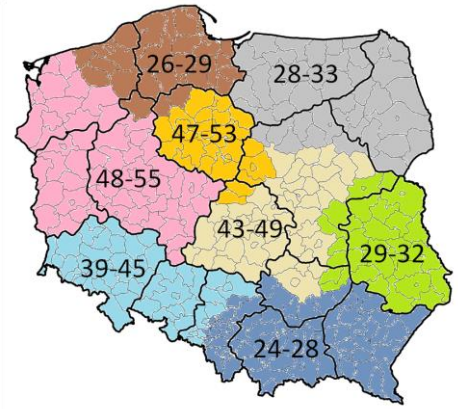
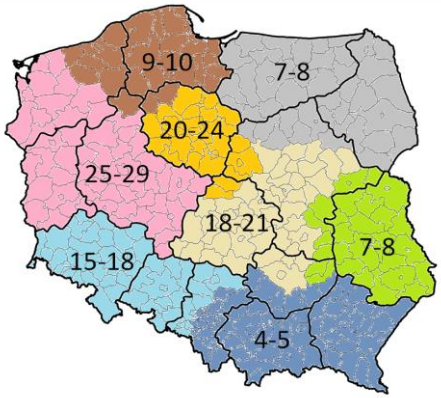
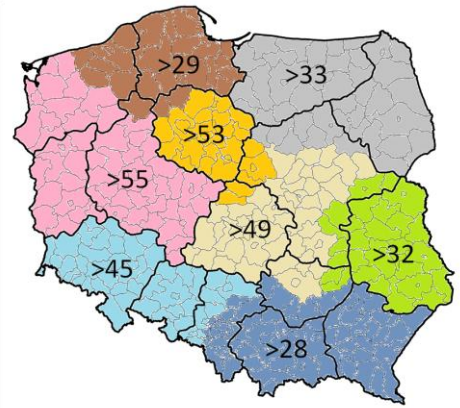
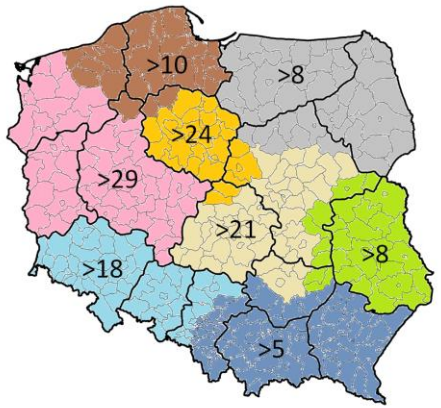
Yield reduction (%)

Maize

Meteorological drought	TASW = 120 mm	TASW = 200 mm
Moderate -1.0≥ SPI>-1.5		
Severe -1.5≥ SPI>-2.0		
Extreme SPI≤-2.0		

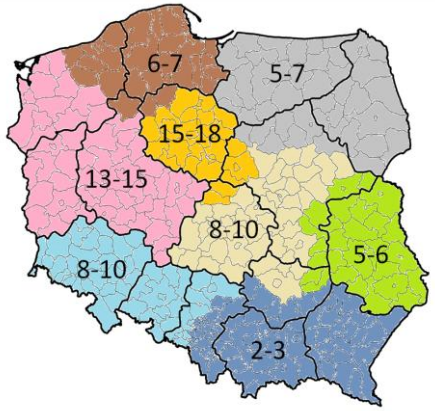
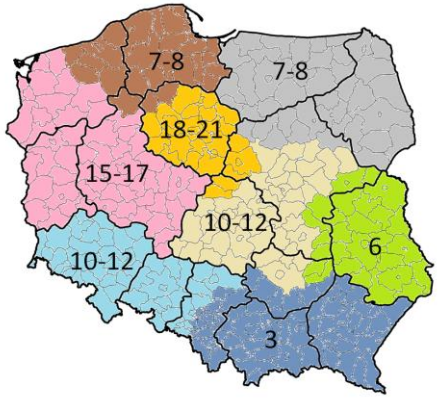
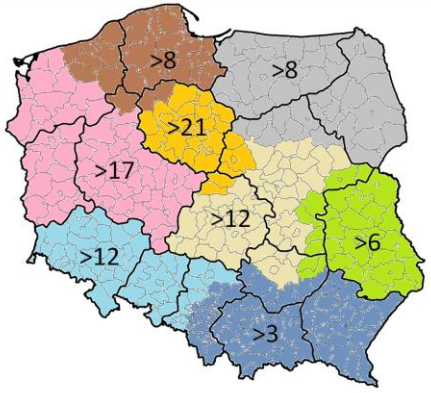
Yield reduction (%)

Sugar beet

Meteorological drought	TASW = 120 mm	TASW = 200 mm
Moderate -1.0≥ SPI>-1.5		
Severe -1.5≥ SPI>-2.0		
Extreme SPI≤-2.0		

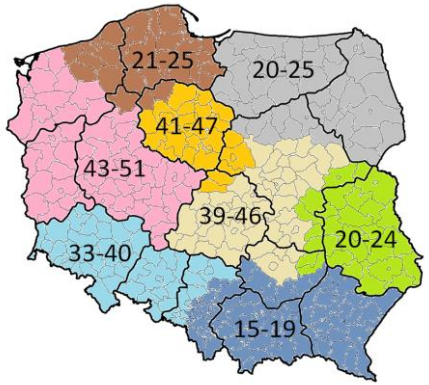
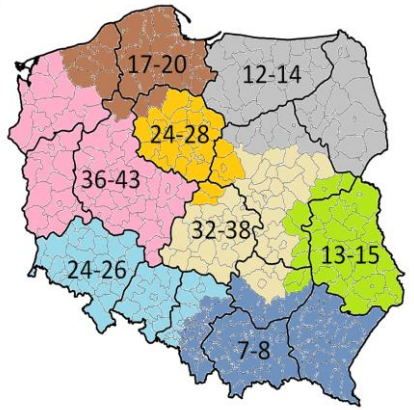
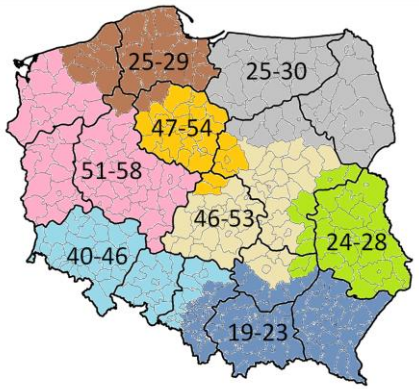
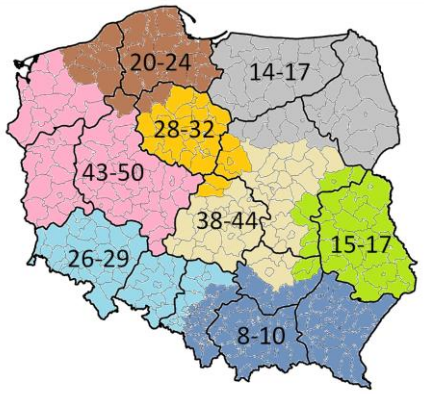
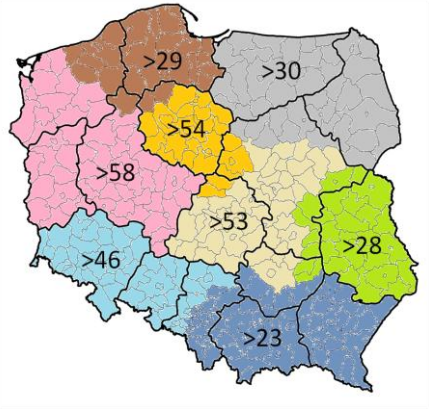
Yiels reduction (%)

Winter rape

Meteorological drought	TASW = 120 mm	TASW = 200 mm
Moderate -1.0≥ SPI>-1.5		
Severe -1.5≥ SPI>-2.0		
Extreme SPI≤-2.0		

Yield reduction (%)

Meadows

Meteorological drought	TASW = 50 mm	TASW = 80 mm
Moderate -1.0≥ SPI>-1.5		
Severe -1.5≥ SPI>-2.0		
Extreme SPI≤-2.0		

Programme

Standardization and monitoring of environmental projects, agricultural technology and infrastructure solutions for security and sustainable development of agriculture and rural areas

(Standaryzacja i monitoring przedsięwzięć środowiskowych, techniki rolniczej i rozwiązań infrastrukturalnych na rzecz bezpieczeństwa i zrównoważonego rozwoju rolnictwa i obszarów wiejskich)

Institute of Technology and Life Sciences

2011-2015

financed by Polish Ministry of Agriculture and Rural Development

Activity 1.2: Monitoring, Predicting of Progress and Risk of Water Deficit and Surplus in Rural Areas

http://agrometeo.itp.edu.pl

www.itp.edu.pl (tab: Monitoring Agrometeo)

ITP

Instytut Technologiczno - Przyrodniczy

Monitoring, prognoza przebiegu i skutków deficytu i nadmiaru wody na obszarach wiejskich

Projekt | Opis sytemu | Mapy i dane | Zespół realizacyjny | Kontakt

JESTEŚ TUTAJ › Strona główna

Znajdź w portalu

czego szukasz? SZUKAJ

- Opis projektu
- Zespół realizacyjny
- Opis systemu monitoringu
- Warunki opadowe
- Uwilgotnienie gleby
- Deficyt wody roślin uprawnych
- Potencjalna redukcja plonu
- Wody powierzchniowe płynące
- Pomiary
- Bibliografia

Polecane — wszystkie informacje »

Opis projektu

16-04-2013

Na mocy Uchwały Rady Ministrów Nr 202/2011 z dnia 14 października 2011 roku, Instytut Technologiczno-Przyrodniczy został wykonawcą Programu Wieloletniego na lata 2011-2015 pt. "Standaryzacja i monitoring przedsięwzięć środowiskowych ...

czytaj więcej »

Warunki opadowe

22-03-2013

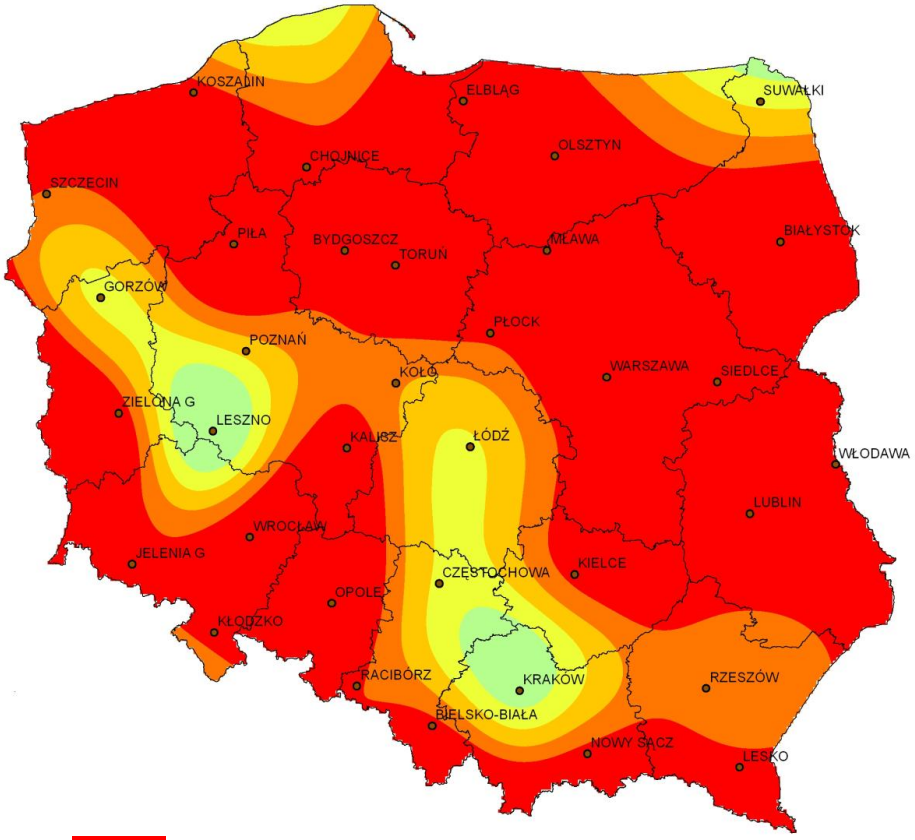
Warunki opadowe są oceniane przy użyciu wskaźnika standaryzowanego opadu SPI. Jest to wskaźnik deficytu i nadmiaru opadów, pokazujący standaryzowane odchylenie opadu w danym okresie od mediany opadu. Wskaźnik SPI obliczany jest z...

czytaj więcej »

Instytut Technologiczno - Przyrodniczy
Falenty - AL. Hrabska 3 - 05-090 Raszyn
tel.: +48 22 720 05 31 - fax: +48 735 75 06

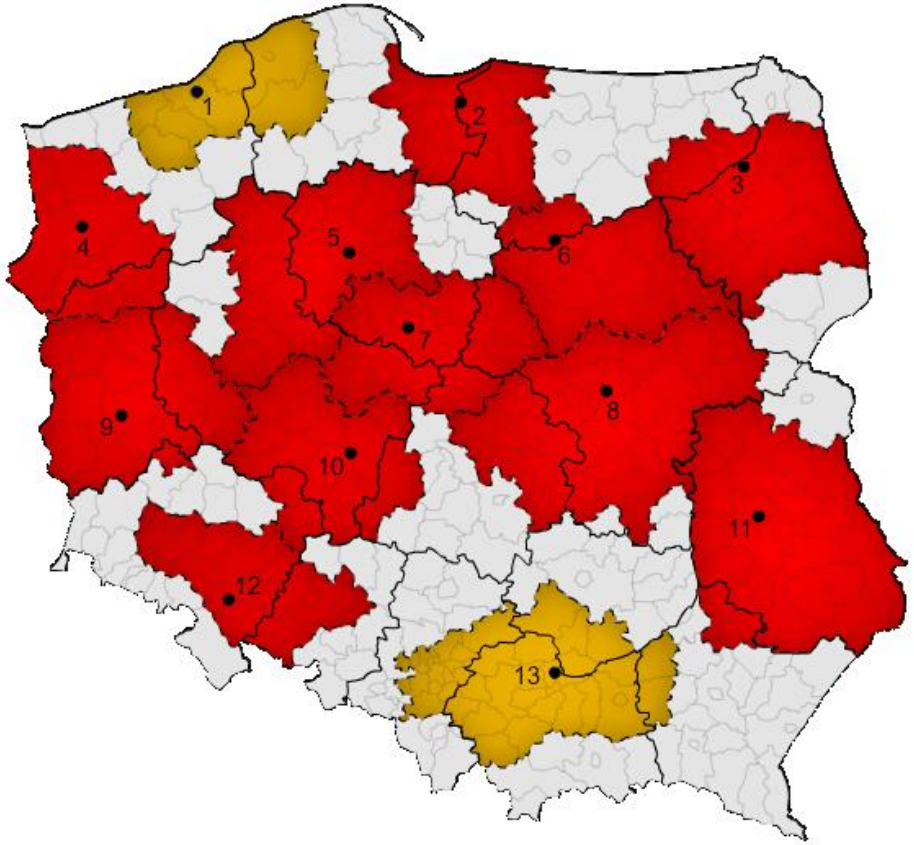
Projekt | Opis sytemu | Mapy i dane | Zespół realizacyjny | Kontakt

Meteorological drought in August 2015



- extreme drought
- severe drought
- moderate drought
- normal conditions – no drought
- meteorological station

Potential yield reduction on meadows on light soils – the state at the end of August 2015



- 0% - 9%
- 10% - 19%
- 20% - 49%
- 50% - 100%
- meteorological station

„The Agency for Restructuring and Modernisation of Agriculture received 166,500 applications from farmers who apply for aid for losses caused by drought in 2015 in the amount of 649.4 million zł”

(according to Polish Ministry of Agriculture and Rural Development)

INSTITUTE OF TECHNOLOGY AND LIFE SCIENCES

Thank you for your attention

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