

# SOIL MOISTURE AND TEMPERATURE MONITORING FOR SUSTAINABLE LAND AND WATER MANAGEMENT IN TRANSYLVANIAN PLAIN, IN ROMANIA

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The Transvivanian Plain. Romania is an important region for agronomic productivity. lowever, limited soils data and adoption of best management practices hinder land productivity. Soil temperatures of the Transvivanian Plain were evaluated using a set of monitored at the surface and at 10.30, and 50 cm deoths, and soil moisture was monitored across the plain were noted. These have important implications for planting

for temperature anomalies. The crop being considered for this study was com. The base to calculate GDDs: 1) minimum and maximum daily temperatures, and 21 24 h of averaged with little long term study and virtually no soil temperature data. The goals of this study are donnae daus (AGDDs) was reached at each site was then analyzed to identify differences comparisons to other results. Averaged values were used to create spline interpolation maps optimal planting dates for seed dermination of local crops. with ArcMap 9.2 (ESRI, Rediands, CA, USA). The southeastern portion of the TP was found to assel a month earlier assuming a planting date of 109 DOY. Four DeKalb® corn hybrids were then selected based on GDDs to tasseling, drydown, drought tolerance, and insect resistance. With a better understanding of the GDD trends across the TP, more effective planting and harvesting could be accomplished by Romanian farmers to maximize

Transylvanian Plain (TP), with an area of approx. 395,000 ha, has a predom pricultural character, and in the past, because of the large areas of agricultural land, with At sites with a tipping bucket rain gauge, the following data were recorded: soil fertile soil, produced large quantities of grain, for economic and social needs of the country. Cereal and steppe character (or anthropogenic steppe) of the area, led to widespread of the popular term "plain", as over 30 villages, located in mid-southem region, wears, along with fixation of the public lakes on quick slopes and irrational agrotehnics for the crops, large areas HOBOware Pro Software Version 2.3.0 (On-set Computer Corp., Bourne, MA, USA), Tab. 1 1954 hectares of the Transylvanian Plain area, are aside agricultural production and tens of housands of hectares are with productivity greatly reduced under the normal. Another feature of the TP is that, although it is lower than the surrounding region, no major river

Station	Station name	Latitude	Elevation,	Rain
number			m	gauge
1	Balda (MS)	46.717002	360	No
2	Triteni (CJ)	46.59116	342	No
2 3 4 5 6	Ludus (MS)	46.497812	293	Yes
4	Band (MS)	46.584881	318	No
5	Juen (CJ)	46.868676	325	Yes
6	Craiesti (MS)	46.758798	375	No
7	Sillivasu de	46.781705	463	Yes
s	Campie (BN) Dipsa (BN)	46.966299	356	Yes
9	Taga (CJ)	46.975769	316	No
10	Caianu (CJ)	46.790873	469	Yes
11	Cojocna (CJ)	46.748059	604	Yes
12	Unguras (CJ)	47.120853	318	Yes
13	Branistea (BN)	47.17046	291	Yes
14	Voiniceni (MS)	46.60518	377	Yes
15	Zau de Campie (MS)	46.61924	350	Yes
16	Sic (CJ)	46.92737	397	No
17	Nuseni (BN)	47,09947	324	No
18	Matei (BN)	46,984869	352	No
19	Zoreni (BN)	46,893457	487	No
20	Filpisu Mare (MS)	46,746178	410	No

MS = Mures county (1 = Out county BN = Bistrita-Nikkind county

character and layout of cities around the edoes (Rusu et al., 2009).

The last research upon the evolution of the climate inside the Carpathian basin, pointed out also shown by the fact that, six of the warmest years of the 20° century were registered in mesic temperature regime. However, differences in seasonal warming and cooling trends pling hills approximately 300 to 450 m above sea level in the south and 550 to 600 m above sea level in the north. Climate of the TP is highly dynamic, ranging from hot summers with high temperatures of >25°C to very cold winters with lows ~-5°C (Climate charts, 2007). The southern TP generally has a xeric moisture regime with steppe vegetation while

epresent approximate planting date to tasseling. The DOY that 694 accumulated growing measure soil temperatures and moisture monitoring across the TP, 2) develop interpolated coil termnerature renimes from collected data. 3) avaluate variables such as slone inclination

Twenty datalogging stations have been deployed across the TP on divergent soil types, an additional ten stations installed in March of 2009. HOBO Smart Temp (S-TMB-M002) Mirm Stations (H21-002) at each site (On-set Computer Com. Roume MA. USA) set Computer Corp., Bourne, MA, USA).

temperature at 10, 30, and 50 cm; soil moisture at 10 cm; surface air temperature; and precipitation. At sites without a tipping bucket rain gauge, the following data were recorded: soil temperature at 10 and 50 cm; soil moisture at 10 cm; and surface air temperature. Data is

For this study. GDDs was non-from approximately day of year (DDV) 110 to 100 to use corn cultivars available from DeKalb®. The Baskerville-Emin (BE) and averaging method

### RESULTS AND DISCUSSION

(December, January, and February). The Soil Survey Staff (2006) defines mesic soil 50 cm or at a densir. lithic or naralithic contact, whichever is shallower Year 1 data from more than 6°C variation between summer and winter. Thus, it appears as though mesic is

The TP has shown some on winn season variability from initial GDDs data. Tab. 2 shows reach 694 AGDDs by 199 DDY; the last day of data currently available. Site 3 had no air

(BE-M/M and AM-M/M), giving four different values; (1) BE-Full, (2) BE-M/M, (3) AM-Full, (4) AM-M/M. Baskerville-Emin was calculated using Eq. [1a] for 24 h data and Eq. [1b] for he minimum and maximum of each day. To calculate BE, Eqs. [1c1], [1c2], and [1c3] mus be evaluated and the values placed in Eqs. [1a] and [1b] (Baskerville and Emin. 1969). The

AMGDD=(MT-BT)/2 [2] Where AVG = the average temperature using the full days worth of temperature readings termorative and MT- maximum termorative. The lower threshold was set at 10°C and the upper threshold was set at 30°C. In case either the BT or MT was below or above.

13\_Rit Tomperature Smart Sensor while the other 10 (rain\_1) have a HORO\* Data Legelin temperature was recorded once every hour, while at the rain- stations, temperature was read the surface, which removes errors that could occur due to higher elevated air temperature not accurately describing the vegetative microclimates (Roltsch et al., 1999). The temperature data was processed in Microsoft Access 2007 to produce the minimum, maximum, and average temperature for 110-199 DOY. The temperature values were then

The accumulated growing degree days (AGDDs) of the four methods were analyzed the approximate day of tasseling based on a 694 AGDDs tassel date. The data was analyzed in SAS software (SAS Institute, 2008) using the LSD test to identify any differences between 9.2 (ESR). Redlands. CA. USA) to create spline internolation mans showing the GDD treno

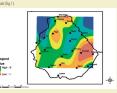
Site	Mean†	
1	189.25	
2	189.5	
4	184.5	
5	188.0	
6	180.5	
7	190.0	
8	190.75	
9	183.75	
10	189.75	
11	187.5	
12	188.5	
13	184.5	
14	190.75	
15	184.5	
17	185.75	
20	181	
†LSD =	1.966	

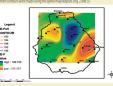


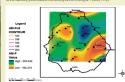


Data collection

9.2 (ESRL 2006) with the same data that was evaluated in SAS using LSD, and solit into 6 equal







DeKalb® Hybrid Brand	Site	D†‡	AGDDs- till Tasseling‡	RM ‡	DT †‡
DKC52- 45	6, 20, 4, 9, 13, 15	1	713	102	3
DKC52- 59		1	711	102	2
DKC48- 37	1, 2, 5, 7, 10, 11, 12, 17	2	679	98	3
DKC42- 72	8, 14, 16, 18, 19	2	672	92	2

#Obtained from 2010 Seed Resource Guide (Monsanto Co., 2009).

†Scale: 1-2=Excellent, 3-4=Very Good, 5-6=Good, 7-8=Fair, 9=Poor. D†# - Drydown†#; RM# - Relative Maturity#; DT†# - DroughtTolerance†#

productivity. Significant differences in air temperatures exist across the TP. These differences

The corn hybrids that were selected (Tah. 3) were hased on GDDs doudown, doubth tolerance, and insect resistance. Irrigation is practically nonexistent in the TP, making drought tolerance a key characteristic. Drydown is an important factor when evaluating corn hybrids in 6 FSBI 3006 ArrCK Darkton Balanca C 7 FSBI Barllands CA Haggard, R.J., D. Weindorf, H. Cacovean, T. Rizzu, J. Loflon, 2010, Analysis of Growing Degree
Days in the Brasylvanian Plain, Romania. Studio Liberentaris Babey-Bolysi, Geographia, Anal IV, cr.
272010, pag. 13-20, Chij-Napoca. ISSIs: 1221-007sc, ISSIs v. online: 2065–9571,
http://studia.ubchody.nobenilipeographia/index\_en.html http://www.asgrowanddekalb.com/web/pdf/products/2010\_seed\_resource\_guide\_north.pdf (verified 25 Sept. 2009). Monsanto Company, St. Louis, MO.

Com will be monitored at chosen stations to determine the most accurate GDD calculation 9. Puscell, B. 2005. Romania and Bulgaria: Crop travel confirms bumper winter and spring

However, adoption of contemporary hybrids and apronomic practices holds the potential for

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