POLJOPRIVREDNI FAKULTET UNIVERZITET U NOVOM SADU
PFNS
DEPARTMAN ZA RATARSTVO I POVRTARSTVO

UNIVERSITÀ DEGLI STUDI FIRENZE
DISPAA
DIPARTIMENTO DI SCIENZE DELLE PRODUZIONI AGROALIMENTARI E DELL'AMBIENTE

UNIVERSITÄT FÜR BODENKULTUR WIEN
BOKU
DEPARTMENT FÜR WASSER-ATMOSPHÄRE-UMWELT

EUROPEAN COMMISSION
Horizon 2020
EUROPEAN UNION FUNDING FOR RESEARCH & INNOVATION

Workshop 2018

Book presentation

Agricultural Meteorology and Climatology

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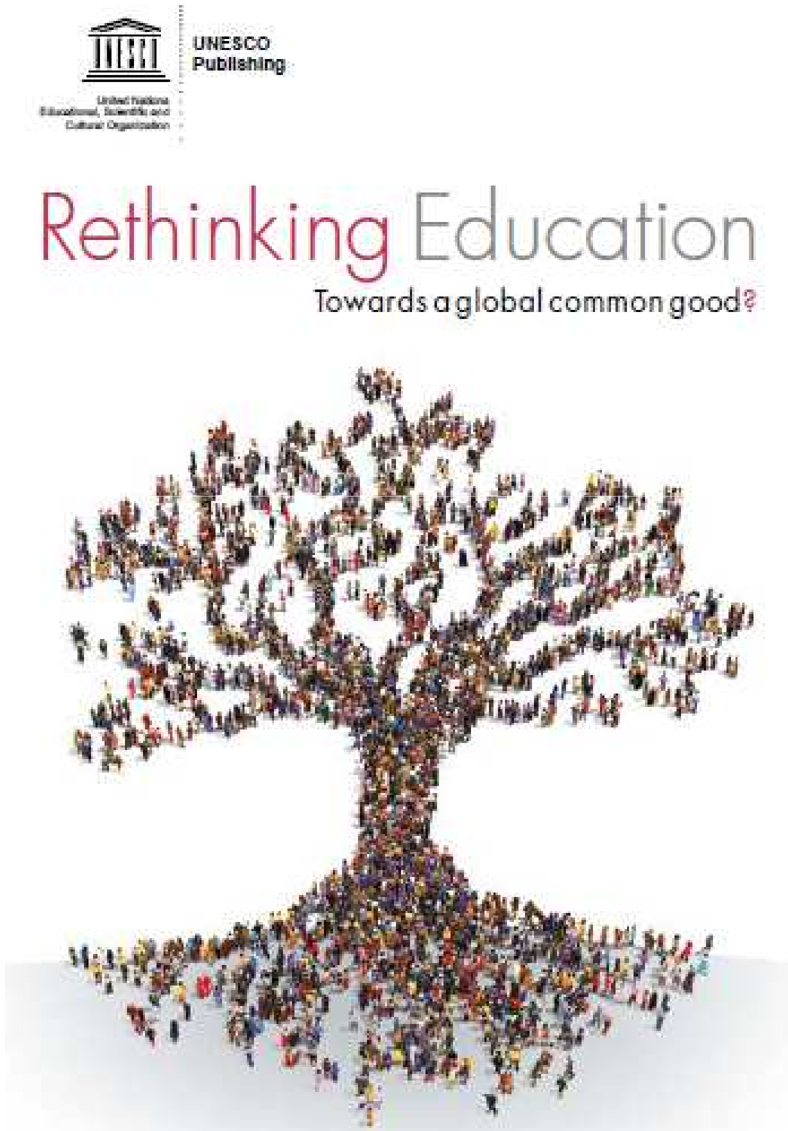
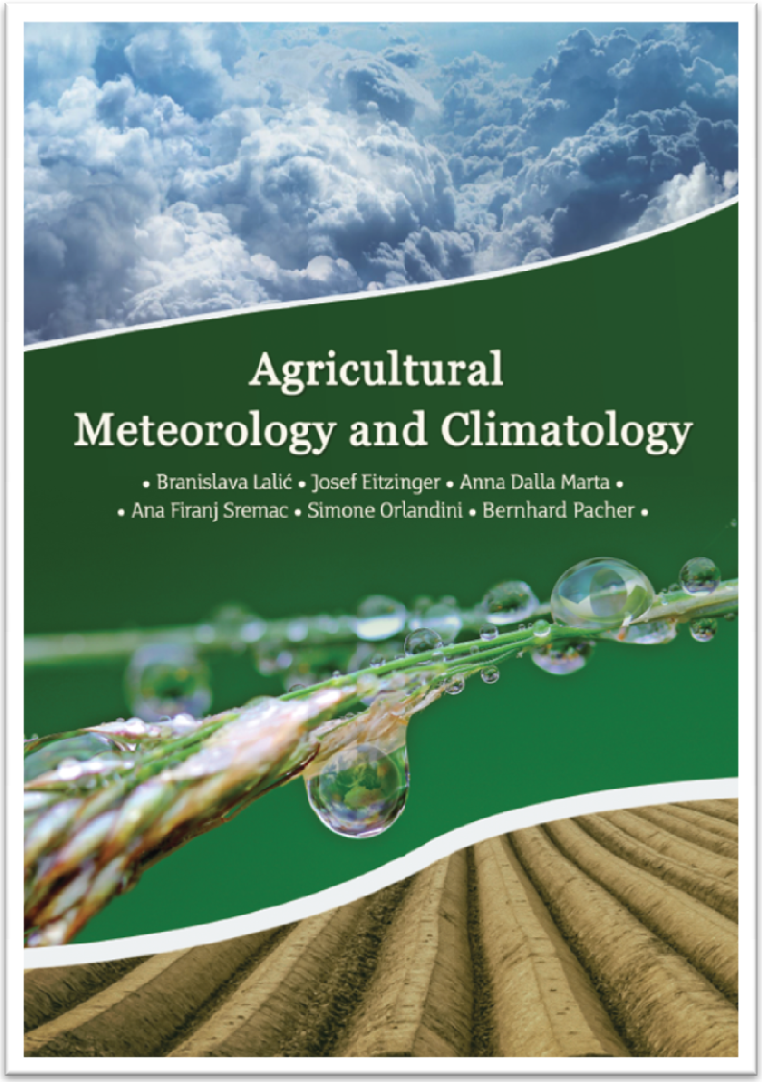
Internationalization of higher education is "the process of integrating an international, intercultural, or global dimension into the purpose, functions or delivery of postsecondary education“ (Knight, 2003)

Internationalization of higher education is "the process of commercializing research and postsecondary education, and international competition for the recruitment of foreign students from wealthy and privileged countries in order to generate revenue, secure national profile, and build international reputation“ (Khorsandi Taskoh, 2014)


UNESCO Publishing
United Nations Educational, Scientific and Cultural Organization
Rethinking Education
Towards a global common good?

"…strengthening strategic partnerships across the EU between higher education institutions and encouraging the emergence by 2024 of some twenty **'European Universities'**, consisting in bottom-up networks of universities across the EU which will enable students to obtain a degree by combining studies in several EU countries and contribute to the international competitiveness of European universities".

(2017 Gothenburg Summit, European Council)



Text book for courses of Meteorology and Climatology at agricultural faculties and courses of Agrometeorology and Agroclimatology at all other faculties with this subject in their curricula. Additionally, book is useful source of information for agronomist and all people interested in different aspects of weather and climate impact on agricultural production.

Serbia for Excell

European Commission

Book is translated on German, Italian and Serbian in order to be used at BOKU (Vienna), UNIFI (Florence) and Faculty of Agriculture (Novi Sad) for Meteorology and Agrometeorology courses.

Slika za vežbe i dodatni materijal

Respecting the fact that knowledge and practical experience increase exponentially, "Agricultural Meteorology and Climatology" design leaves open access to new information by extending its content out of book cover and including, on line available, numerical examples and additional reading material. The last two are in the form of easy-editing work sheets and text files which can be continuously improved.

Basics

Applications

Agrometeorological measurements

Numerical examples

Basics

- Origin and composition of the atmosphe
- Energy balance of the atmosphere
- Soil and air temperature
- Air humidity
- Clouds and precipitation
- Atmospheric circulations and winds
- Soil and water

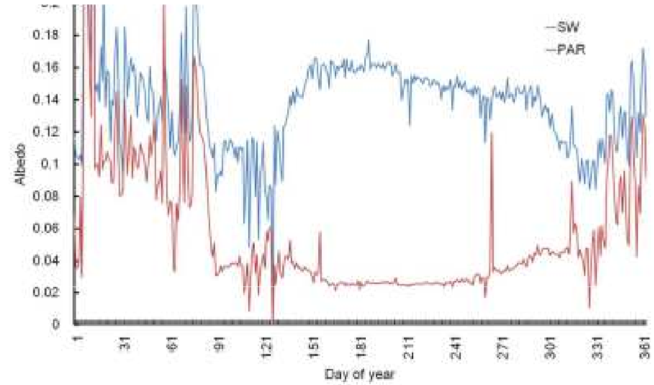


Figure 2.9 Mean midday (10 to 14h) values of global (SW) and PAR albedo measured during 2004 above forest at Prospect Hill Tract, Harvard Forest, Petersham (MA, USA) (Munger and Wofsy, 2017).

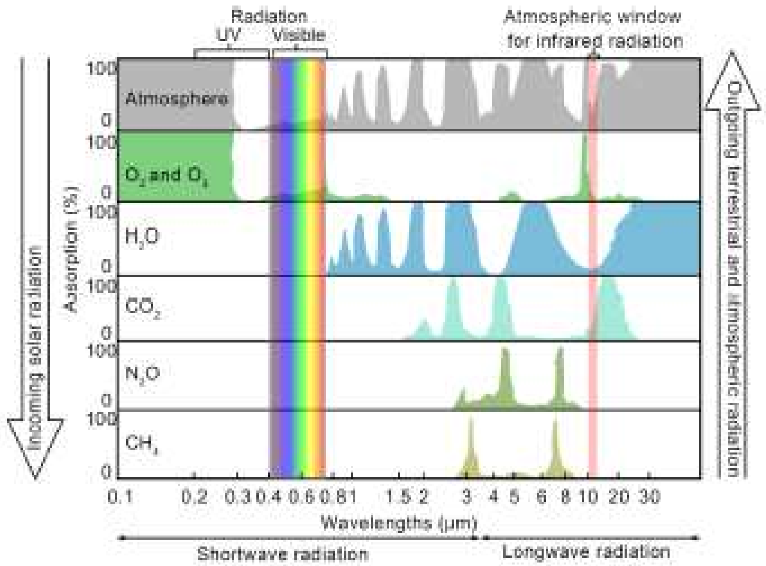


Figure 2.4 Absorption spectra for major natural "greenhouse gases" (GHGs) in the Earth's atmosphere of shortwave and longwave radiation.

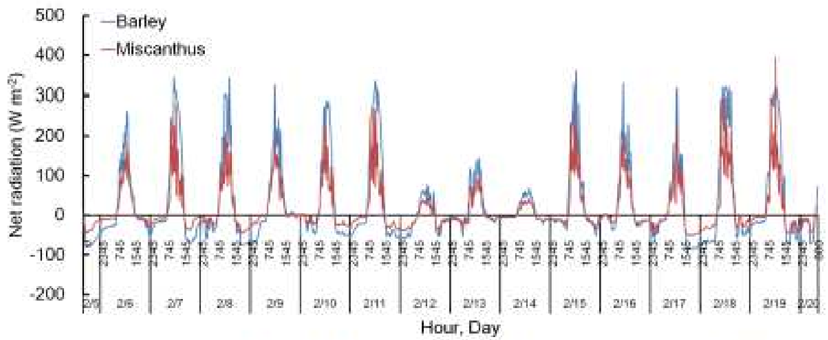


Figure 2.11 Daily variation of net radiation balance of miscanthus and winter barley during 5th to 20th February 1998 in Marchfield (Source: SE of the Weinviertel, Austria).

Applications

- Phenology
- Extreme events
- Risk management
- Agrometeorological models
- Climate, climate change and agriculture

8.6.1 Mapping climate suitability for crops by phenological models

Once phenological models have been established or calibrated for specific plants or crops, phenological mapping can be carried out by using weather data on various spatial scales. For example, crop suitability maps can be drawn based on the temperature sum method, such as for grapes using the HUGLIN index for spatial high resolution scales (Fig. 8.11) as well as for larger scales.

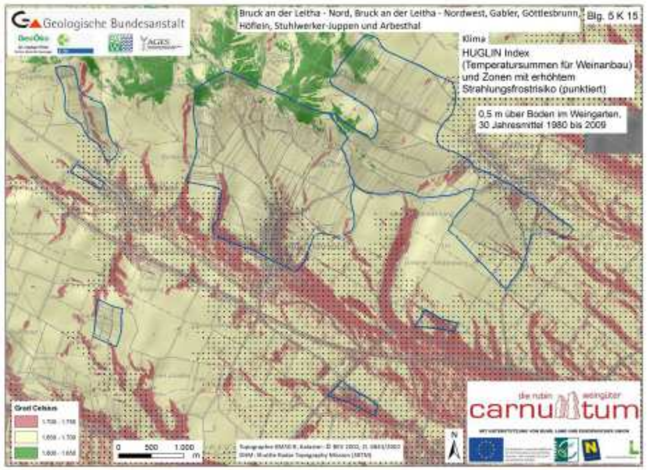


Figure 8.11 HUGLIN Index und frost risk areas (scattered area) for an Austrian grape growing region over the climatic period 1980-2009 (source: BOKU-Met; Interactive web map: http://www.arcgis.com/home/webmap/viewer.html?webmap=5fbb85508f7d49fdab74c8e255ef40).

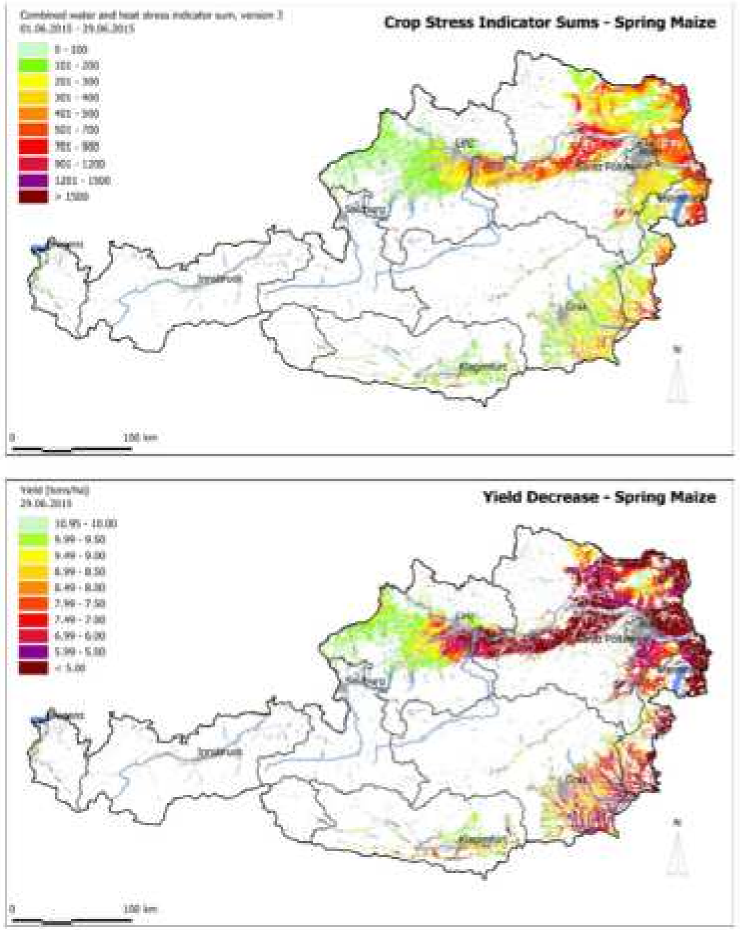


Figure 9.11 Accumulated drought and heat stress for maize (above) and related expected grain yield (below) for Austria in 2015 (https://warndienst.lko.at/mais+2500+++6577?typ=YIELDCLASS)

Applications

- Phenology
- Extreme events
- Risk management
- Agrometeorological models
- Climate, climate change and agriculture

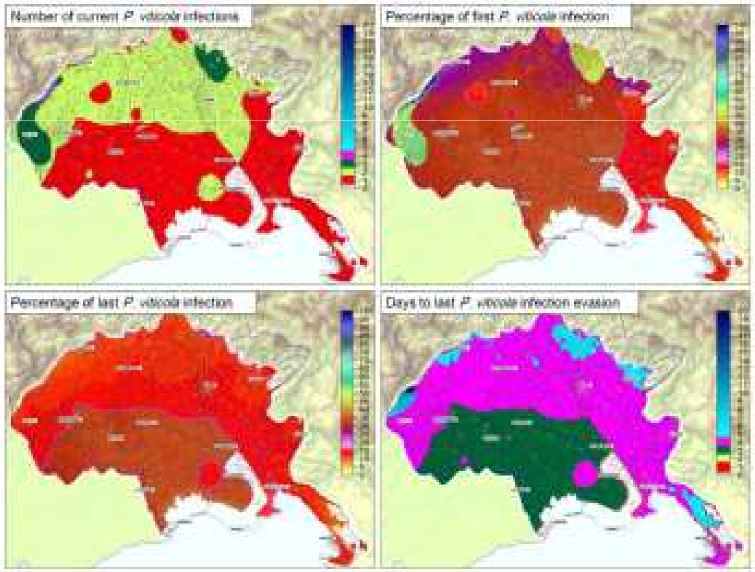
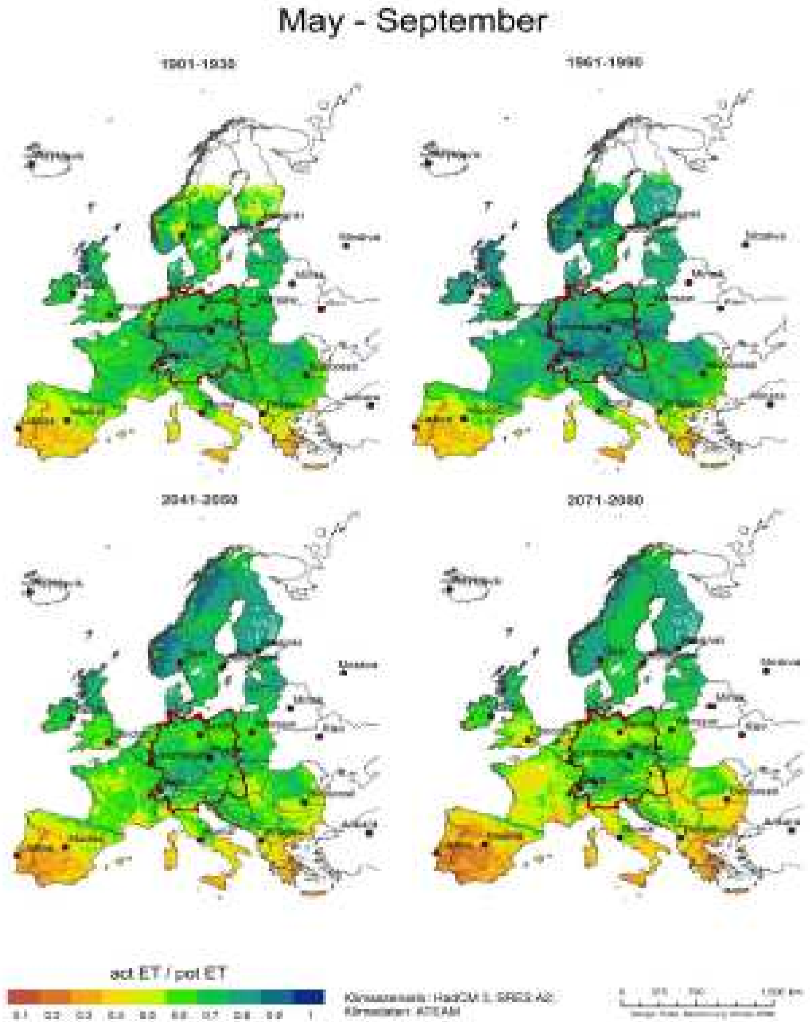


Figure 9.10 Warning system for *Plasmopara viticola* infections implemented by the meteorological service of Friuli Venezia Giulia (Italy) (http://www.meteo.fvg.it/agro.php)



gure 12.13 Relationship of actual to potential evapotranspiration of grass from -September as a drought indicator (1-wet; 0.1-very dry) over different past and future (scenario-based) climate periods across Europe (adapted from Eitzinger et al., 2009).

Agrometeorological measurements

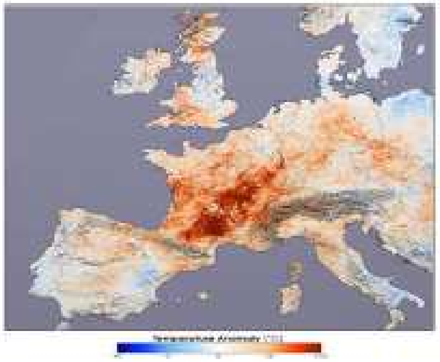


Figure 14.5 The 2003 heatwave on European scale (July 2003/July 2002). Surface temperature map based on MODIS data (by NASA Earth Observatory - VISIBLE EARTH); (source: Nejedlik and Orlandini, 2008).

An example of observing crop phenology or agricultural management is shown in Fig. 15.6, indicating areas of harvested crops and/or bare soils over south-eastern Europe using NDVI.

Figure 14.6 Atmospherically corrected NDVI map of Hungary. NOAA/AVHRR 10-day composite image of 1-10 September 1997 (source: Nejedlik and Orlandini, 2008).

Figure 13.2 Transect measurement station of vineyard climate (air and soil temperature, air humidity, potential evaporation) in hilly Austrian terrain (compare derived results of Fig. 12.4 and Fig .8.11 in the other chapters); (source: BOKU-Met).

Figure 13.3 Transect measurements on wind and evaporation leeward of a hedgerow in Austria; (source: BOKU-Met).

Numerical examples

Conversion from PPFD in µmol m^{-2} s^{-1} to W m^{-2} and in reverce for different wavelengths

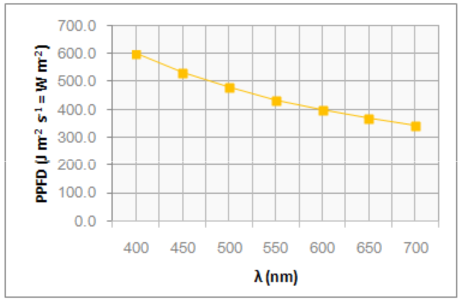
Transformation

nm	→	m
	1	1.00E-09
µmol	→	mol
	1	1.00E-06

Constants

	Symbol	Value	Unit
Planck constant	h	6.63E-34	J s
Speed of light	c	3.00E+08	m s^{-1}
Avogadro number	Na	6.02E+23	

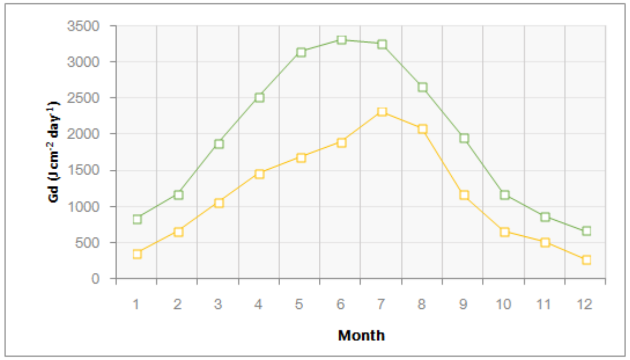
λ(m)	λ(nm)	E(λ)	PPFD (µmol m^{-2} s^{-1})	PPFD (mol m^{-2} s^{-1})	PPFD (quanta m-2 s-1)	PPFD (J m^{-2} s^{-1} = W m^{-2})
400	0.0000004	4.96919E-19	2000	0.002	1.20E+21	598.3
450	0.00000045	4.41705E-19	2000	0.002	1.204E+21	531.8
500	0.0000005	3.97535E-19	2000	0.002	1.204E+21	478.6
550	0.00000055	3.61395E-19	2000	0.002	1.204E+21	435.1
600	0.0000006	3.31279E-19	2000	0.002	1.204E+21	398.9
650	0.00000065	3.05796E-19	2000	0.002	1.204E+21	368.2
700	0.0000007	2.83953E-19	2000	0.002	1.204E+21	341.9



Ångstrom-Prescott method for global solar radiation estimation

Location
Pancevo: 44°52'14.99"N, 20°38'25.01"E

Row Labels	Values: Average of Gd (J cm-2 day-1)	Average of Max Gd (J cm-2 day-1)
1	352.8	837.5
2	661.0	1170.0
3	1053.6	1872.2
4	1461.3	2512.5
5	1678.0	3144.0
6	1893.8	3310.1
7	2317.1	3256.0
8	2083.1	2656.6
9	1165.1	1959.6
10	656.7	1177.4
11	511.7	861.8
12	269.3	666.0
Grand Total	1176.355469	1953.055191



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Serbia for Excell

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