

Yield Mapping at TUM in Weihenstephan 1990 to 2000

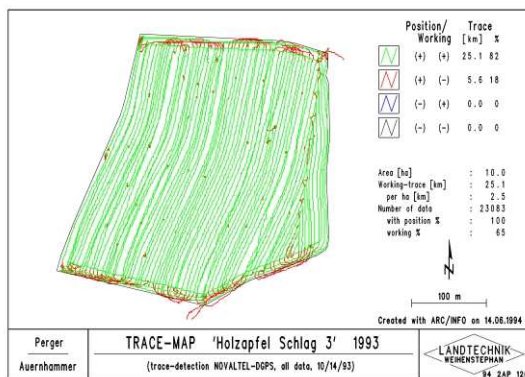
In 1990 local yield measurement with serial-production combine harvesters equipped with yield sensors and Global Positioning Sensors (GPS) took place for the first time and continued for the entire decade.

In the joint research programs FAM (Forschungsverbund Agrarökosystem München | Research Association Agricultural Eco Systems) from 1990 to 2000 and IKB (Informationssystem Kleinräumige Bestandsführung Dürnast | Information System Small Scale Crop Husbandry) from 1999 to 2005 geo referenced yield measurement covered a wide range of combinable crops with:

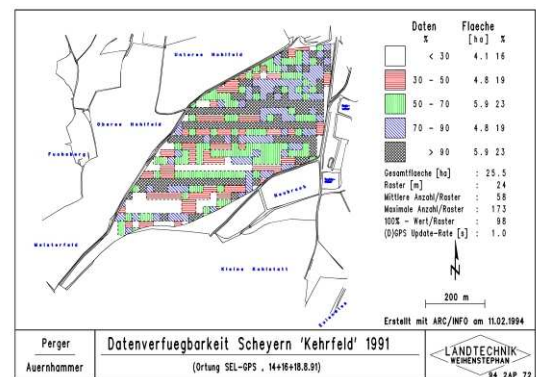
WW = Winter wheat	WB = Winter barley	WR = Winter rye	SW = Summer wheat
SB = Summer barley	OA = Oats	TR = Triticale	PE = Peas
LP = Lupines	CO = Corn		

In 1993 geo referenced yield measurement was extended to a self-propelled forage harvester in silage maize (SM) followed later by yield measurement in a trailed potato harvester (PT) and finally by test investigations in a trailed mower conditioner with swathing belt on grassland (GR).

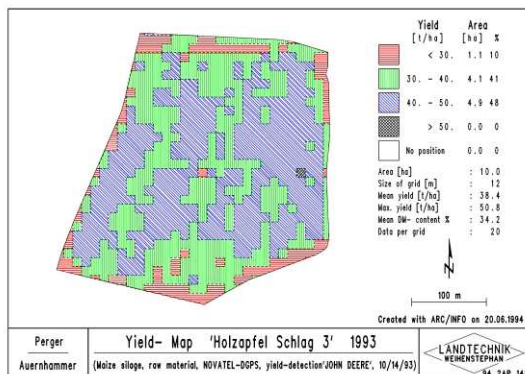
After harvest six different types of maps have been derived from yield sensor data together with GPS positioning data using ArcInfo®.



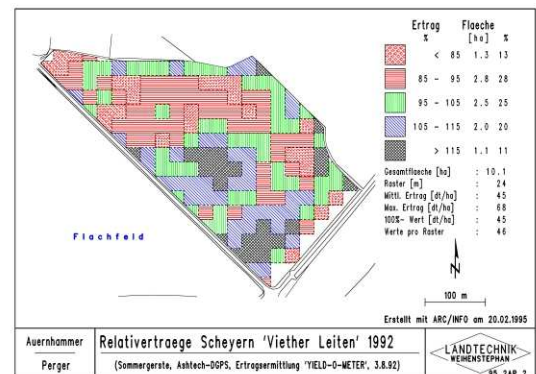
Type 1: "Trace Map"



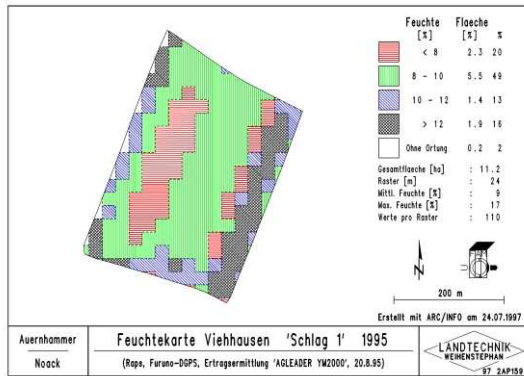
Type 2: Map "Data Availability" in different grid layouts



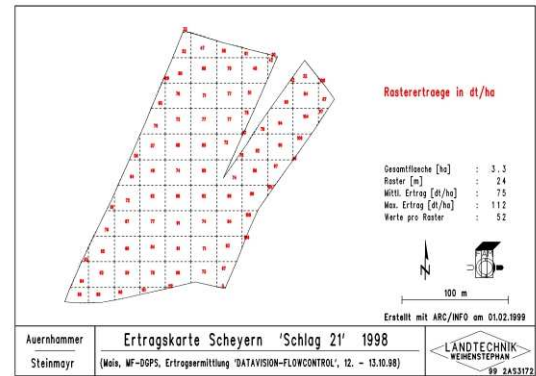
Type 3: Map "Absolute Yield" in different grid layouts



Type 4: Map "Relative Yield" in different grid layouts



Type 5: “Moisture Map” in different grid layouts



Type 6: “Grid Map” with integrated yield data/grid

Every map is named by a unique character string with its data source in the following sequence:

Harvesting date_Crop_Location_Field_Content_Grid size_Language_(Drawing no.)_{ID in AgTecCollection}

- with:
- Harvesting date = YYYY-MM-DD
 - Crop = WW to GR (see above) and UC (Unknown Crop), AC (All Crops)
 - Location = SL (SCHLÜTER), SY (FAM Scheyern), DA (IKB Duernast), VH (Viehhausen), ...
 - Content = Y (Yield abs.), R (Yield rel.), M (Moisture), T (Trace)
 - Grid size = 0 (Trace), 3 to 50 m squared grids
 - Language = DE (German), EN (English)

In total 1,371 maps were generated for the investigated time period and belong to the field locations as shown in table 1.

Table 1: Maps by Year, Location and Language 1990 - 2000

Year	Scheyern (FAM)		Duernast (IKB)		Viehhausen	SCHLUETER, Hardegg, ...		Total
	DE	EN	DE	EN	DE	DE	EN	
1990	9	7	0	0	0	9	9	34
1991	92	55	0	0	0	0	0	147
1992	148	74	0	0	0	0	0	222
1993	23	23	0	0	0	22	22	90
1994	65	35	0	0	0	0	0	100
1995	8	1	13	0	23	0	0	45
1996	5	2	39	0	0	0	0	46
1997	133	41	7	0	6	4	0	191
1998	169	4	75	0	48	5	0	301
1999	60	30	44	57	1	0	0	192
2000	0	0	3	0	0	0	0	3
Total	712	272	181	57	78	40	31	1.371

In table 2 maps are classified by its content and layout.

Table 2: Maps by Year and Data Layout 1990 - 2000

Year	Data	Yield abs.	Yield rel.	Moisture	Grid	Trace	Total
1990	0	30	0	0	0	4	34
1991	45	72	0	0	4	26	147
1992	54	124	2	0	2	40	222
1993	0	60	0	0	1	29	90
1994	0	53	23	0	0	24	100
1995	0	19	7	12	5	2	45
1996	0	19	21	0	0	6	46
1997	0	88	56	1	13	33	191
1998	0	122	114	0	33	32	301
1999	0	132	52	0	0	8	192
2000	0	0	0	0	0	3	3
Total	99	719	275	13	58	207	1.371

Finally in table 3 the generated maps are associated to the crop type.

Table 3: Maps by Year and Crop Type 1990 - 2000

Crop	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	Total	
WW	26	141	0	0	67	34	43	105	153	139	2	710	
WB	0	0	0	0	0	0	0	0	7	22	0	29	
WR	0	0	0	0	8	9	0	23	44	0	0	84	
SW	0	0	0	0	9	0	0	0	0	11	0	20	
TR	0	0	0	0	0	0	0	0	21	0	0	21	
SB	0	0	221	2	0	0	0	0	0	0	0	223	
OA	0	0	0	0	0	0	0	0	0	6	0	6	
PE	0	0	0	0	0	0	0	0	1	3	1	5	
LP	0	0	0	0	10	0	0	0	0	0	0	10	
PT	0	0	0	0	0	0	1	21	47	7	0	76	
SM	0	0	0	87	0	0	0	2	7	4	0	100	
CO	8	0	0	0	0	2	2	19	18	0	0	49	
GR	0	0	0	0	0	0	0	0	2	0	0	2	
UC	0	0	0	0	0	0	0	18	1	0	0	19	
AC	0	6	1	1	6	0	0	3	0	0	0	17	
Total	34	147	222	90	100	45	46	191	301	192	3	1371	
WW	Winter wheat			TR	Triticale			LP	Lupines			GR	Gras
WB	Winter barley			SB	Summer barley			PT	Potato			UC	Unknown crops
WR	Winter rye			OA	Oats			SM	Silage maize			AC	All crops
SW	Summer wheat			PE	Peas			CO	Corn				

As an overview all generated maps in German and in English layout are documented with their thumbnails and the related naming in the mentioned sequence in two different documents.

The generated maps in png-format are arranged by harvesting date in folders of the harvesting location again divided in the two languages as it is shown in the tree of the tar-file.

Documentation Structure

YIELDMAPS

- Maps_English-Layout_1990-2000.pdf
- Maps_German-Layout_1990-2000.pdf
- Maps_Statistics.pdf
- tar_Folder-Structure (Tree) .pdf

Duernast(IKB)

- Maps_Duernast (IKB)_1995-2000.pdf

English_Layout_(EN)

- 1999-07-18_WB_DA_18_Y_12_EN_(2000-2AS-3901) .png
- 1999-07-18_WB_DA_18_Y_25_EN_(2000-2AS-3902) .png
- 1999-07-18_WB_DA_18_Y_50_EN_(2000-2AS-3903) .png
- .
- .
- .
- 1999-09-22_SM_DA_S4_Y_50_EN_(2000-2AS-3923) .png

German_Layout_(DE)

- 1995-08-nn_WW_DA_1_G_24_DE_(1997-2AP-0796) .png
- 1995-08-nn_WW_DA_1_G_50_DE_(1997-2AP-0795) .png
- 1995-08-nn_WW_DA_1_M_12_DE_(1997-2AS-1610) .png
- .
- .
- .
- 2000-08-nn_WW_DA_4_T_00_DE_(2000-2AS-4346) .png

Scheyern(FAM)

- Maps_Scheyern_1990-2000.pdf

English_Layout_(EN)

- 1990-08-12_WW_SY_Flachfeld_T_00_EN_(1992-2AP-0098)_{...
- 1990-08-12_WW_SY_Flachfeld_Y_05_EN_(1991-2AP-0010)_{...
- 1990-08-12_WW_SY_Flachfeld_Y_12_EN_(1991-2AP-0011)_{...
- .
- .
- .
- 1999-09-nn_PT_SY_15_Y_50_EN_(2000-2AS-4047) .png

German_Layout_(DE)

- 1990-08-12_WW_SY_Flachfeld_T_00_DE_(1992-2AP-0095)_{...
- 1990-08-12_WW_SY_Flachfeld_Y_05_DE_(1991-2AP-0026)_{...
- 1990-08-12_WW_SY_Flachfeld_Y_05_DE_(1992-2AP-0094) .png
- .
- .
- .
- 1999-09-nn_PT_SY_15_Y_50_DE_(2000-2AS-4044) .png

SCHLUETER_HARDEGG_Others

- Maps_SCHLÜTER_Hardegg_others.pdf

English_Layout_(EN)

- 1990-08-20_WW_SL_Schlueterhof_T_00_EN_(1993-2AP-0178) .png
- 1990-08-20_WW_SL_Schlueterhof_Y_05_EN_(1991-2AP-0005)_{...

1990-08-20_WW_SL_Schlueterhof_Y_12_EN_(1991-2AP-0004)_ {...
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.
1993-10-31_SM_FL_3_T_00_EN_(1993-2AP-0188) .png

German_Layout_(DE)

1990-08-20_WW_SL_Schlueterhof_T_00_DE_(1993-2AP-0177) .png
1990-08-20_WW_SL_Schlueterhof_Y_05_DE_(1991-2AP-0021)_ {...
1990-08-20_WW_SL_Schlueterhof_Y_12_DE_(1991-2AP-0020)_ {...
.
.
1998-08-07_WW_FT_Waldacker_Y_50_DE_(1999-2AS-3346) .png

Viehhausen (Organic Farming)

Maps_Viehhausen_1995-1999.pdf

German_Layout_(DE)

1995-08-07_WW_VH_4_G_24_DE_(1997-2AP-0460) .png
1995-08-07_WW_VH_4_G_50_DE_(1997-2AP-0459) .png
1995-08-20_WR_VH_1_M_12_DE_(1997-2AS-1596) .png
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1999-07-28_PE_VH_4_Y_25_DE_(1999-2AS-3828) .png