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Agriculture Test Fields „WAGNA“ Lysimeter and Groundwater Research Area

Results of 1st Research Year (October 2004 – September 2005)

Johann Fank
October 2005

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Contents

■ Technical Equipment and Data Management

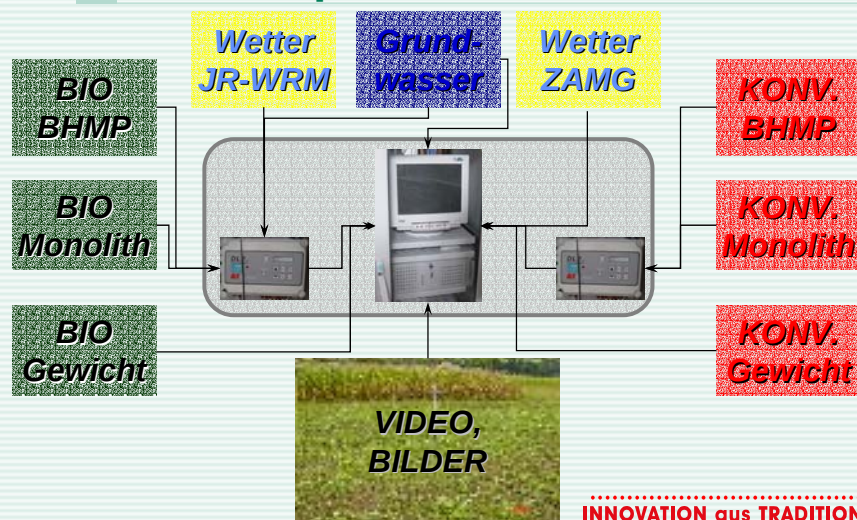
- Data Management
- Weighing Data
- Soil Data
- Groundwater Recharge (Seepage Water)
- Solute Transport (Tracing Experiment)

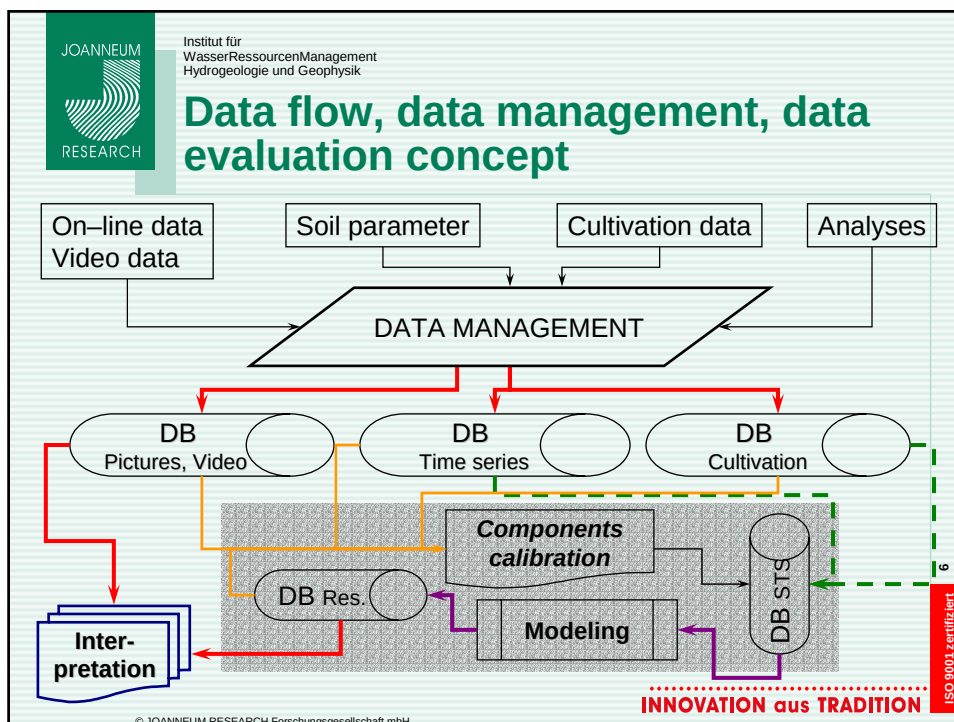
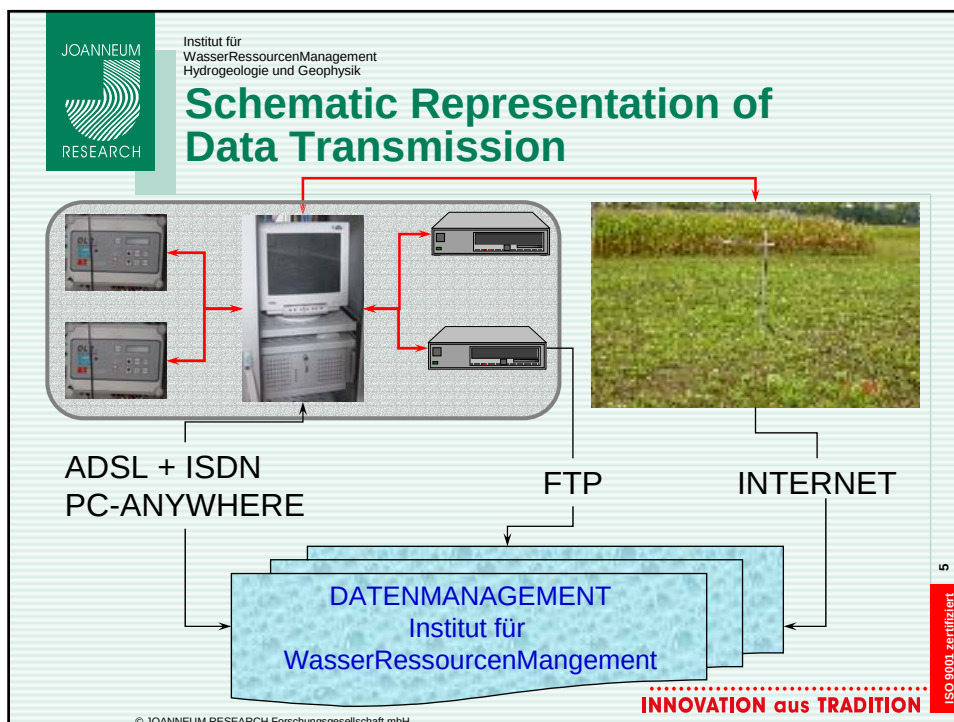
■ Water and Solute Balance Evaluation (October 2004 – September 2005)

■ Cropping Period 1 (09/2004 – 03/2005)

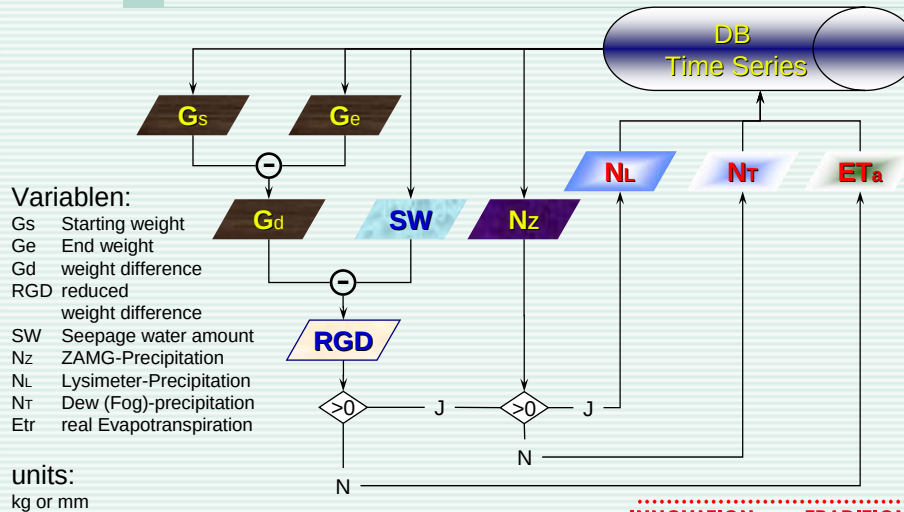
■ Cropping Period 2 (04/2005 – 09/2005)

Schematic Representation of Data Acquisition

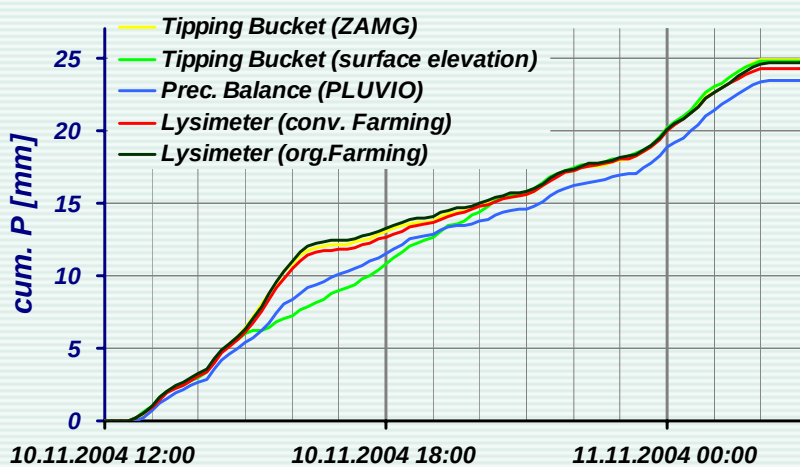


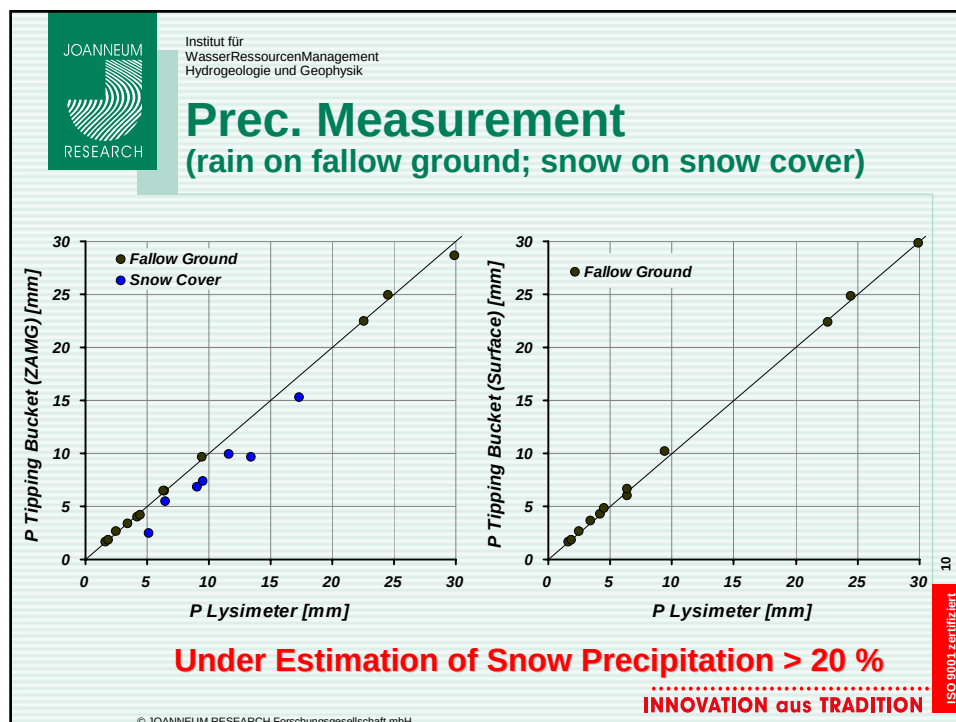
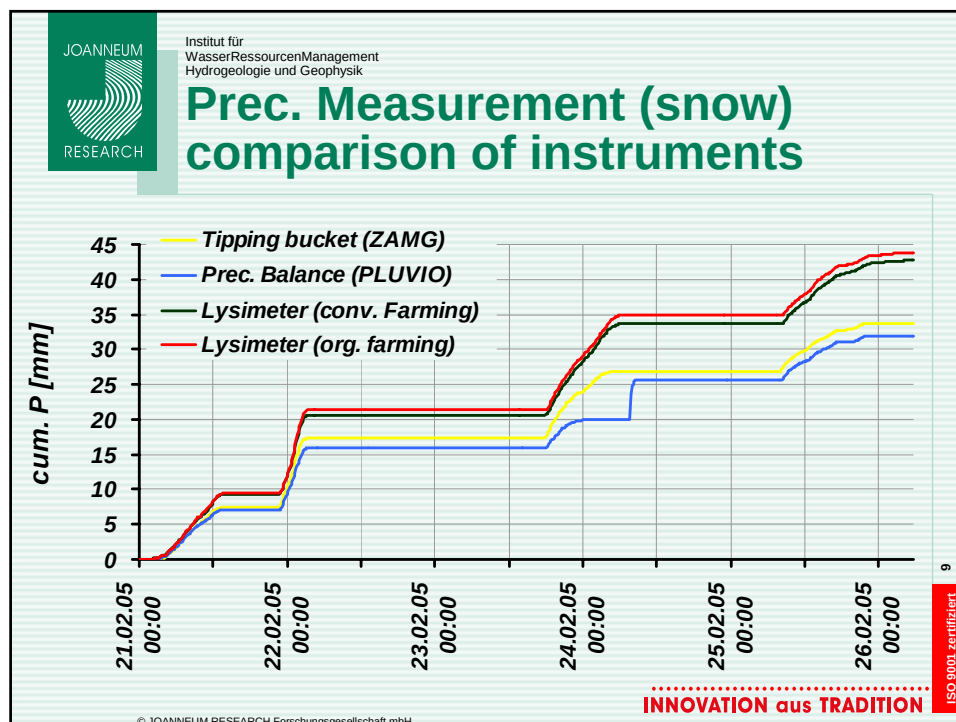


Evaluation of weight data for 1 timestep

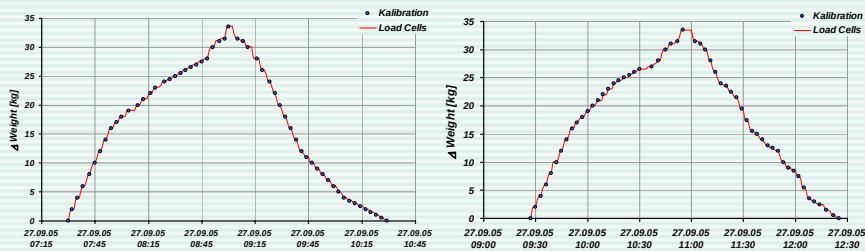


Prec. Measurement (rain) comparison of instruments





Control of Weighing Precision (2005.09.27)

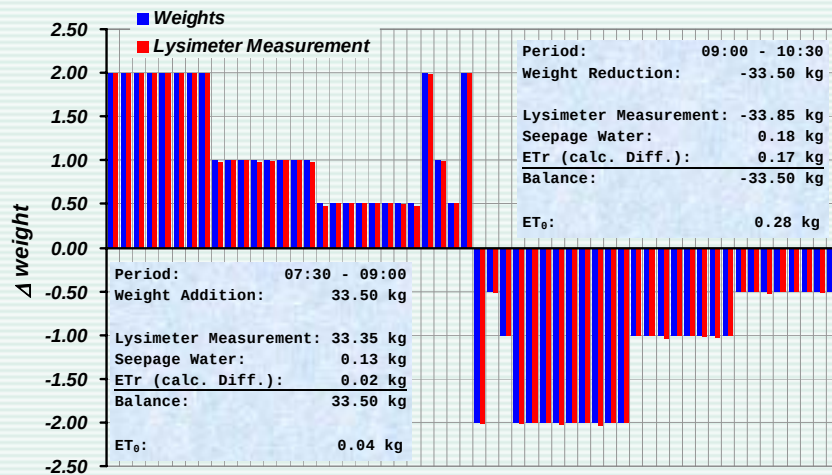


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Control of Weighing Precision (2005.09.27)

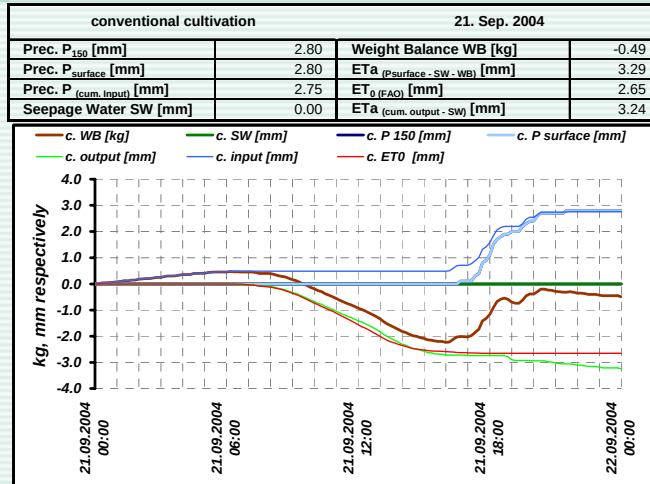


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Daily Water Balance (Example)

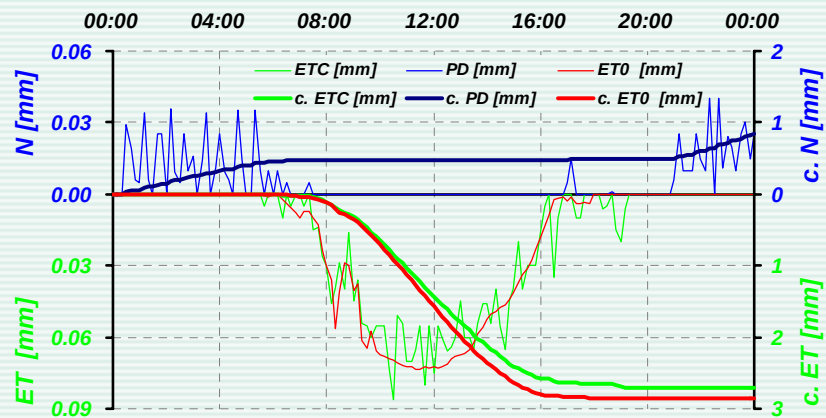


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Measurement of Dew Precipitation (PD) and Crop Evapotranspiration (ETC) in the course of a day (2004.09.20 as example)



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Soil sampling for laboratory investigations (2004.07.26)

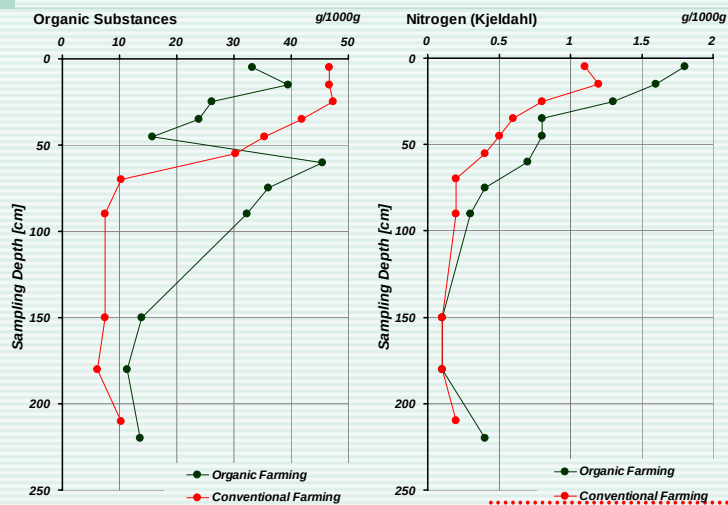


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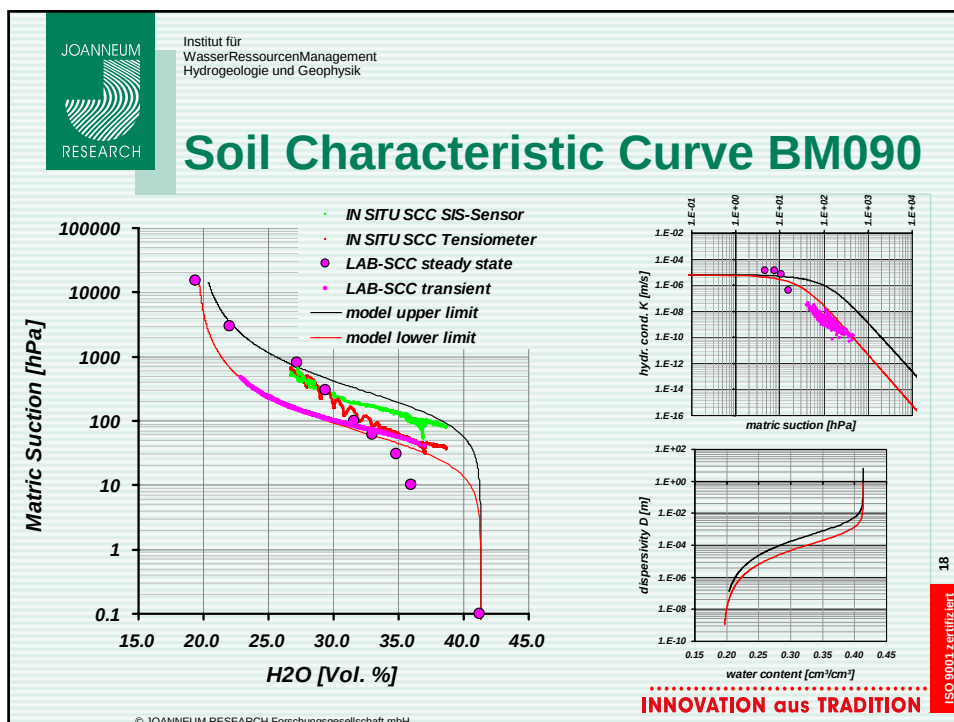
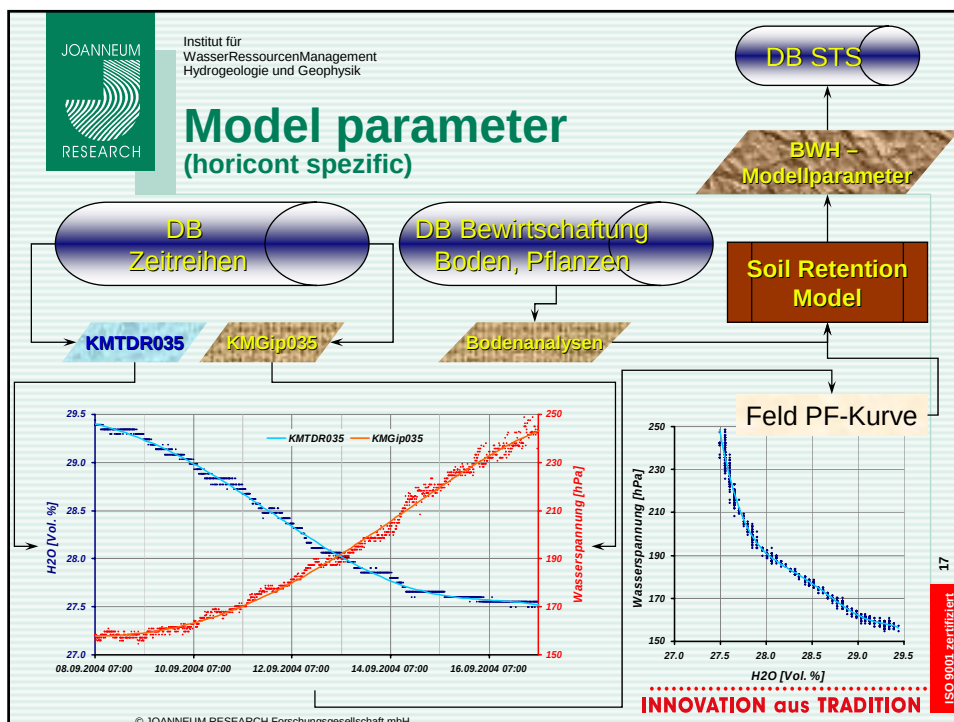
Result Examples: Distribution of Substances in the profiles



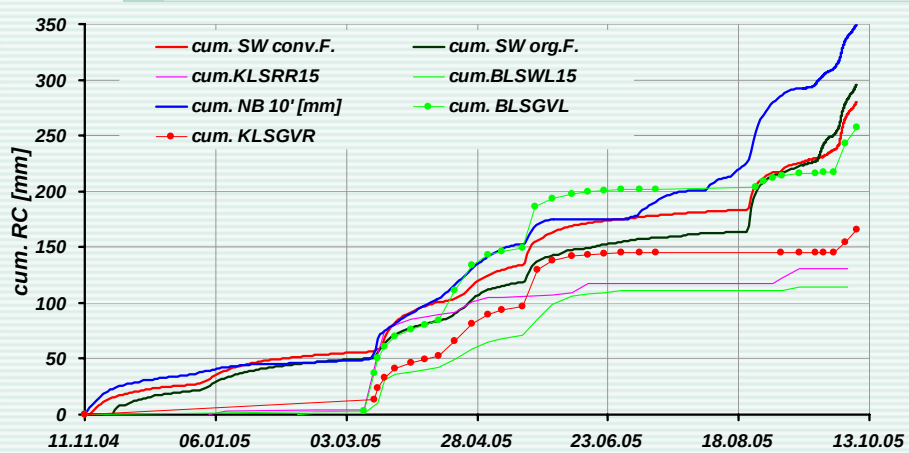
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GW – Recharge: Comparison of different Measuring Systems



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A Tracing Experiment has been done to detect the Influence of Excavation to Flow Velocity



	CONVENTIONAL FARMING	
	Inner Circle	Outer Circle
Area [m²]	0.5	0.5
Tracer	² H	NaBr
Tracer Amount	10 ml 99.8 %	50 g
Solution Amount	1000 ml	1000 ml
Start Time	12.04.2005 16:53	12.04.2005 17:09
End Time	12.04.2005 16:55	12.04.2005 17:11
Weight Difference [kg]	0.99	0.98

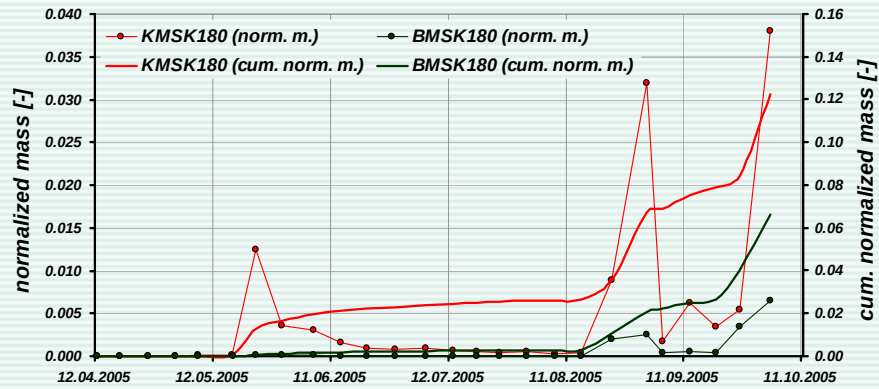
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Tracer Breakthrough curves (Comparison of Lysimeters)

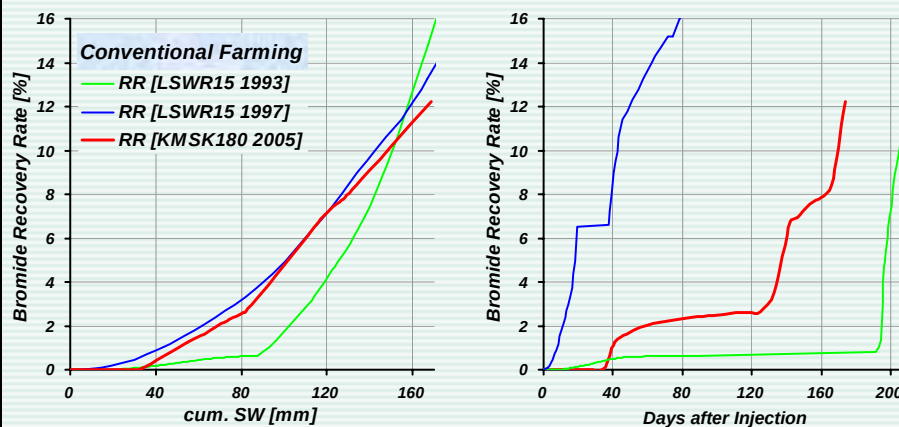


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Bromide Recovery Rate (Comparison of Tracing Experiments)

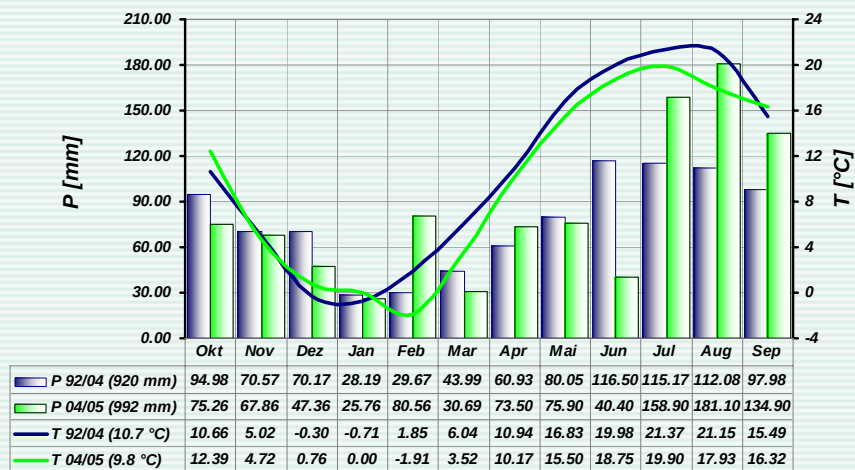


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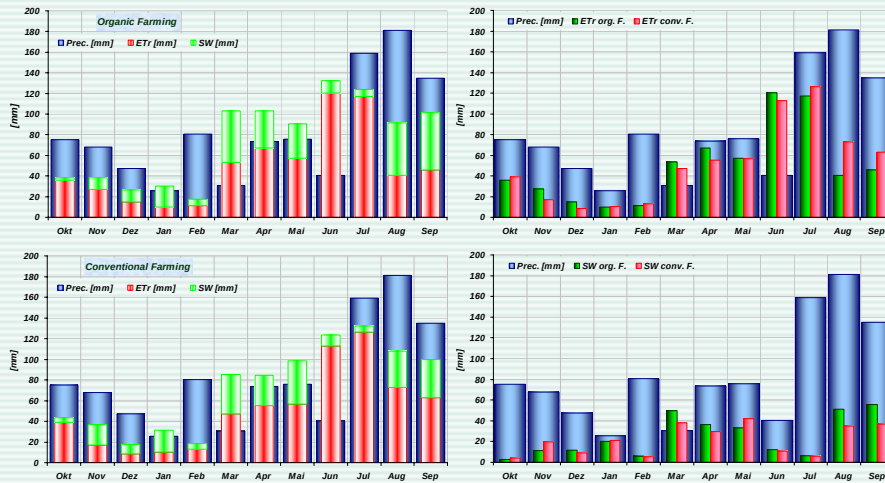
Hydrologic Year 10/04 – 09/05 Basic Characteristics



Water Balance

Balance Period: 01.10.2004 - 30.09.2005		
ET0 [mm] (ASCE - PM)	683.7	
Precipitation [mm]	992.2	
	Conventional Farming	Organic Farming
Seepage Water [mm]	257.5	296.3
Δ Water Storage [mm]	113.0	95.7
ETr [mm]	621.7	600.2

Water Balance Parameters (monthly distribution)



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Hydrologic Year 10/04 – 09/05 Solute Balance

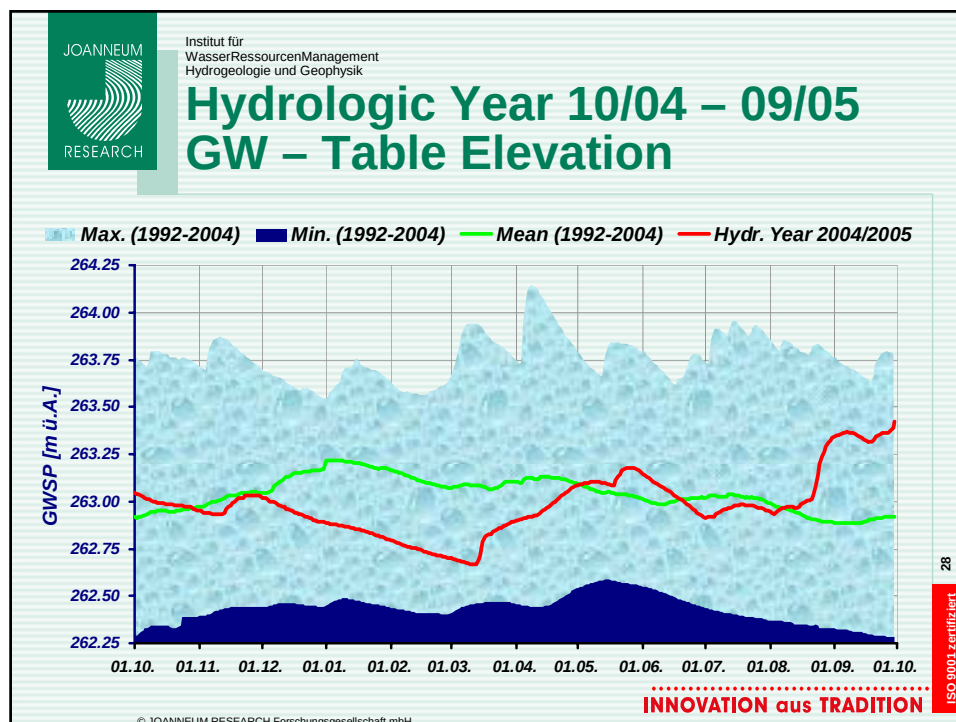
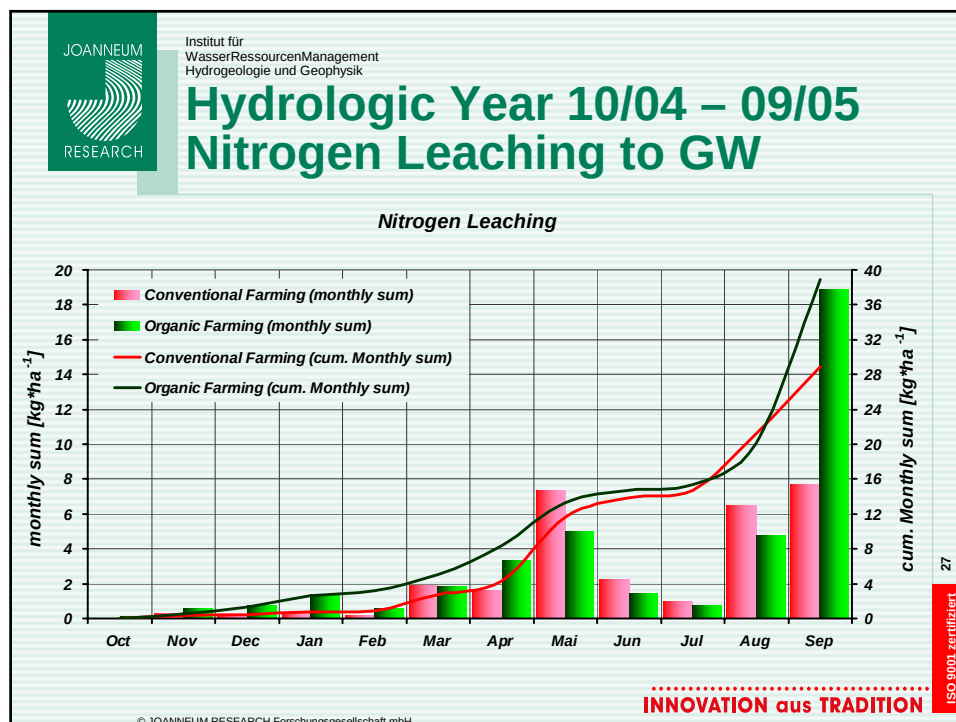
Solute leaching 01.10.2004 bis 30.09.2005

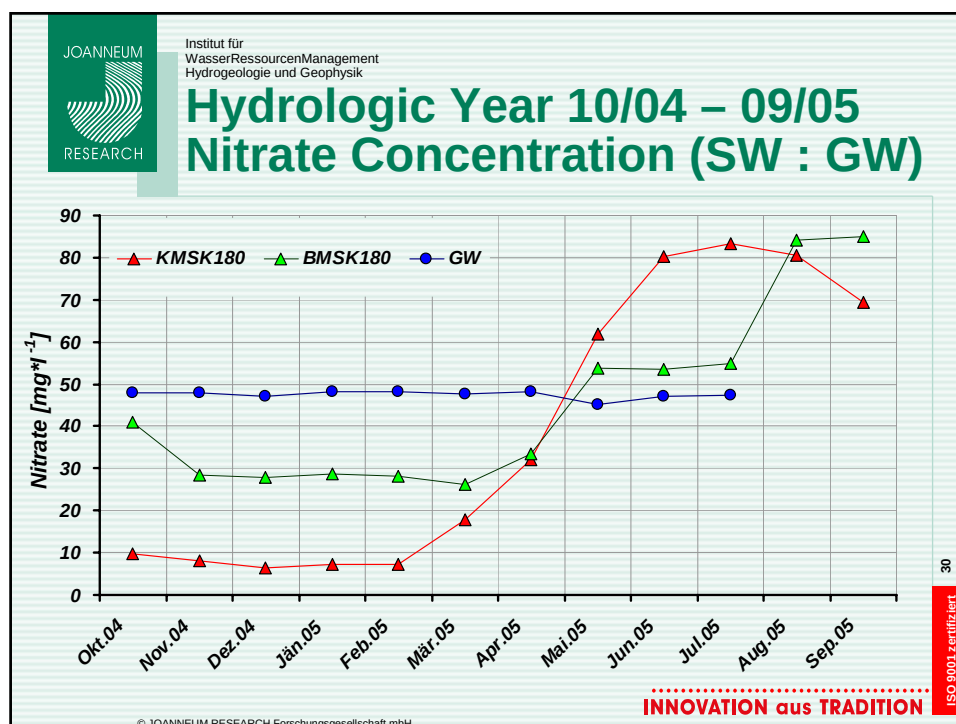
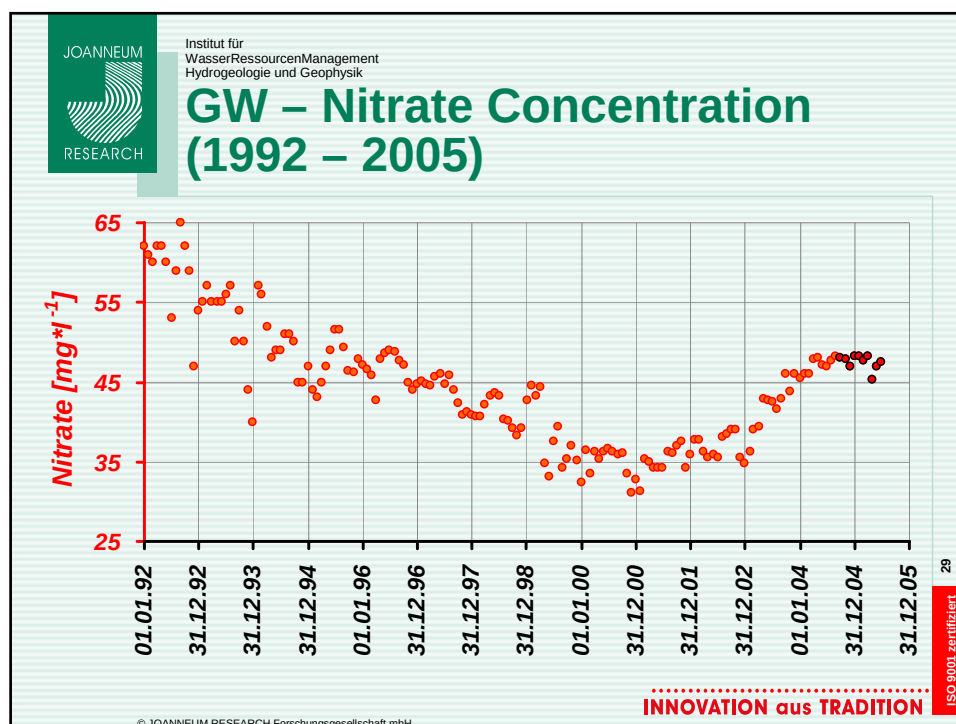
Parameter	Unit	Conventional Farming	Organic Farming
cum. Sum of SW	mm	258	296
mean value of el. cond.	$\mu S \cdot cm^{-1}$	350	443
mean value of pH	-	7.28	7.41
Leaching			
Sodium	$kg \cdot ha^{-1}$	22.43	18.42
Potassium	$kg \cdot ha^{-1}$	3.00	2.24
Magnesium	$kg \cdot ha^{-1}$	14.09	15.67
Calcium	$kg \cdot ha^{-1}$	154.96	258.88
Chloride	$kg \cdot ha^{-1}$	42.89	25.43
Nitrate	$kg \cdot ha^{-1}$	128.04	172.53
Sulphate	$kg \cdot ha^{-1}$	117.51	154.84
Mean Concentration			
Sodium	$mg \cdot l^{-1}$	8.06	5.77
Potassium	$mg \cdot l^{-1}$	1.07	0.68
Magnesium	$mg \cdot l^{-1}$	4.81	4.86
Calcium	$mg \cdot l^{-1}$	52.18	78.97
Chloride	$mg \cdot l^{-1}$	14.37	9.00
Nitrate	$mg \cdot l^{-1}$	40.75	47.99
Sulphate	$mg \cdot l^{-1}$	46.41	51.78

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Cropping Period (CP) 1: Crop Development (Autumn 2004)

2004.08.24	2004.09.02
	
2004.09.14	2004.10.29
	

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CP1: Weather Development (Winter 2004/2005)

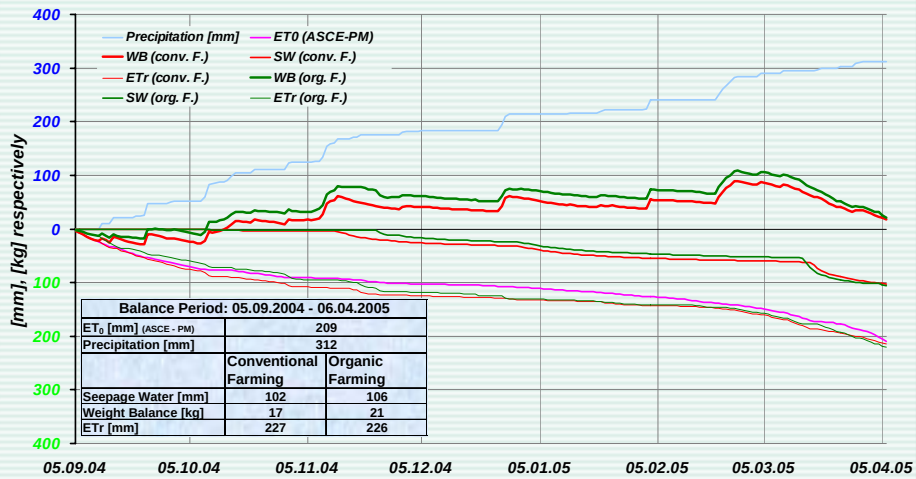
2004.11.17	2005.02.03
	
2005.03.16	2005.04.07
	

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CP1: Water Balance cumulativ curves of components



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Cropping Period (CP) 2: 2005 APR 07 Preparation of the Lysimeter



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CP 2: 2005 APR 11 Calibration, Implementation of Lysimeter



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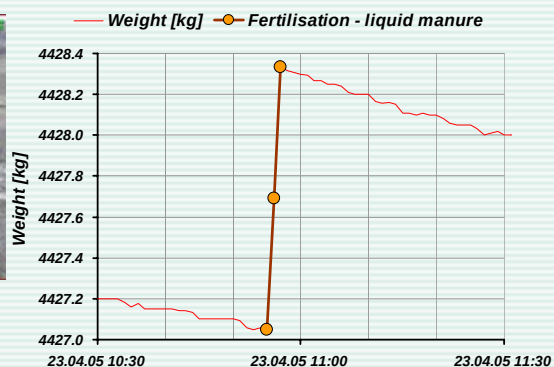
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CP 2: 2005 APR 23 Fertilization with Liquid Manure



10:55 – 10:57
 $\Delta \text{weight} = 1.382 \text{ kg}$
 $\sim 12.830 \text{ kg} \cdot \text{ha}^{-1}$



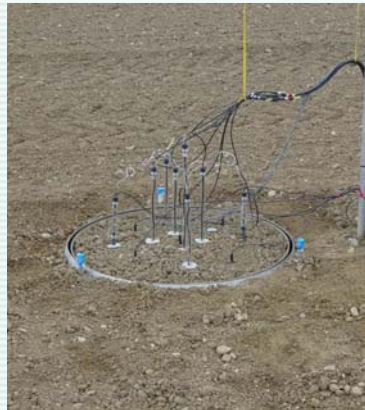
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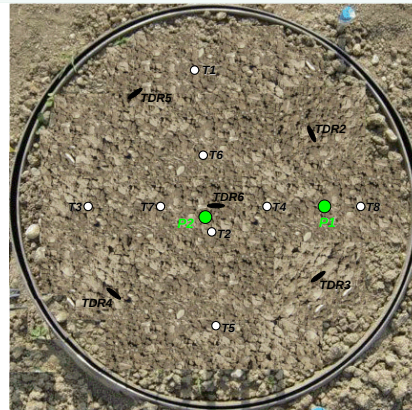
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CP 2: 2005 MAY 06

Additional Instruments in upper part



- Pumpkin - Plant (P)
- TDR - Probe (TDR)
- Tensiometer (T)



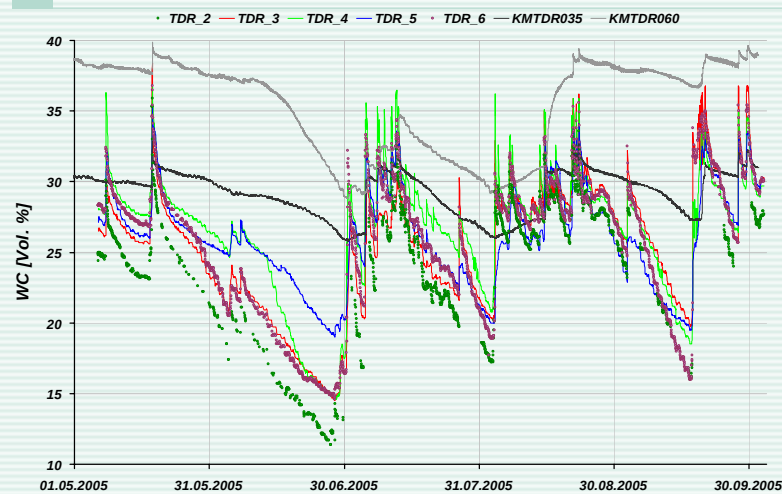
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CP2: Water Content (Time Series)



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CP 2: Crop Development (org. F.)

17.05.2005
02.06.2005
17.06.2005
30.06.2005
13.07.2005
03.08.2005
25.08.2005
13.09.2005
24.09.2005



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CP 2: Crop Development (conv. F.)



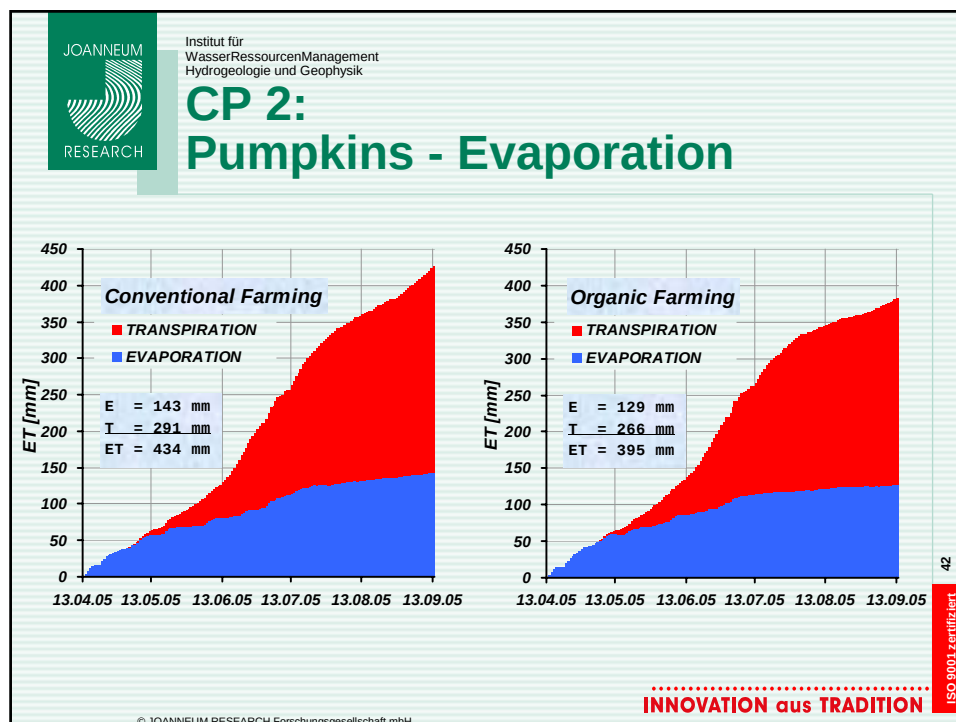
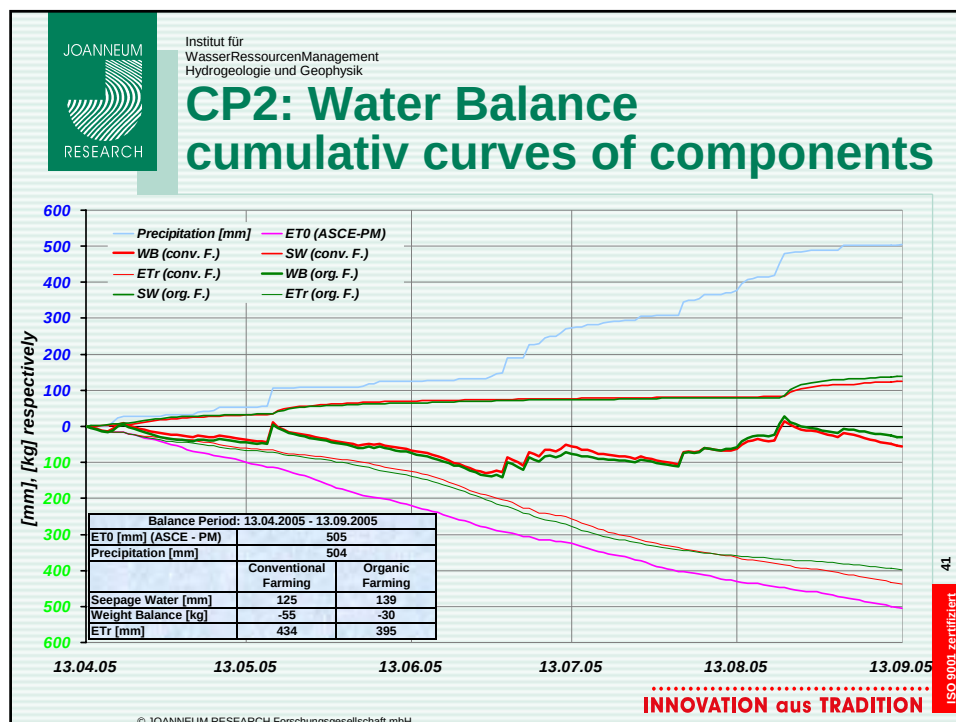
02.06.2005, 06.07.2005, 03.08.2005,
25.08.2005, 13.09.2005, 24.09.2005

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CP 2: Pumpkins Yield

Organic Farming

→ Pumpkin 1

■ Pumpkin Weight	2.630	kg
■ Pumpkin Seed (wet)	0.139	kg

→ Pumpkin 2

■ Pumpkin Weight	3.147	kg
■ Pumpkin Seed (wet)	0.094	kg
■ Weight	6.777	kg
■ Seed	0.233	kg

Conventional Farming

→ Pumpkin 1

■ Pumpkin Weight	1.994	kg
■ Pumpkin Seed (wet)	0.147	kg

→ Pumpkin 2 (rotten)

0.097	kg
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