

Příloha 1

Výstup počítačového modelu CROPWAT 8.0, modul „nároky plodiny na vodu“ – pšenice

MONTHLY ETO PENMAN-MONTEITH DATA

(File: C:\Documents and Settings\All Users\Data aplikací\CROPWAT\data\climate\klima 2009.PEM)

Country: Czech republic Station: Czech Hydromete. Ins
 Altitude: 430 m. Latitude: 49.45 °N Longitude: 15.30 °E

Month	Min Temp °C	Max Temp °C	Humidity %	Wind m/s	Sun hours	Rad MJ/m2/day	ETo mm/day
January	-6.3	-2.1	84	4.8	1.6	3.3	0.45
February	-6.5	1.3	86	4.7	2.6	5.6	0.58
March	-3.3	5.5	79	5.0	4.0	9.6	1.14
April	7.2	14.7	64	4.7	5.6	14.5	2.93
May	7.4	15.8	66	4.4	6.9	18.4	3.40
June	9.5	17.3	71	4.4	7.3	19.9	3.52
July	13.4	20.6	68	4.3	7.3	19.4	4.07
August	13.2	21.6	66	4.0	6.8	16.7	3.93
September	10.3	17.4	78	4.2	5.4	12.1	2.42
October	2.1	9.4	86	4.2	3.9	7.4	1.04
November	1.7	7.8	87	4.8	1.8	3.7	0.74
December	-5.2	0.5	89	4.9	1.5	2.7	0.41
Average	3.6	10.8	77	4.5	4.6	11.1	2.05

MONTHLY RAIN DATA

(File: C:\Documents and Settings\All Users\Data aplikací\CROPWAT\data\rain\srážky 2009.CRM)

Station: Czech republic

Eff. rain method: USDA Soil Conservation Service formula:

$$\begin{aligned} \text{Peff} &= \text{Pmon} * (125 - 0.2 * \text{Pmon}) / 125 && \text{for Pmon} \leq 250 \text{ mm} \\ \text{Peff} &= 125 + 0.1 * \text{Pmon} && \text{for Pmon} > 250 \text{ mm} \end{aligned}$$

	Rain mm	Eff rain mm
January	25.0	24.0
February	61.0	55.0
March	76.0	66.8
April	23.0	22.2
May	86.0	74.2
June	113.0	92.6
July	111.0	91.3
August	57.0	51.8
September	22.0	21.2
October	68.0	60.6
November	43.0	40.0
December	58.0	52.6
Total	743.0	652.3

DRY CROP DATA

(File: C:\Documents and Settings\All Users\Data aplikací\CROPWAT\data\crops\FAO\WHEAT.CRO)

Crop Name: Spring Wheat Planting date: 03/04 Harvest: 10/08

Stage	initial	develop	mid	late	total
Length (days)	30	30	40	30	130
Kc Values	0.30	-->	1.15	0.30	
Rooting depth (m)	0.30	-->	1.20	1.20	
Critical depletion	0.55	-->	0.55	0.80	
Yield response f.	0.40	0.60	0.80	0.40	1.15
Cropheight (m)			1.00		

SOIL DATA
(File: untitled)

Soil name:

General soil data:

Total available soil moisture (FC - WP)	mm/meter
Maximum rain infiltration rate	mm/day
Maximum rooting depth	centimeters
Initial soil moisture depletion (as % TA)	%
Initial available soil moisture	mm/meter

CROP WATER REQUIREMENTS

ETo station: Czech Hydromete. Ins Crop: Spring Wheat
Rain station: Czech republic Planting date: 03/04

Month	Decade	Stage	Kc coeff	ETc mm/day	ETc mm/dec	Eff rain mm/dec	Irr. Req. mm/dec
Apr	1	Init	0.30	0.72	5.8	7.4	0.0
Apr	2	Init	0.30	0.91	9.1	2.8	6.3
Apr	3	Init	0.30	0.95	9.5	10.1	0.0
May	1	Deve	0.40	1.31	13.1	20.0	0.0
May	2	Deve	0.69	2.36	23.6	26.3	0.0
May	3	Deve	1.00	3.43	37.8	27.8	10.0
Jun	1	Mid	1.17	4.08	40.8	29.4	11.4
Jun	2	Mid	1.17	4.13	41.3	31.8	9.5
Jun	3	Mid	1.17	4.34	43.4	31.3	12.1
Jul	1	Mid	1.17	4.56	45.6	31.8	13.8
Jul	2	Late	1.04	4.24	42.4	32.2	10.2
Jul	3	Late	0.74	2.96	32.6	27.2	5.3
Aug	1	Late	0.43	1.74	17.4	21.4	0.0
					362.2	299.6	78.5

Příloha 2

Výstup počítačového modelu CROPWAT 8.0, modul „nároky plodiny na vodu“ – kukuřice

MONTHLY ETO PENMAN-MONTEITH DATA

(File: C:\Documents and Settings\All Users\Data aplikací\CROPWAT\data\climate\klima 2009.PEM)

Country: Czech republic Station: Czech Hydromete. Ins
 Altitude: 430 m. Latitude: 49.45 °N Longitude: 15.30 °E

Month	Min Temp °C	Max Temp °C	Humidity %	Wind m/s	Sun hours	Rad MJ/m2/day	ETo mm/day
January	-6.3	-2.1	84	4.8	1.6	3.3	0.45
February	-6.5	1.3	86	4.7	2.6	5.6	0.58
March	-3.3	5.5	79	5.0	4.0	9.6	1.14
April	7.2	14.7	64	4.7	5.6	14.5	2.93
May	7.4	15.8	66	4.4	6.9	18.4	3.40
June	9.5	17.3	71	4.4	7.3	19.9	3.52
July	13.4	20.6	68	4.3	7.3	19.4	4.07
August	13.2	21.6	66	4.0	6.8	16.7	3.93
September	10.3	17.4	78	4.2	5.4	12.1	2.42
October	2.1	9.4	86	4.2	3.9	7.4	1.04
November	1.7	7.8	87	4.8	1.8	3.7	0.74
December	-5.2	0.5	89	4.9	1.5	2.7	0.41
Average	3.6	10.8	77	4.5	4.6	11.1	2.05

MONTHLY RAIN DATA

(File: C:\Documents and Settings\All Users\Data aplikací\CROPWAT\data\rain\srážky 2009.CRM)

Station: Czech republic

Eff. rain method: USDA Soil Conservation Service formula:

$$\begin{aligned} \text{Peff} &= \text{Pmon} * (125 - 0.2 * \text{Pmon}) / 125 && \text{for Pmon} \leq 250 \text{ mm} \\ \text{Peff} &= 125 + 0.1 * \text{Pmon} && \text{for Pmon} > 250 \text{ mm} \end{aligned}$$

	Rain mm	Eff rain mm
January	25.0	24.0
February	61.0	55.0
March	76.0	66.8
April	23.0	22.2
May	86.0	74.2
June	113.0	92.6
July	111.0	91.3
August	57.0	51.8
September	22.0	21.2
October	68.0	60.6
November	43.0	40.0
December	58.0	52.6
Total	743.0	652.3

DRY CROP DATA

(File: C:\Documents and Settings\All Users\Data aplikací\CROPWAT\data\crops\FAO\MAIZE.CRO)

Crop Name: MAIZE (Grain) Planting date: 26/04 Harvest: 28/08

Stage	initial	develop	mid	late	total
Length (days)	20	35	40	30	125
Kc Values	0.30	-->	1.20	0.35	
Rooting depth (m)	0.30	-->	1.00	1.00	
Critical depletion	0.55	-->	0.55	0.80	
Yield response f.	0.40	0.40	1.30	0.50	1.25
Cropheight (m)			2.00		

SOIL DATA
(File: untitled)

Soil name:

General soil data:

Total available soil moisture (FC - WP)	mm/meter
Maximum rain infiltration rate	mm/day
Maximum rooting depth	centimeters
Initial soil moisture depletion (as % TA)	%
Initial available soil moisture	mm/meter

CROP WATER REQUIREMENTS

ETo station: Czech Hydromete. Ins Crop: MAIZE (Grain)
Rain station: Czech republic Planting date: 26/04

Month	Decade	Stage	Kc coeff	ETc mm/day	ETc mm/dec	Eff rain mm/dec	Irr. Req. mm/dec
Apr	3	Init	0.30	0.95	4.7	5.1	0.0
May	1	Init	0.30	0.97	9.7	20.0	0.0
May	2	Deve	0.34	1.15	11.5	26.3	0.0
May	3	Deve	0.59	2.03	22.3	27.8	0.0
Jun	1	Deve	0.87	3.01	30.1	29.4	0.7
Jun	2	Mid	1.13	3.96	39.6	31.8	7.9
Jun	3	Mid	1.22	4.52	45.2	31.3	13.9
Jul	1	Mid	1.22	4.74	47.4	31.8	15.7
Jul	2	Mid	1.22	4.97	49.7	32.2	17.5
Jul	3	Late	1.21	4.88	53.7	27.2	26.4
Aug	1	Late	1.00	4.06	40.6	21.4	19.2
Aug	2	Late	0.71	2.87	28.7	16.9	11.9
Aug	3	Late	0.45	1.58	12.6	9.9	0.0
					396.0	311.0	113.1

Příloha 3

Výstup počítačového modelu CROPWAT 8.0, modul „nároky plodiny na vodu“ – cukrová řepa

MONTHLY ETO PENMAN-MONTEITH DATA

(File: C:\Documents and Settings\All Users\Data aplikací\CROPWAT\data\climate\klima 2009.PEM)

Country: Czech republic Station: Czech Hydromete. Ins
 Altitude: 430 m. Latitude: 49.45 °N Longitude: 15.30 °E

Month	Min Temp °C	Max Temp °C	Humidity %	Wind m/s	Sun hours	Rad MJ/m2/day	ETo mm/day
January	-6.3	-2.1	84	4.8	1.6	3.3	0.45
February	-6.5	1.3	86	4.7	2.6	5.6	0.58
March	-3.3	5.5	79	5.0	4.0	9.6	1.14
April	7.2	14.7	64	4.7	5.6	14.5	2.93
May	7.4	15.8	66	4.4	6.9	18.4	3.40
June	9.5	17.3	71	4.4	7.3	19.9	3.52
July	13.4	20.6	68	4.3	7.3	19.4	4.07
August	13.2	21.6	66	4.0	6.8	16.7	3.93
September	10.3	17.4	78	4.2	5.4	12.1	2.42
October	2.1	9.4	86	4.2	3.9	7.4	1.04
November	1.7	7.8	87	4.8	1.8	3.7	0.74
December	-5.2	0.5	89	4.9	1.5	2.7	0.41
Average	3.6	10.8	77	4.5	4.6	11.1	2.05

MONTHLY RAIN DATA

(File: C:\Documents and Settings\All Users\Data aplikací\CROPWAT\data\rain\srážky 2009.CRM)

Station: Czech republic

Eff. rain method: USDA Soil Conservation Service formula:

$$\begin{aligned} \text{Peff} &= \text{Pmon} * (125 - 0.2 * \text{Pmon}) / 125 && \text{for Pmon} \leq 250 \text{ mm} \\ \text{Peff} &= 125 + 0.1 * \text{Pmon} && \text{for Pmon} > 250 \text{ mm} \end{aligned}$$

	Rain mm	Eff rain mm
January	25.0	24.0
February	61.0	55.0
March	76.0	66.8
April	23.0	22.2
May	86.0	74.2
June	113.0	92.6
July	111.0	91.3
August	57.0	51.8
September	22.0	21.2
October	68.0	60.6
November	43.0	40.0
December	58.0	52.6
Total	743.0	652.3

DRY CROP DATA

(File: C:\Documents and Settings\All Users\Data aplikací\CROPWAT\data\crops\FAO\SUGARBET.CRO)

Crop Name: Sugarbeet Planting date: 03/04 Harvest: 09/09

Stage	initial	develop	mid	late	total
Length (days)	25	35	50	50	160
Kc Values	0.35	-->	1.20	0.70	
Rooting depth (m)	0.30	-->	1.00	1.00	
Critical depletion	0.50	-->	0.60	0.60	
Yield response f.	0.50	0.80	1.20	1.00	1.10
Cropheight (m)			0.70		

SOIL DATA

(File: untitled)

Soil name:

General soil data:

Total available soil moisture (FC - WP)	mm/meter
Maximum rain infiltration rate	mm/day
Maximum rooting depth	centimeters
Initial soil moisture depletion (as % TA)	%
Initial available soil moisture	mm/meter

CROP WATER REQUIREMENTS

ETo station: Czech Hydromete. Ins Crop: Sugarbeet
Rain station: Czech republic Planting date: 03/04

Month	Decade	Stage	Kc coeff	ETc mm/day	ETc mm/dec	Eff rain mm/dec	Irr. Req. mm/dec
Apr	1	Init	0.35	0.84	6.7	7.4	0.0
Apr	2	Init	0.35	1.06	10.6	2.8	7.8
Apr	3	Deve	0.36	1.15	11.5	10.1	1.4
May	1	Deve	0.56	1.82	18.2	20.0	0.0
May	2	Deve	0.81	2.75	27.5	26.3	1.2
May	3	Deve	1.07	3.68	40.5	27.8	12.7
Jun	1	Mid	1.22	4.24	42.4	29.4	13.0
Jun	2	Mid	1.22	4.29	42.9	31.8	11.1
Jun	3	Mid	1.22	4.51	45.1	31.3	13.8
Jul	1	Mid	1.22	4.74	47.4	31.8	15.6
Jul	2	Mid	1.22	4.96	49.6	32.2	17.4
Jul	3	Late	1.17	4.70	51.7	27.2	24.5
Aug	1	Late	1.06	4.30	43.0	21.4	21.6
Aug	2	Late	0.96	3.88	38.8	16.9	21.9
Aug	3	Late	0.86	2.99	32.9	13.6	19.3
Sep	1	Late	0.75	2.20	19.8	7.4	11.6
					528.6	337.5	192.8

Příloha 4

Výstup počítačového modelu CROPWAT 8.0, modul „nároky plodiny na vodu“ – rajčata

MONTHLY ETO PENMAN-MONTEITH DATA

(File: C:\Documents and Settings\All Users\Data aplikací\CROPWAT\data\climate\klima 2009.PEM)

Country: Czech republic Station: Czech Hydromete. Ins
 Altitude: 430 m. Latitude: 49.45 °N Longitude: 15.30 °E

Month	Min Temp °C	Max Temp °C	Humidity %	Wind m/s	Sun hours	Rad MJ/m2/day	ETo mm/day
January	-6.3	-2.1	84	4.8	1.6	3.3	0.45
February	-6.5	1.3	86	4.7	2.6	5.6	0.58
March	-3.3	5.5	79	5.0	4.0	9.6	1.14
April	7.2	14.7	64	4.7	5.6	14.5	2.93
May	7.4	15.8	66	4.4	6.9	18.4	3.40
June	9.5	17.3	71	4.4	7.3	19.9	3.52
July	13.4	20.6	68	4.3	7.3	19.4	4.07
August	13.2	21.6	66	4.0	6.8	16.7	3.93
September	10.3	17.4	78	4.2	5.4	12.1	2.42
October	2.1	9.4	86	4.2	3.9	7.4	1.04
November	1.7	7.8	87	4.8	1.8	3.7	0.74
December	-5.2	0.5	89	4.9	1.5	2.7	0.41
Average	3.6	10.8	77	4.5	4.6	11.1	2.05

MONTHLY RAIN DATA

(File: C:\Documents and Settings\All Users\Data aplikací\CROPWAT\data\rain\srážky 2009.CRM)

Station: Czech republic

Eff. rain method: USDA Soil Conservation Service formula:

Pe_{eff} = P_{mon} * (125 - 0.2 * P_{mon}) / 125 for P_{mon} ≤ 250 mm

Pe_{eff} = 125 + 0.1 * P_{mon} for P_{mon} > 250 mm

	Rain mm	Eff rain mm
January	25.0	24.0
February	61.0	55.0
March	76.0	66.8
April	23.0	22.2
May	86.0	74.2
June	113.0	92.6
July	111.0	91.3
August	57.0	51.8
September	22.0	21.2
October	68.0	60.6
November	43.0	40.0
December	58.0	52.6
Total	743.0	652.3

DRY CROP DATA

(File: C:\Documents and Settings\All Users\Data aplikací\CROPWAT\data\crops\FAO\TOMATO.CRO)

Crop Name: Tomato	Planting date: 01/05	Harvest: 22/09			
Stage	initial	develop	mid	late	total
Length (days)	30	40	45	30	145
Kc Values	0.60	-->	1.15	0.80	
Rooting depth (m)	0.25	-->	1.00	1.00	
Critical depletion	0.30	-->	0.40	0.50	
Yield response f.	0.50	0.60	1.10	0.80	1.05
Cropheight (m)			0.60		

SOIL DATA
(File: untitled)

Soil name:

General soil data:

Total available soil moisture (FC - WP)	mm/meter
Maximum rain infiltration rate	mm/day
Maximum rooting depth	centimeters
Initial soil moisture depletion (as % TA)	%
Initial available soil moisture	mm/meter

CROP WATER REQUIREMENTS

ETo station: Czech Hydromete. Ins Crop: Tomato
Rain station: Czech republic Planting date: 01/05

Month	Decade	Stage	Kc coeff	ETc mm/day	ETc mm/dec	Eff rain mm/dec	Irr. Req. mm/dec
May	1	Init	0.60	1.95	19.5	20.0	0.0
May	2	Init	0.60	2.04	20.4	26.3	0.0
May	3	Deve	0.60	2.07	22.8	27.8	0.0
Jun	1	Deve	0.69	2.41	24.1	29.4	0.0
Jun	2	Deve	0.83	2.93	29.3	31.8	0.0
Jun	3	Deve	0.97	3.60	36.0	31.3	4.7
Jul	1	Mid	1.11	4.33	43.3	31.8	11.5
Jul	2	Mid	1.16	4.74	47.4	32.2	15.1
Jul	3	Mid	1.16	4.68	51.5	27.2	24.3
Aug	1	Mid	1.16	4.71	47.1	21.4	25.7
Aug	2	Mid	1.16	4.69	46.9	16.9	30.1
Aug	3	Late	1.12	3.93	43.2	13.6	29.6
Sep	1	Late	1.00	2.94	29.4	8.3	21.1
Sep	2	Late	0.89	2.15	21.5	3.8	17.7
Sep	3	Late	0.82	1.60	3.2	1.9	3.2
					485.4	323.5	183.0

Příloha 5

Výstup počítačového modelu CROPWAT 8.0, modul „zavlažovací plán“ – pšenice

MONTHLY ETO PENMAN-MONTEITH DATA

(File: C:\Documents and Settings\All Users\Data aplikací\CROPWAT\data\climate\klima 2009.PEM)

Country: Czech republic Station: Czech Hydromete. Ins
 Altitude: 430 m. Latitude: 49.45 °N Longitude: 15.30 °E

Month	Min Temp °C	Max Temp °C	Humidity %	Wind m/s	Sun hours	Rad MJ/m2/day	ETo mm/day
January	-6.3	-2.1	84	4.8	1.6	3.3	0.45
February	-6.5	1.3	86	4.7	2.6	5.6	0.58
March	-3.3	5.5	79	5.0	4.0	9.6	1.14
April	7.2	14.7	64	4.7	5.6	14.5	2.93
May	7.4	15.8	66	4.4	6.9	18.4	3.40
June	9.5	17.3	71	4.4	7.3	19.9	3.52
July	13.4	20.6	68	4.3	7.3	19.4	4.07
August	13.2	21.6	66	4.0	6.8	16.7	3.93
September	10.3	17.4	78	4.2	5.4	12.1	2.42
October	2.1	9.4	86	4.2	3.9	7.4	1.04
November	1.7	7.8	87	4.8	1.8	3.7	0.74
December	-5.2	0.5	89	4.9	1.5	2.7	0.41
Average	3.6	10.8	77	4.5	4.6	11.1	2.05

MONTHLY RAIN DATA

(File: C:\Documents and Settings\All Users\Data aplikací\CROPWAT\data\rain\srážky 2009.CRM)

Station: Czech republic

Eff. rain method: USDA Soil Conservation Service formula:

$$\begin{aligned} \text{Peff} &= \text{Pmon} * (125 - 0.2 * \text{Pmon}) / 125 && \text{for Pmon} \leq 250 \text{ mm} \\ \text{Peff} &= 125 + 0.1 * \text{Pmon} && \text{for Pmon} > 250 \text{ mm} \end{aligned}$$

	Rain mm	Eff rain mm
January	25.0	24.0
February	61.0	55.0
March	76.0	66.8
April	23.0	22.2
May	86.0	74.2
June	113.0	92.6
July	111.0	91.3
August	57.0	51.8
September	22.0	21.2
October	68.0	60.6
November	43.0	40.0
December	58.0	52.6
Total	743.0	652.3

DRY CROP DATA

(File: C:\Documents and Settings\All Users\Data aplikací\CROPWAT\data\crops\FAO\WHEAT.CRO)

Crop Name: Spring Wheat Planting date: 25/03 Harvest: 01/08

Stage	initial	develop	mid	late	total
Length (days)	30	30	40	30	130
Kc Values	0.30	-->	1.15	0.30	
Rooting depth (m)	0.30	-->	1.20	1.20	
Critical depletion	0.55	-->	0.55	0.80	
Yield response f.	0.40	0.60	0.80	0.40	1.15
Cropheight (m)			1.00		

SOIL DATA

(File: C:\Documents and Settings\All Users\Data aplikací\CROPWAT\data\soils\FAO\MEDIUM.SOI)

Soil name: Medium (loam)

General soil data:

Total available soil moisture (FC - WP)	290.0	mm/meter
Maximum rain infiltration rate	40	mm/day
Maximum rooting depth	900	centimeters
Initial soil moisture depletion (as % TA)	0	%
Initial available soil moisture	290.0	mm/meter

CROPPING PATTERN DATA

(File: untitled)

Cropping pattern name:

No.	Crop file	Crop name	Planting date	Harvest date	Area %
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CROP WATER REQUIREMENTS

ETo station: Czech Hydromete. Ins
 Rain station: Czech republic

Crop: Spring Wheat
 Planting date: 25/03

Month	Decade	Stage	Kc coeff	ETc mm/day	ETc mm/dec	Eff rain mm/dec	Irr. Req. mm/dec
Mar	3	Init	0.30	0.50	3.5	12.1	0.0
Apr	1	Init	0.30	0.72	7.2	9.3	0.0
Apr	2	Init	0.30	0.91	9.1	2.8	6.3
Apr	3	Deve	0.38	1.20	12.0	10.1	1.9
May	1	Deve	0.67	2.16	21.6	20.0	1.6
May	2	Deve	0.96	3.26	32.6	26.3	6.3
May	3	Mid	1.17	4.02	44.2	27.8	16.4
Jun	1	Mid	1.18	4.10	41.0	29.4	11.5
Jun	2	Mid	1.18	4.14	41.4	31.8	9.7
Jun	3	Mid	1.18	4.36	43.6	31.3	12.3
Jul	1	Late	1.07	4.16	41.6	31.8	9.9
Jul	2	Late	0.78	3.18	31.8	32.2	0.0
Jul	3	Late	0.48	1.91	21.0	27.2	0.0
Aug	1	Late	0.30	1.21	1.2	2.1	1.2
					351.9	294.3	77.1

CROP IRRIGATION SCHEDULE

ETo station: Czech Hydromete. Crop: Spring Wheat
 Rain station: Czech republic Soil: Medium (loam)

Planting date: 25/03
 Harvest date: 01/08

Yield red.: 0.0 %

Crop scheduling options

Timing: Irrigate at 100 % depletion
 Application: Refill to 100 % of field capacity
 Field eff. 70 %

Table format: Irrigation schedule

Date	Day	Stage	Rain mm	Ks fract.	Eta %	Depl %	Net Irr	IrrDeficit	Loss	Gr. Irr	Flow
							mm	mm	mm	mm	l/s/ha
1 Aug	End	End	0.0	1.00	0	6					

Totals:

Total gross irrigation	0.0 mm	Total rainfall	343.6 mm
Total net irrigation	0.0 mm	Effective rainfall	329.6 mm
Total irrigation losses	0.0 mm	Total rain loss	14.0 mm
Actual water use by crop	350.7 mm	Moist deficit at harvest	21.1 mm
Potential water use by crop	350.7 mm	Actual irrigation requirement	21.1 mm
Efficiency irrigation schedule	- %	Efficiency rain	95.9 %
Deficiency irrigation schedule	0.0 %		

Yield reductions:

Stagelabel	A	B	C	D	Season
Reductions in ETc	0.0	0.0	0.0	0.0	0.0 %
Yield response factor	0.40	0.60	0.80	0.40	1.15
Yield reduction	0.0	0.0	0.0	0.0	0.0 %
Cumulative yield reduction	0.0	0.0	0.0	0.0	0.0 %

Příloha 6

Výstup počítačového modelu CROPWAT 8.0, modul „zavlažovací plán“ – kukuřice

MONTHLY ETO PENMAN-MONTEITH DATA

(File: C:\Documents and Settings\All Users\Data aplikací\CROPWAT\data\climate\klima nedokončené.PEM)

Country: Czech republic Station: Czech Hydromete. Ins
 Altitude: 430 m. Latitude: 49.45 °N Longitude: 15.30 °E

Month	Min Temp °C	Max Temp °C	Humidity %	Wind m/s	Sun hours	Rad MJ/m2/day	ETo mm/day
January	-6.3	-2.1	84	4.8	1.6	3.3	0.45
February	-6.5	1.3	86	4.7	2.6	5.6	0.58
March	-3.3	5.5	79	5.0	4.0	9.6	1.14
April	7.2	14.7	64	4.7	5.6	14.5	2.93
May	7.4	15.8	66	4.4	6.9	18.4	3.40
June	9.5	17.3	71	4.4	7.3	19.9	3.52
July	13.4	20.6	68	4.3	7.3	19.4	4.07
August	13.2	21.6	66	4.0	6.8	16.7	3.93
September	10.3	17.4	78	4.2	5.4	12.1	2.42
October	2.1	9.4	86	4.2	3.9	7.4	1.04
November	1.7	7.8	87	4.8	1.8	3.7	0.74
December	-5.2	0.5	89	4.9	1.5	2.7	0.41
Average	3.6	10.8	77	4.5	4.6	11.1	2.05

MONTHLY RAIN DATA

(File: C:\Documents and Settings\All Users\Data aplikací\CROPWAT\data\rain\srážky 2009.CRM)

Station: Czech republic

Eff. rain method: USDA Soil Conservation Service formula:

$$\begin{aligned} \text{Peff} &= \text{Pmon} * (125 - 0.2 * \text{Pmon}) / 125 && \text{for Pmon} \leq 250 \text{ mm} \\ \text{Peff} &= 125 + 0.1 * \text{Pmon} && \text{for Pmon} > 250 \text{ mm} \end{aligned}$$

	Rain mm	Eff rain mm
January	25.0	24.0
February	61.0	55.0
March	76.0	66.8
April	23.0	22.2
May	86.0	74.2
June	113.0	92.6
July	111.0	91.3
August	57.0	51.8
September	22.0	21.2
October	68.0	60.6
November	43.0	40.0
December	58.0	52.6
Total	743.0	652.3

DRY CROP DATA

(File: C:\Documents and Settings\All Users\Data aplikací\CROPWAT\data\crops\FAO\MAIZE.CRO)

Crop Name: MAIZE (Grain) Planting date: 26/04 Harvest: 28/08

Stage	initial	develop	mid	late	total
Length (days)	20	35	40	30	125
Kc Values	0.30	-->	1.20	0.35	
Rooting depth (m)	0.30	-->	1.00	1.00	
Critical depletion	0.55	-->	0.55	0.80	
Yield response f.	0.40	0.40	1.30	0.50	1.25
Cropheight (m)			2.00		

SOIL DATA

(File: C:\Documents and Settings\All Users\Data aplikací\CROPWAT\data\soils\FAO\MEDIUM.SOI)

Soil name: Medium (loam)

General soil data:

Total available soil moisture (FC - WP)	290.0	mm/meter
Maximum rain infiltration rate	40	mm/day
Maximum rooting depth	900	centimeters
Initial soil moisture depletion (as % TA)	0	%
Initial available soil moisture	290.0	mm/meter

CROPPING PATTERN DATA

(File: untitled)

Cropping pattern name:

No.	Crop file	Crop name	Planting date	Harvest date	Area %
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CROP WATER REQUIREMENTS

ETo station: Czech Hydromete. Ins
 Rain station: Czech republic

Crop: MAIZE (Grain)
 Planting date: 26/04

Month	Decade	Stage	Kc coeff	ETc mm/day	ETc mm/dec	Eff rain mm/dec	Irr. Req. mm/dec
Apr	3	Init	0.30	0.95	4.7	5.1	0.0
May	1	Init	0.30	0.97	9.7	20.0	0.0
May	2	Deve	0.34	1.15	11.5	26.3	0.0
May	3	Deve	0.59	2.03	22.3	27.8	0.0
Jun	1	Deve	0.87	3.01	30.1	29.4	0.7
Jun	2	Mid	1.13	3.96	39.6	31.8	7.9
Jun	3	Mid	1.22	4.52	45.2	31.3	13.9
Jul	1	Mid	1.22	4.74	47.4	31.8	15.7
Jul	2	Mid	1.22	4.97	49.7	32.2	17.5
Jul	3	Late	1.21	4.88	53.7	27.2	26.4
Aug	1	Late	1.00	4.06	40.6	21.4	19.2
Aug	2	Late	0.71	2.87	28.7	16.9	11.9
Aug	3	Late	0.45	1.58	12.6	9.9	0.0
					396.0	311.0	113.1

CROP IRRIGATION SCHEDULE

ETo station: Czech Hydromete. Crop: MAIZE (Grain) Planting date: 26/04
 Rain station: Czech republic Soil: Medium (loam) Harvest date: 28/08

Yield red.: 0.0 %

Crop scheduling options

Timing: Irrigate at 100 % depletion
 Application: Refill to 100 % of field capacity
 Field eff. 70 %

Table format: Irrigation schedule

Date	Day	Stage	Rain mm	Ks fract.	Eta %	Depl %	Net Irr	IrrDeficit	Loss	Gr. Irr	Flow
							mm	mm	mm	mm	l/s/ha
28 Aug	End	End	16.3	1.00	100	30					

Totals:

Total gross irrigation	0.0 mm	Total rainfall	372.3 mm
Total net irrigation	0.0 mm	Effective rainfall	308.6 mm
Total irrigation losses	0.0 mm	Total rain loss	63.7 mm
Actual water use by crop	394.5 mm	Moist deficit at harvest	85.8 mm
Potential water use by crop	394.5 mm	Actual irrigation requirement	85.8 mm
Efficiency irrigation schedule	- %	Efficiency rain	82.9 %
Deficiency irrigation schedule	0.0 %		

Yield reductions:

Stagelabel	A	B	C	D	Season
Reductions in ETc	0.0	0.0	0.0	0.0	0.0 %
Yield response factor	0.40	0.40	1.30	0.50	1.25
Yield reduction	0.0	0.0	0.0	0.0	0.0 %
Cumulative yield reduction	0.0	0.0	0.0	0.0	0.0 %

Příloha 7

Výstup počítačového modelu CROPWAT 8.0, modul „zavlažovací plán“ – cukrová řepa

MONTHLY ETO PENMAN-MONTEITH DATA

(File: C:\Documents and Settings\All Users\Data aplikací\CROPWAT\data\climate\klima 2009.PEM)

Country: Czech republic Station: Czech Hydromete. Ins
 Altitude: 430 m. Latitude: 49.45 °N Longitude: 15.30 °E

Month	Min Temp °C	Max Temp °C	Humidity %	Wind m/s	Sun hours	Rad MJ/m2/day	ETo mm/day
January	-6.3	-2.1	84	4.8	1.6	3.3	0.45
February	-6.5	1.3	86	4.7	2.6	5.6	0.58
March	-3.3	5.5	79	5.0	4.0	9.6	1.14
April	7.2	14.7	64	4.7	5.6	14.5	2.93
May	7.4	15.8	66	4.4	6.9	18.4	3.40
June	9.5	17.3	71	4.4	7.3	19.9	3.52
July	13.4	20.6	68	4.3	7.3	19.4	4.07
August	13.2	21.6	66	4.0	6.8	16.7	3.93
September	10.3	17.4	78	4.2	5.4	12.1	2.42
October	2.1	9.4	86	4.2	3.9	7.4	1.04
November	1.7	7.8	87	4.8	1.8	3.7	0.74
December	-5.2	0.5	89	4.9	1.5	2.7	0.41
Average	3.6	10.8	77	4.5	4.6	11.1	2.05

MONTHLY RAIN DATA

(File: C:\Documents and Settings\All Users\Data aplikací\CROPWAT\data\rain\srážky 2009.CRM)

Station: Czech republic

Eff. rain method: USDA Soil Conservation Service formula:

$$\begin{aligned} \text{Peff} &= \text{Pmon} * (125 - 0.2 * \text{Pmon}) / 125 && \text{for Pmon} \leq 250 \text{ mm} \\ \text{Peff} &= 125 + 0.1 * \text{Pmon} && \text{for Pmon} > 250 \text{ mm} \end{aligned}$$

	Rain mm	Eff rain mm
January	25.0	24.0
February	61.0	55.0
March	76.0	66.8
April	23.0	22.2
May	86.0	74.2
June	113.0	92.6
July	111.0	91.3
August	57.0	51.8
September	22.0	21.2
October	68.0	60.6
November	43.0	40.0
December	58.0	52.6
Total	743.0	652.3

DRY CROP DATA

(File: C:\Documents and Settings\All Users\Data aplikací\CROPWAT\data\crops\FAO\SUGARBET.CRO)

Crop Name: Sugarbeet Planting date: 03/04 Harvest: 09/09

Stage	initial	develop	mid	late	total
Length (days)	25	35	50	50	160
Kc Values	0.35	-->	1.20	0.70	
Rooting depth (m)	0.30	-->	1.00	1.00	
Critical depletion	0.50	-->	0.60	0.60	
Yield response f.	0.50	0.80	1.20	1.00	1.10
Cropheight (m)			0.70		

SOIL DATA

(File: C:\Documents and Settings\All Users\Data aplikací\CROPWAT\data\soils\FAO\MEDIUM.SOI)

Soil name: Medium (loam)

General soil data:

Total available soil moisture (FC - WP)	290.0	mm/meter
Maximum rain infiltration rate	40	mm/day
Maximum rooting depth	900	centimeters
Initial soil moisture depletion (as % TA)	0	%
Initial available soil moisture	290.0	mm/meter

CROPPING PATTERN DATA

(File: untitled)

Cropping pattern name:

No.	Crop file	Crop name	Planting date	Harvest date	Area %
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CROP WATER REQUIREMENTS

ETo station: Czech Hydromete. Ins
 Rain station: Czech republic

Crop: Sugarbeet
 Planting date: 03/04

Month	Decade	Stage	Kc coeff	ETc mm/day	ETc mm/dec	Eff rain mm/dec	Irr. Req. mm/dec
Apr	1	Init	0.35	0.84	6.7	7.4	0.0
Apr	2	Init	0.35	1.06	10.6	2.8	7.8
Apr	3	Deve	0.36	1.15	11.5	10.1	1.4
May	1	Deve	0.56	1.82	18.2	20.0	0.0
May	2	Deve	0.81	2.75	27.5	26.3	1.2
May	3	Deve	1.07	3.68	40.5	27.8	12.7
Jun	1	Mid	1.22	4.24	42.4	29.4	13.0
Jun	2	Mid	1.22	4.29	42.9	31.8	11.1
Jun	3	Mid	1.22	4.51	45.1	31.3	13.8
Jul	1	Mid	1.22	4.74	47.4	31.8	15.6
Jul	2	Mid	1.22	4.96	49.6	32.2	17.4
Jul	3	Late	1.17	4.70	51.7	27.2	24.5
Aug	1	Late	1.06	4.30	43.0	21.4	21.6
Aug	2	Late	0.96	3.88	38.8	16.9	21.9
Aug	3	Late	0.86	2.99	32.9	13.6	19.3
Sep	1	Late	0.75	2.20	19.8	7.4	11.6
					528.6	337.5	192.8

CROP IRRIGATION SCHEDULE

ETo station: Czech Hydromete. Crop: Sugarbeet
 Rain station: Czech republic Soil: Medium (loam)

Planting date: 03/04
 Harvest date: 09/09

Yield red.: 0.0 %

Crop scheduling options

Timing: Irrigate at 100 % depletion
 Application: Refill to 100 % of field capacity
 Field eff. 70 %

Table format: Irrigation schedule

Date	Day	Stage	Rain mm	Ks fract.	Eta %	Depl %	Net Irr	IrrDeficit	Loss	Gr. Irr	Flow l/s/ha
9 Sep	End	End	0.0	1.00	0	48					

Totals:

Total gross irrigation	0.0 mm	Total rainfall	398.6 mm
Total net irrigation	0.0 mm	Effective rainfall	386.0 mm
Total irrigation losses	0.0 mm	Total rain loss	12.6 mm
Actual water use by crop	526.4 mm	Moist deficit at harvest	140.4 mm
Potential water use by crop	526.4 mm	Actual irrigation requirement	140.4 mm
Efficiency irrigation schedule	- %	Efficiency rain	96.8 %
Deficiency irrigation schedule	0.0 %		

Yield reductions:

Stagelabel	A	B	C	D	Season
Reductions in ETc	0.0	0.0	0.0	0.0	0.0 %
Yield response factor	0.50	0.80	1.20	1.00	1.10
Yield reduction	0.0	0.0	0.0	0.0	0.0 %
Cumulative yield reduction	0.0	0.0	0.0	0.0	0.0 %

Příloha 8

Výstup počítačového modelu CROPWAT 8.0, modul „zavlažovací plán“ – rajčata

MONTHLY ETO PENMAN-MONTEITH DATA

(File: C:\Documents and Settings\All Users\Data aplikací\CROPWAT\data\climate\klima 2009.PEM)

Country: Czech republic Station: Czech Hydromete. Ins
 Altitude: 430 m. Latitude: 49.45 °N Longitude: 15.30 °E

Month	Min Temp °C	Max Temp °C	Humidity %	Wind m/s	Sun hours	Rad MJ/m2/day	ETo mm/day
January	-6.3	-2.1	84	4.8	1.6	3.3	0.45
February	-6.5	1.3	86	4.7	2.6	5.6	0.58
March	-3.3	5.5	79	5.0	4.0	9.6	1.14
April	7.2	14.7	64	4.7	5.6	14.5	2.93
May	7.4	15.8	66	4.4	6.9	18.4	3.40
June	9.5	17.3	71	4.4	7.3	19.9	3.52
July	13.4	20.6	68	4.3	7.3	19.4	4.07
August	13.2	21.6	66	4.0	6.8	16.7	3.93
September	10.3	17.4	78	4.2	5.4	12.1	2.42
October	2.1	9.4	86	4.2	3.9	7.4	1.04
November	1.7	7.8	87	4.8	1.8	3.7	0.74
December	-5.2	0.5	89	4.9	1.5	2.7	0.41
Average	3.6	10.8	77	4.5	4.6	11.1	2.05

MONTHLY RAIN DATA

(File: C:\Documents and Settings\All Users\Data aplikací\CROPWAT\data\rain\srážky 2009.CRM)

Station: Czech republic

Eff. rain method: USDA Soil Conservation Service formula:

$$\begin{aligned} \text{Peff} &= \text{Pmon} * (125 - 0.2 * \text{Pmon}) / 125 && \text{for Pmon} \leq 250 \text{ mm} \\ \text{Peff} &= 125 + 0.1 * \text{Pmon} && \text{for Pmon} > 250 \text{ mm} \end{aligned}$$

	Rain mm	Eff rain mm
January	25.0	24.0
February	61.0	55.0
March	76.0	66.8
April	23.0	22.2
May	86.0	74.2
June	113.0	92.6
July	111.0	91.3
August	57.0	51.8
September	22.0	21.2
October	68.0	60.6
November	43.0	40.0
December	58.0	52.6
Total	743.0	652.3

DRY CROP DATA

(File: C:\Documents and Settings\All Users\Data aplikací\CROPWAT\data\crops\FAO\TOMATO.CRO)

Crop Name:	Tomato	Planting date:	01/05	Harvest:	22/09
Stage	initial	develop	mid	late	total
Length (days)	30	40	45	30	145
Kc Values	0.60	-->	1.15	0.80	
Rooting depth (m)	0.25	-->	1.00	1.00	
Critical depletion	0.30	-->	0.40	0.50	
Yield response f.	0.50	0.60	1.10	0.80	1.05
Cropheight (m)			0.60		

SOIL DATA

(File: C:\Documents and Settings\All Users\Data aplikací\CROPWAT\data\soils\FAO\MEDIUM.SOI)

Soil name: Medium (loam)

General soil data:

Total available soil moisture (FC - WP)	290.0	mm/meter
Maximum rain infiltration rate	40	mm/day
Maximum rooting depth	900	centimeters
Initial soil moisture depletion (as % TA)	0	%
Initial available soil moisture	290.0	mm/meter

CROPPING PATTERN DATA

(File: untitled)

Cropping pattern name:

No.	Crop file	Crop name	Planting date	Harvest date	Area %
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CROP WATER REQUIREMENTS

ETo station: Czech Hydromete. Ins
 Rain station: Czech republic

Crop: Tomato
 Planting date: 01/05

Month	Decade	Stage	Kc coeff	ETc mm/day	ETc mm/dec	Eff rain mm/dec	Irr. Req. mm/dec
May	1	Init	0.60	1.95	19.5	20.0	0.0
May	2	Init	0.60	2.04	20.4	26.3	0.0
May	3	Deve	0.60	2.07	22.8	27.8	0.0
Jun	1	Deve	0.69	2.41	24.1	29.4	0.0
Jun	2	Deve	0.83	2.93	29.3	31.8	0.0
Jun	3	Deve	0.97	3.60	36.0	31.3	4.7
Jul	1	Mid	1.11	4.33	43.3	31.8	11.5
Jul	2	Mid	1.16	4.74	47.4	32.2	15.1
Jul	3	Mid	1.16	4.68	51.5	27.2	24.3
Aug	1	Mid	1.16	4.71	47.1	21.4	25.7
Aug	2	Mid	1.16	4.69	46.9	16.9	30.1
Aug	3	Late	1.12	3.93	43.2	13.6	29.6
Sep	1	Late	1.00	2.94	29.4	8.3	21.1
Sep	2	Late	0.89	2.15	21.5	3.8	17.7
Sep	3	Late	0.82	1.60	3.2	1.9	3.2
					485.4	323.5	183.0

CROP IRRIGATION SCHEDULE

ETo station: Czech Hydromete. Crop: Tomato
 Rain station: Czech republic Soil: Medium (loam)

Planting date: 01/05
 Harvest date: 22/09

Yield red.: 0.0 %

Crop scheduling options

Timing: Irrigate at 100 % depletion
 Application: Refill to 100 % of field capacity
 Field eff. 70 %

Table format: Irrigation schedule

Date	Day	Stage	Rain mm	Ks fract.	Eta %	Depl %	Net Irr	IrrDeficit	Loss	Gr. Irr	Flow
							mm	mm	mm	mm	l/s/ha
31 Aug	123	End	0.0	1.00	100	43	125.7	0.0	0.0	179.6	0.17
22 Sep	End	End	0.0	1.00	100	14					

Totals:

Total gross irrigation	179.6 mm	Total rainfall	379.1 mm
Total net irrigation	125.7 mm	Effective rainfall	317.9 mm
Total irrigation losses	0.0 mm	Total rain loss	61.1 mm
Actual water use by crop	483.8 mm	Moist deficit at harvest	40.2 mm
Potential water use by crop	483.8 mm	Actual irrigation requirement	165.9 mm
Efficiency irrigation schedule	100.0 %	Efficiency rain	83.9 %
Deficiency irrigation schedule	0.0 %		

Yield reductions:

Stagelabel	A	B	C	D	Season
Reductions in ETc	0.0	0.0	0.0	0.0	0.0 %
Yield response factor	0.50	0.60	1.10	0.80	1.05
Yield reduction	0.0	0.0	0.0	0.0	0.0 %
Cumulative yield reduction	0.0	0.0	0.0	0.0	0.0 %

Příloha 9

Projekt diplomové práce

Projekt diplomové práce (DP) oboru sociální a kulturní ekologie

1. Jméno studenta, tituly:

Lucie Landová, Bc.

2. Osobní číslo (UČO):

9952

3. Rok imatrikulace na FHS (IZV) UK (bak. studium, jinak mag. studium):

1.9.2004 (bakalářské studium), 21.3.2008 (magisterské studium)

4. Datum zápisu na katedru sociální a kulturní ekologie FHS UK rozhodné pro datum obhajoby DP:

19.9.2008

5. Názvy všech předchozích bakalářských (magisterských) prací, škola, obor a rok, kde a kdy byly obhájeny:

Prezentace regionu v muzeu (na příkladu Krkonošského muzea ve Vrchlabí). Fakulta humanitních studií UK, obor Studium humanitní vzdělanosti. 2008, Praha

6. Předběžný název DP:

Vodní stopa. Metodologie a výpočet vodní stopy procesu pěstování zemědělských plodin.

7. Obecný kontext (souvislosti tématu, širší rámec [zasazení „do světa“]):

Vodní stopa (Water Footprint, WFP) je indikátor užití vody zaměřený na spotřebu. Koncept vytvořil v roce 2003 A. Y. Hoekstra a v ČR se doposud nepoužívá.

Voda a využívání vodních zdrojů se stává globálním politicko-strategickým problémem, zejména vinou její nerovnoměrné distribuce a spotřeby. Množství vody, které máme k dispozici, je ale ovlivňováno také dvěma fenomény moderní doby – zemědělstvím a urbanizací. Proto se ukazuje, že konvenční ukazatele využívání vodních zdrojů nejsou dostatečné. Potřebujeme indikátor, jenž nám pomůže identifikovat kritická a citlivá místa naší spotřeby vody vedoucí k negativním a mnohdy až fatálním dopadům nejen na společnost, ale též na

ekosystémy a jejich funkce. Pak teprve budeme moci zformulovat efektivní politické a společenské strategie, které povedou k šetrnějšímu, udržitelnému využívání vodních zdrojů – a to i v podmínkách pokračujícího populačního růstu a zvyšování životní úrovně. Takovým indikátorem je právě vodní stopa.

8. Předmět zkoumání (vlastní předmět práce [zasazení „do vědy“]):

Předmětem výzkumu je indikátor udržitelného využívání vodních zdrojů, tzv. vodní stopa (WFP). Jelikož jde o koncept, který se dosud v ČR nepoužívá, bude součástí práce zjištění dostupnosti datových zdrojů pro výpočet WFP a návrh datové a metadatové základny potřebné pro výpočet v podmínkách ČR. Práce aplikuje a pilotně ověří metodu vodní stopy pro podmínky ČR a poskytne praktický nástroj pro lepší management vodních zdrojů v ČR. Výpočet vodní stopy bude konkretizován na příkladu vodní stopy procesu pěstování vybraných zemědělských plodin.

9. Hlavní vstupní hypotéza nebo hypotézy (2–4 na výběr); pro práci 1–2, možno však formulovat výzkumné otázky, event. jen výzkumný problém:

Česká republika se nachází v oblasti mírného vodního stresu. Měla by si proto v co nejširší míře vystačit s vlastními vodními zdroji, případně virtuální vodu importovat. Vezmeme-li v úvahu, že zemědělství se podílí plnými 85 % na celkové vodní stopě lidstva, bude nás zajímat, jaká je vodní stopa zemědělských plodin, které tvoří hlavní vývozní artikly České republiky, a jak velká je tato stopa v porovnání s těmiž komoditami v jiných státech světa.

10. Metodologický postup: metody a techniky, které budou v práci použity:

- Rešerše dostupné literatury a jiných zdrojů
- Analýza datových zdrojů
- Kvantifikace toků vodní stopy pomocí tzv. Penman-Monteithovy kombinační rovnice a počítačového modelu CROPWAT 8.0

11. Cíl DP (kromě ověření hypotéz a teoretického přínosu např. *praktický přínos*, vypracování metodologie, základ pro řešení problémů v praxi atd.):

- Zjistit stav stávajícího poznání v oblasti problematiky WFP

- Aplikovat a pilotně ověřit metodu vodní stopy pro podmínky ČR a poskytnout praktický nástroj pro lepší management vodních zdrojů v ČR
- Zjištění dostupnosti datových zdrojů pro výpočet WFP a návrh struktury datové a metadatové základny potřebné pro výpočet
- Výpočet WFP vybraných zemědělských komodit – pšenice, kukuřice, cukrová řepa a rajčata

12. Čím budou rozšířeny dosavadní znalosti (vědecká „přidaná hodnota DP“):

Jelikož je vodní stopa indikátorem, který se v České republice doposud neužívá, bude hlavním přínosem práce uvedení do problematiky tohoto konceptu, který poskytuje nový pohled na hospodaření s vodními zdroji.

Práce poskytne návrh české terminologie, zanalyzuje data nezbytná pro výpočet vodní stopy a navrhne metodologii pro výpočet vodní stopy zemědělských plodin pro konkrétní podmínky České republiky. Výstupem práce bude výpočet vodní stopy vybraných zemědělských plodin (pšenice, kukuřice, cukrové řepy a rajčat), které jsou hlavním vývozním artiklem České republiky.

13. Jaké bude (bude-li) jejich teoretické zobecnění a přínos:

Vodní stopa poskytuje nový pohled na hospodaření s vodními zdroji – kategorizace virtuální vody na zelenou, modrou a šedou umožní lepší porozumění funkci ekosystémových služeb a umožní efektivněji odhalit kritická místa naší vodní spotřeby.

14. Struktura DP (předběžný obsah – názvy oddílů a kapitol):

1. Úvod
2. Teoretická část
 - 2.1. Virtuální voda
 - 2.2. Koncept vodní stopy
 - 2.3. Výpočet vodní stopy
 - 2.3.1. Vodní stopa procesního kroku
 - 2.3.2. Vodní stopa výrobku
 - 2.3.3. Vodní stopa geograficky vymezené oblasti
 - 2.3.4. Vodní stopa spotřebitele
 - 2.3.5. Vodní stopa národní spotřeby
 - 2.3.6. Vodní stopa podniku

- 2.4.Hodnocení udržitelnosti pomocí indikátoru vodní stopy
- 2.5.Spektrum odpovědí na vodní stopu
- 3. Praktická část
 - 3.1.Předmět a cíle výzkumu
 - 3.2.Metodika
 - 3.3.Datová základna
 - 3.4.Výpočet vodní stopy pšenice, kukuřice, cukrové řepy a rajčat
- 4. Závěr

15. Předběžná bibliografie k tématu:

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16. Předpokládaný vedoucí DP:

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17. Důvod volby tématu (dosavadní znalosti, zázemí, praxe a zájem studenta):¹

Jinonice 15. dubna 2011

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vedoucí katedry SKE

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