



COST 734 WG4 Berlin Analysis of climate related variation in crop yields

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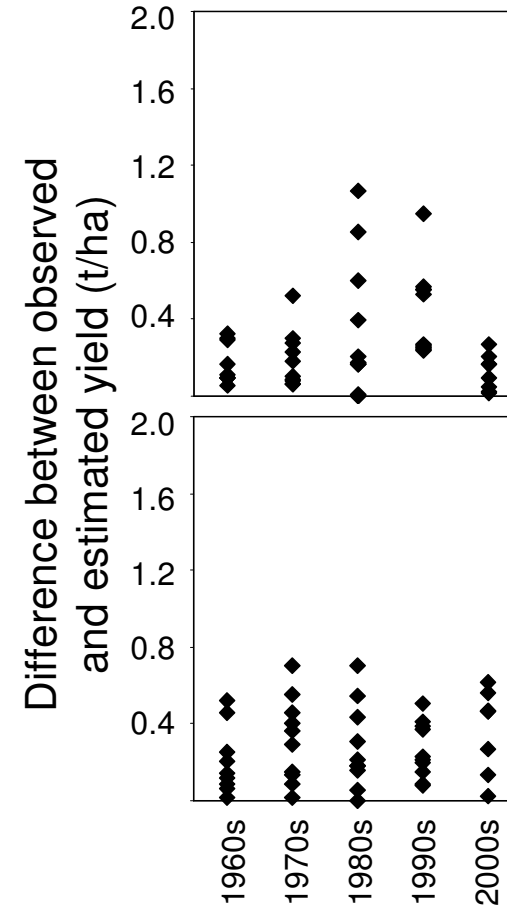
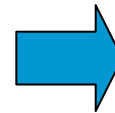
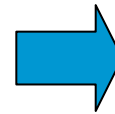
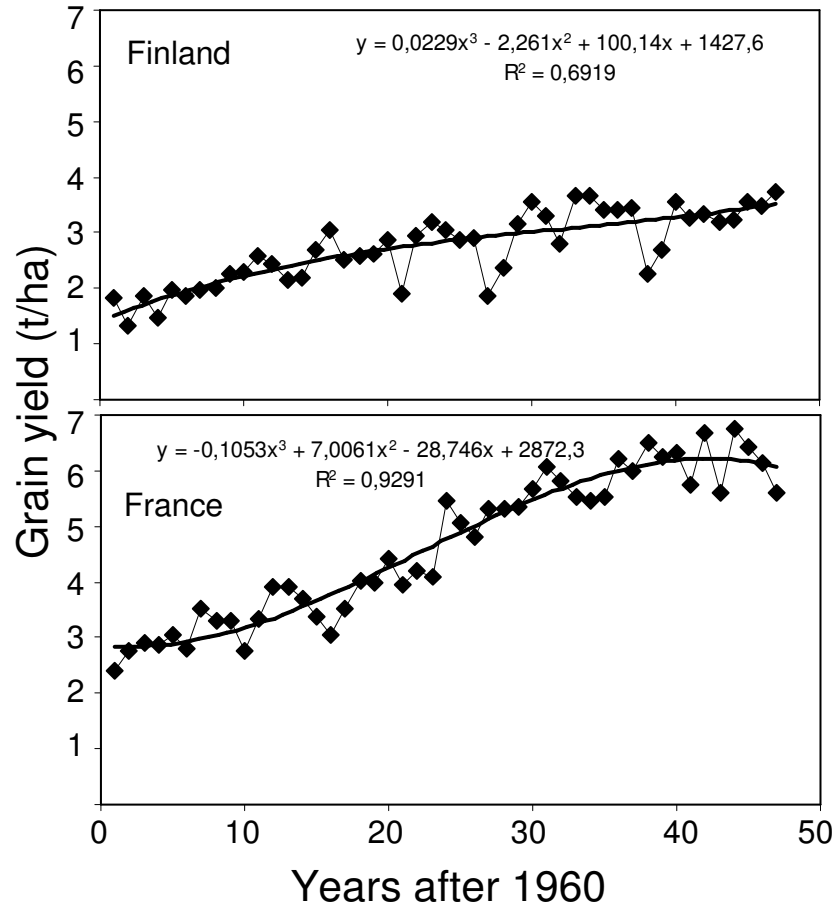
COST 734 WG4

- Introduction of this meeting:
 - Determination of critical thresholds
 - What we can accept
 - What we cannot accept
- Approaching this with suggested work?

Basic idea

- Long-term FAO yield datasets
 - 1960-2007
 - Austria, Czech Republic, Denmark, Finland, France, Germany, Hungary, The Netherlands, Norway, Switzerland (only Hungary not in Mirek's datasets)
- Long-term climatic datasets
 - Same period or what is available
- Characterization of variation in yield
 - Barley, wheat, rapeseed, potato and sugar beet
 - Is either spring or winter type used, is either one dominating or in full mix and has there been change over time?
 - Forage maize no more in FAO statistics
- Characterization of periods with recorded high variation or deviations in climatic parameters that have major role in yield determination
- Interpretation of the results
- Writing a joint article

Example: Barley yield in Finland and France



	SUM PER DECADE Absolute Value for Barley Observed - Estimated Yields (kg/ha)									
	Austria	Czech Rep	Denmark	Finland	France	Germany	Hungary	Netherlands	Norway	Switzerland
1960s	1981	2413	2122	1714	2063	2455	2125	2297	2971	1866
1970s	2519	2281	2019	1903	3171	2317	2510	2156	2901	2391
1980s	3087	2754	3281	3626	2782	1956	4249	4174	2149	4371
1990s	2627	4474	4287	4420	2635	2292	4242	3594	3088	4456
2000s	3266	3795	1612	1233	3758	3404	5713	1809	1665	2861

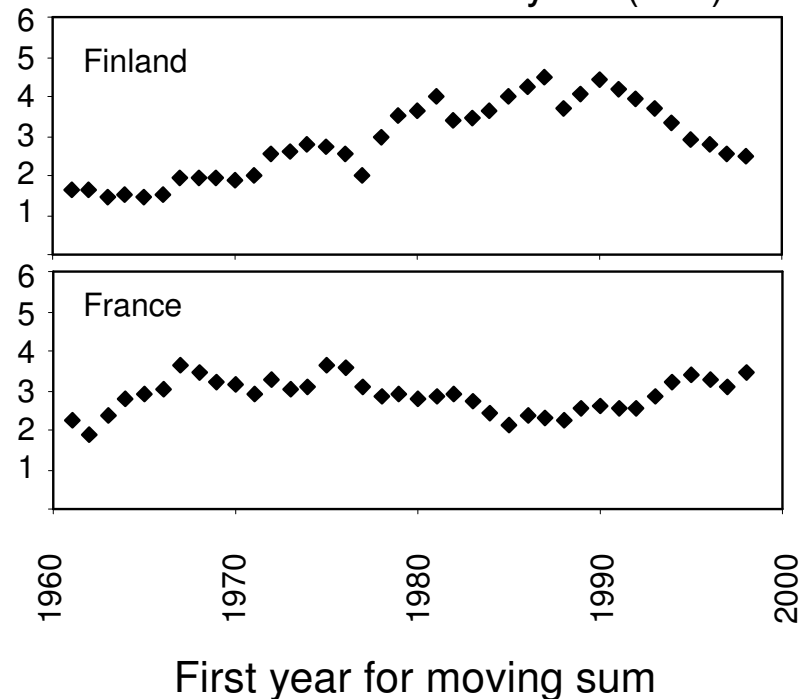
Example: Barley yield in Finland and France



		10 YEAR MOVING SUM FOR Absolute Value for Barley Observed - Estimated Yields (kg/ha)									
from		Austria	Czech Rep	Denmark	Finland	France	Germany	Hungary	Netherlands	Norway	Switzerland
1961		1880	2459	2073	1632	2261	2582	2580	2835	2831	1947
1962		1944	2255	1845	1641	1897	2159	2240	2873	2492	2312
1963		1862	2040	1984	1442	2370	2153	1809	2492	2381	2122
1964		1829	1965	1784	1502	2768	2379	1864	2572	2339	1850
1965		2002	2083	1811	1450	2902	2549	1852	2198	2913	2152
1966		1900	2077	1912	1514	3045	2383	2204	2380	3557	2179
1967		2076	2019	2579	1941	3632	2476	2048	2087	3413	2105
1968		1838	1999	2609	1964	3472	2299	1934	1881	3537	2347
1969		1887	2154	2307	1930	3235	2051	1973	2101	3172	2376
1970		2519	2281	2019	1903	3171	2317	2510	2156	2901	2391
1971		2510	2009	2168	1982	2928	2009	2201	1500	2870	2221
1972		3040	2405	2206	2532	3273	2304	2429	1388	2832	2045
1973		3084	2407	2013	2605	3023	2074	2578	2116	2888	1944
1974		3142	2432	3039	2768	3105	2083	2567	2264	3135	2195
1975		3199	2667	3446	2697	3657	1873	3184	2713	2865	2614
1976		3058	2655	3474	2524	3553	2017	2937	2573	2432	2431
1977		3220	2554	3020	2006	3061	1747	3093	3447	2329	3458
1978		3491	2619	3031	2990	2875	1944	3202	3527	2114	3621
1979		3558	2525	3034	3527	2919	1979	3892	3700	2192	3522
1980		3087	2754	3281	3626	2782	1956	4249	4174	2149	4371
1981		3692	4013	3695	3988	2835	2061	4769	4274	2663	4359
1982		3292	4078	3909	3384	2904	2102	5072	4195	2717	4386
1983		3467	4058	5563	3460	2747	2323	5009	3650	3200	4606
1984		3821	4406	4761	3634	2434	2477	5994	3805	3106	4608
1985		3489	4157	4167	3984	2145	2454	5097	3952	2816	4314
1986		3227	4114	4188	4251	2350	2402	5102	4121	2929	4598
1987		3254	4332	4215	4505	2333	2447	5659	3784	2928	4015
1988		3099	4521	4402	3680	2229	2403	5524	3965	3146	3811
1989		2932	4874	4415	4031	2547	2356	4816	3904	2912	4496
1990		2627	4474	4287	4420	2635	2292	4242	3594	3088	4456
1991		2732	3953	3728	4162	2559	2202	4115	3413	2529	4377
1992		2533	3400	3352	3962	2521	2319	3551	3664	2475	4708
1993		2499	3501	1896	3723	2836	2359	4005	3978	2068	4587
1994		2411	3271	1768	3326	3225	2787	3913	3883	1909	4966
1995		3130	3959	1649	2935	3378	3251	4866	3189	2411	5041
1996		3280	4013	1556	2761	3252	3143	5288	3056	2057	4666
1997		2876	3811	1590	2525	3082	3062	4982	2594	1801	4209
1998		2789	3659	1459	2488	3470	3050	5083	2245	1636	3906

Example: Barley yield in Finland and France

10 years' moving sum of difference between observed and estimated yield (t/ha)



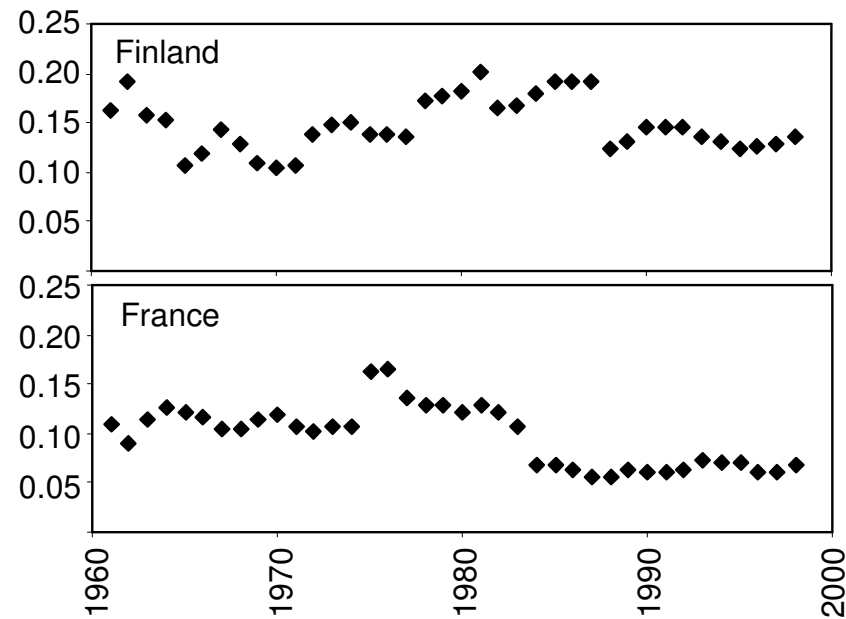
Example: Barley yield in Finland and France



		10 YEAR MOVING S.D. and MEAN as RATIO for Barley Observed Yields (kg/ha)									
To	from	Austria	Czech Rep	Denmark	Finland	France	Germany	Hungary	Netherlands	Norway	Switzerland
1970	1961	0,114	0,147	0,057	0,164	0,110	0,121	0,123	0,093	0,158	0,079
1971	1962	0,119	0,165	0,049	0,192	0,090	0,088	0,150	0,093	0,166	0,102
1972	1963	0,119	0,169	0,049	0,158	0,114	0,104	0,177	0,087	0,140	0,110
1973	1964	0,113	0,172	0,045	0,153	0,127	0,107	0,197	0,093	0,138	0,094
1974	1965	0,117	0,174	0,046	0,106	0,122	0,123	0,198	0,092	0,164	0,116
1975	1966	0,068	0,138	0,053	0,119	0,116	0,108	0,186	0,093	0,167	0,095
1976	1967	0,081	0,105	0,074	0,143	0,104	0,083	0,176	0,087	0,136	0,087
1977	1968	0,082	0,100	0,075	0,128	0,104	0,082	0,162	0,091	0,136	0,085
1978	1969	0,090	0,109	0,075	0,110	0,114	0,088	0,161	0,112	0,139	0,095
1979	1970	0,102	0,106	0,076	0,105	0,118	0,083	0,150	0,113	0,125	0,094
1980	1971	0,103	0,090	0,072	0,108	0,107	0,054	0,122	0,083	0,127	0,076
1981	1972	0,104	0,089	0,071	0,139	0,101	0,047	0,109	0,072	0,128	0,078
1982	1973	0,111	0,077	0,078	0,148	0,106	0,058	0,100	0,104	0,125	0,083
1983	1974	0,115	0,077	0,094	0,151	0,107	0,060	0,106	0,099	0,124	0,076
1984	1975	0,133	0,115	0,138	0,139	0,163	0,084	0,158	0,113	0,124	0,128
1985	1976	0,126	0,111	0,145	0,138	0,165	0,097	0,141	0,098	0,088	0,119
1986	1977	0,126	0,102	0,130	0,135	0,135	0,086	0,140	0,116	0,068	0,121
1987	1978	0,123	0,100	0,129	0,172	0,128	0,080	0,137	0,103	0,068	0,103
1988	1979	0,132	0,101	0,129	0,177	0,128	0,083	0,154	0,105	0,075	0,109
1989	1980	0,105	0,098	0,133	0,182	0,122	0,086	0,141	0,097	0,074	0,140
1990	1981	0,121	0,129	0,140	0,201	0,128	0,089	0,150	0,093	0,095	0,137
1991	1982	0,090	0,105	0,134	0,165	0,121	0,086	0,130	0,087	0,095	0,133
1992	1983	0,089	0,098	0,169	0,166	0,106	0,078	0,121	0,092	0,119	0,131
1993	1984	0,092	0,105	0,130	0,181	0,068	0,063	0,167	0,092	0,115	0,123
1994	1985	0,092	0,116	0,128	0,193	0,068	0,063	0,165	0,094	0,112	0,123
1995	1986	0,092	0,124	0,134	0,193	0,063	0,068	0,167	0,090	0,114	0,122
1996	1987	0,081	0,132	0,136	0,192	0,056	0,064	0,188	0,102	0,115	0,094
1997	1988	0,069	0,137	0,135	0,125	0,055	0,059	0,190	0,105	0,118	0,074
1998	1989	0,069	0,147	0,133	0,132	0,063	0,054	0,185	0,091	0,110	0,080
1999	1990	0,068	0,142	0,133	0,145	0,060	0,062	0,170	0,080	0,111	0,089
2000	1991	0,079	0,098	0,131	0,145	0,062	0,063	0,155	0,075	0,097	0,087
2001	1992	0,077	0,054	0,131	0,145	0,063	0,078	0,122	0,073	0,096	0,091
2002	1993	0,073	0,051	0,047	0,136	0,073	0,069	0,128	0,077	0,068	0,092
2003	1994	0,073	0,051	0,036	0,131	0,071	0,067	0,144	0,079	0,066	0,096
2004	1995	0,091	0,112	0,029	0,124	0,070	0,076	0,172	0,065	0,088	0,097
2005	1996	0,091	0,114	0,028	0,127	0,061	0,075	0,175	0,061	0,073	0,090
2006	1997	0,087	0,117	0,038	0,128	0,061	0,071	0,168	0,053	0,070	0,088
2007	1998	0,088	0,117	0,039	0,135	0,069	0,072	0,168	0,049	0,070	0,086

Example: Barley yield in Finland and France

10 years' moving S.D. to mean ratio for observed yields



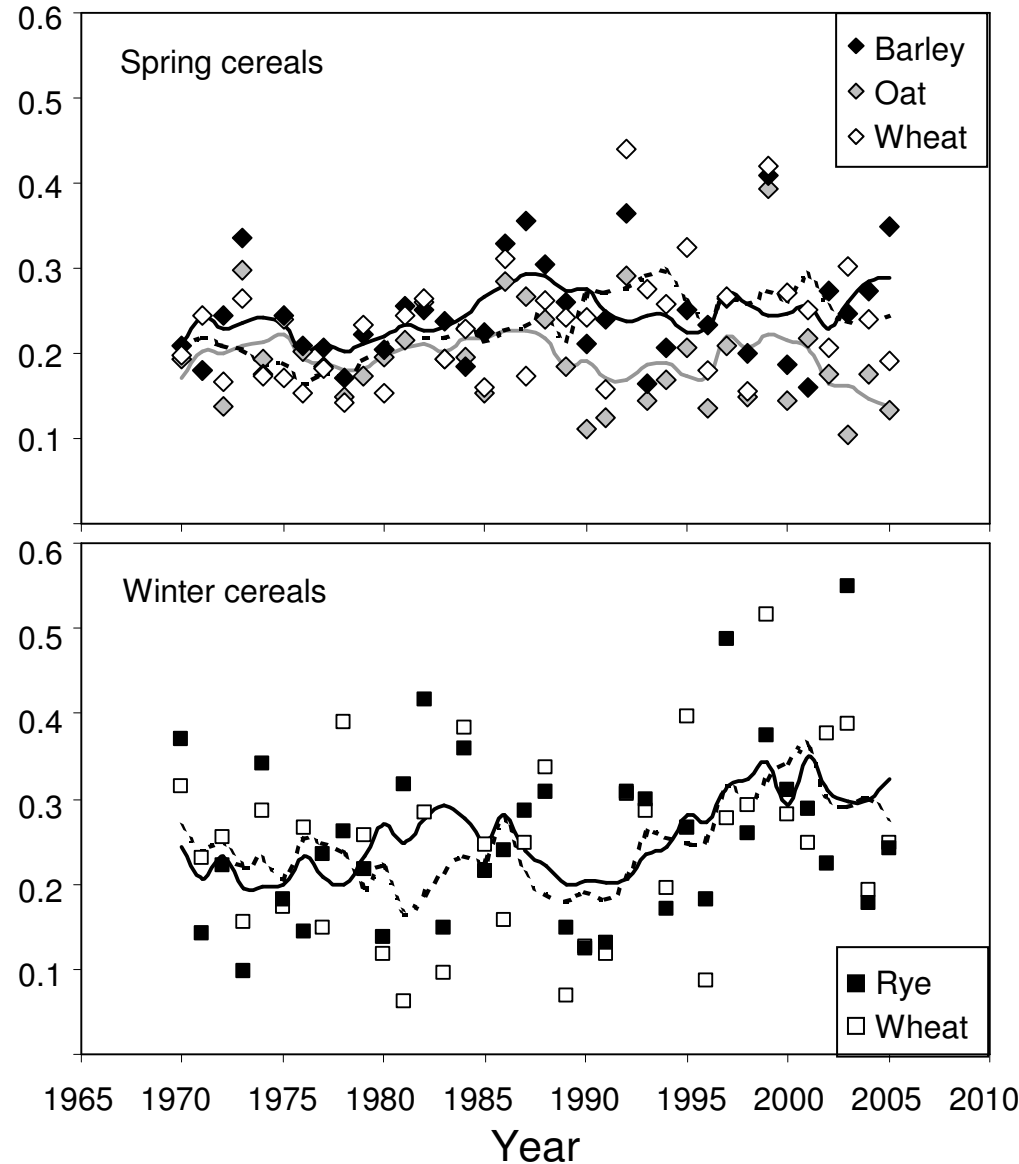
First year for moving S.D. to mean ratio

Basic idea

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 - 1960-2007
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- Long-term climatic datasets
 - Same period or what is available
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- Writing a joint article

Within year variation in Finland

Relative variation in grain yield



S.D. within each year divided by mean and 5 years moving average as lines

MTT long-term multi-location variety trials since 1970

Peltonen-Sainio, P., Jauhiainen, L., Laurila, I.P. 2009. Cereal yield trends in northern European conditions: changes in yield potential and its realisation. *Field Crops Research* 110: 85-90.



Thank you!

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