A joined European network of progeny trials of *Larix decidua 'polonica'*

First results (*continued*)

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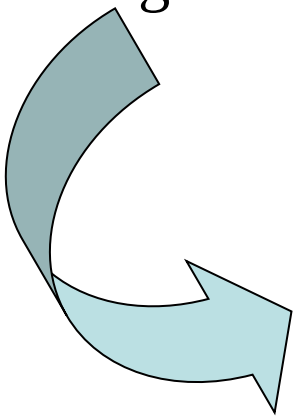
What does large genetic field experimental network across Europe bring to the scientific community? TREEBREEDEX seminar, 22-24 June 2010, Sekocin (PL)

Objectives

Larix '*polonica*' has shown interest in IUFRO provenance trials

- to broaden the geographic origin of provenances (Grojec),
- to confirm the interest of polish larch in terms of *adaptation*, *stem straightness*, *wood quality*,
- to examine seed transfer possibilities from East to West,
- to get a better picture on how genetic variability is structured.

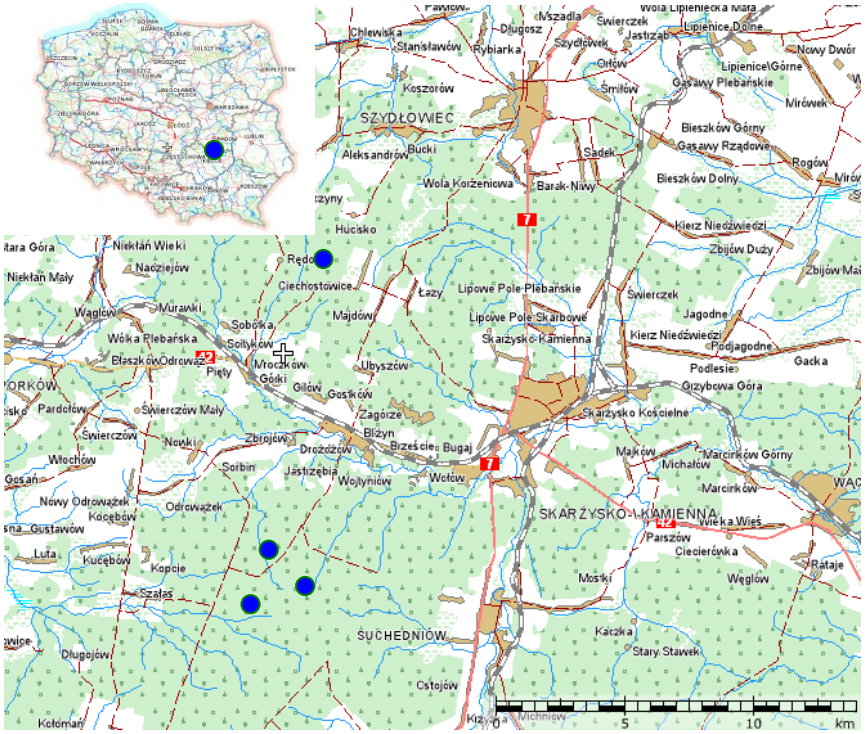


- *to broaden the breeding population,*
- *to take benefits of polish larch properties in interspecific hybridization.*

Material & Methods

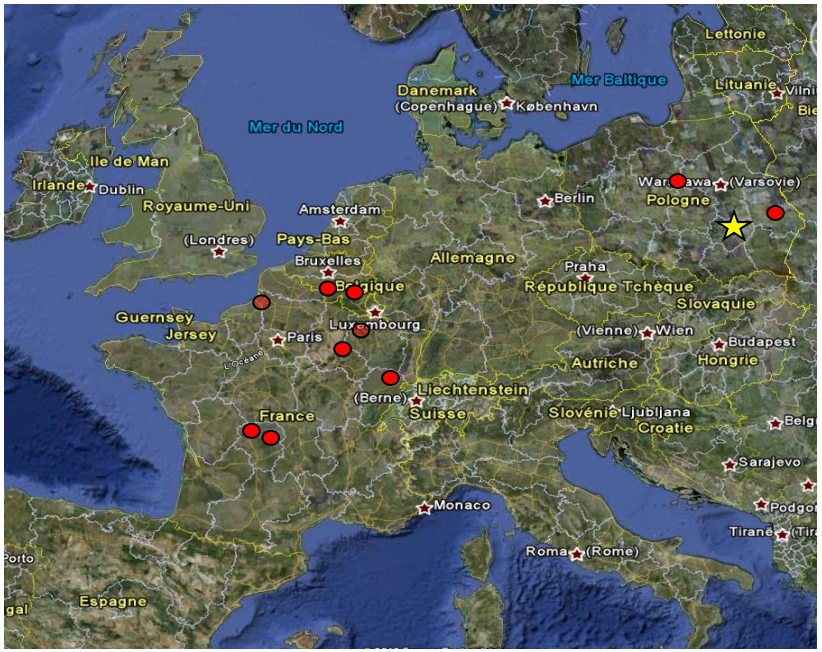
- Joined cone collection by INRA & IBL in Mont Gory Swietokezyski in Dec.1987,
- 157 open-pollinated progenies, randomly chosen (except distances and level of fructification),
- in 4 autochtonous ‘stands’ (mainly old natural reserves).

- material shared with IBL and SRFGx



Field trials

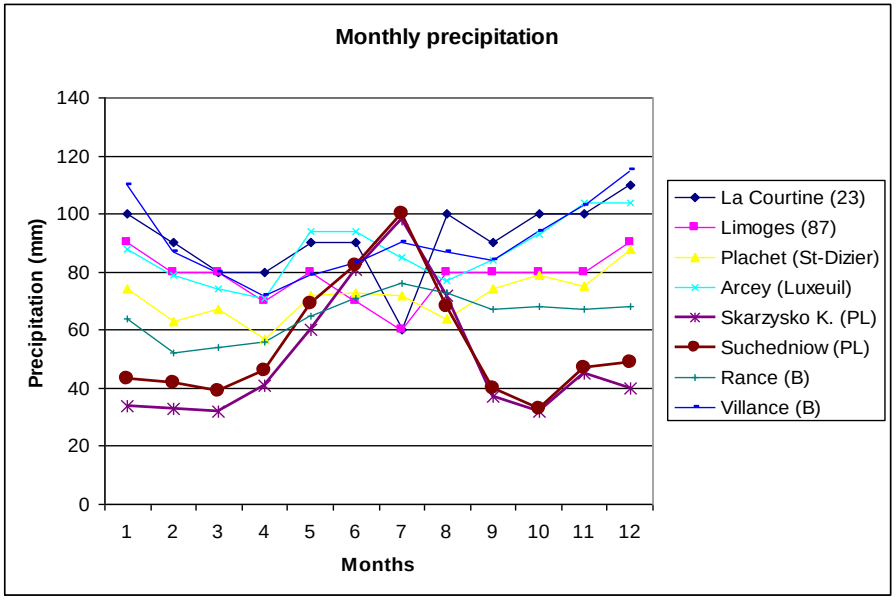
8 progeny trials + 2 conservation plots

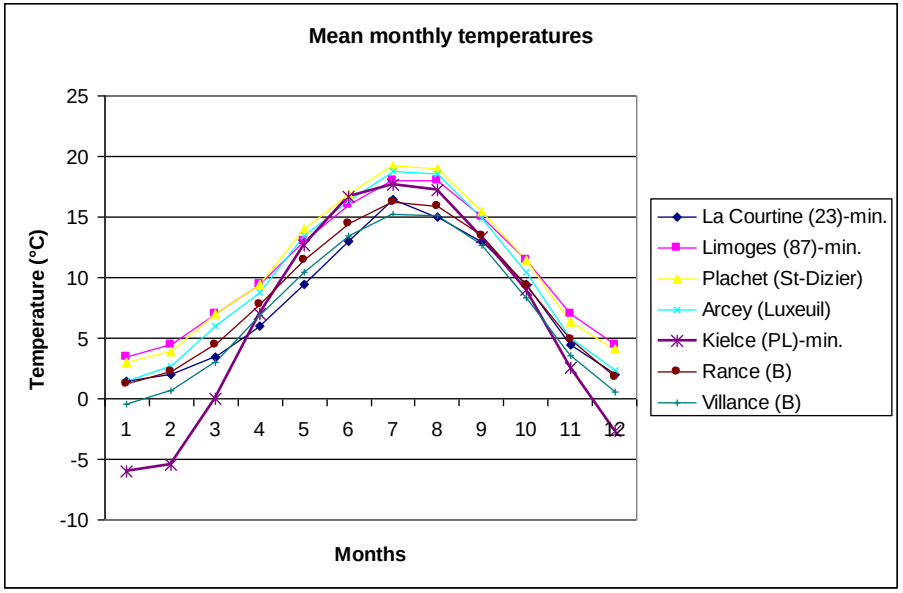


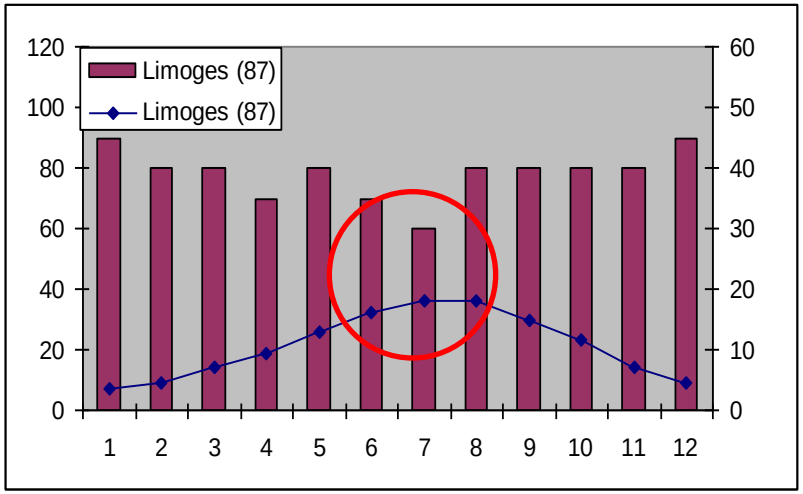
Site	Country	Region	Longitude	Latitude	Altitude (m)	Année semis	Area (ha)	Ecartements (m)	Nber of progenies	Design
FC.Arcey (25)	F	Jura	6°35' E	47°30' N	410	1989	5.84	2.5x2.5	157	IRBD, 1 tree plot
FD.Plachet (52)	F	Lorraine	4°59' E	48°15' N	320	1989	7.14	3x3	157	IRBD, 1 tree plot
Crozet (23)	F	Plateau de Millevaches	2°11' E	45°48' N	750	1990	5.06	3x3	157	IRBD, 1 tree plot
Bort (87)	F	Ouest Massif Central	1°20' E	45°56' N	350	1990	4.48	3x3	157	IRBD, 1 tree plot
FD. Apremont (55)	F	Plateau Meuse	5°37' E	48°52' N	350	1989	5.00	3x3	-	
FD. Eu (76)	F	Normandie	1°37' E	49°53' N	190	1990	1.51	3x3	-	
Kutno	PL		19°19' E	52°16' N		1996	1.9	2x2	157	1 tree plot
Zwierzyniec	PL		23°02' E	50°46' N		1998	2.2	2x2	85	1 tree plot
Rance	B	Fagne	4°15'E	50°10' N	250	1994	1.2	3x2	93	CRBD, 8 trees raw plot
Villance	B	Ardennes	5°14'E	50°00' N	425	1994	1.4	3x2	93	CRBD, 8 trees raw plot

Ecologically contrasting sites

- From less than 150 m up to 750 m asl.
- Constrated soils:
  - shallow (Arcey, Bort) to deep (Croze)
  - very low (Bort, Croze) up to high pH soils (Arcey, Plachet)
- Climatically different






Limoges (87)
Limoges (87)
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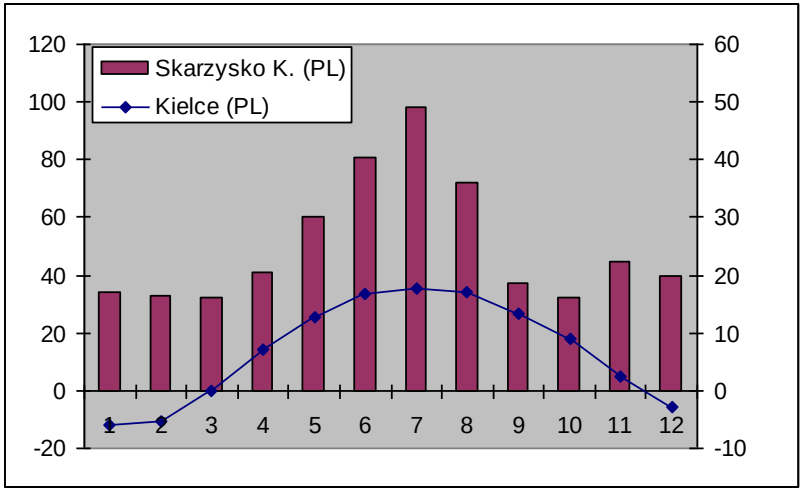
Skarzysko K. (PL)
Kielce (PL)
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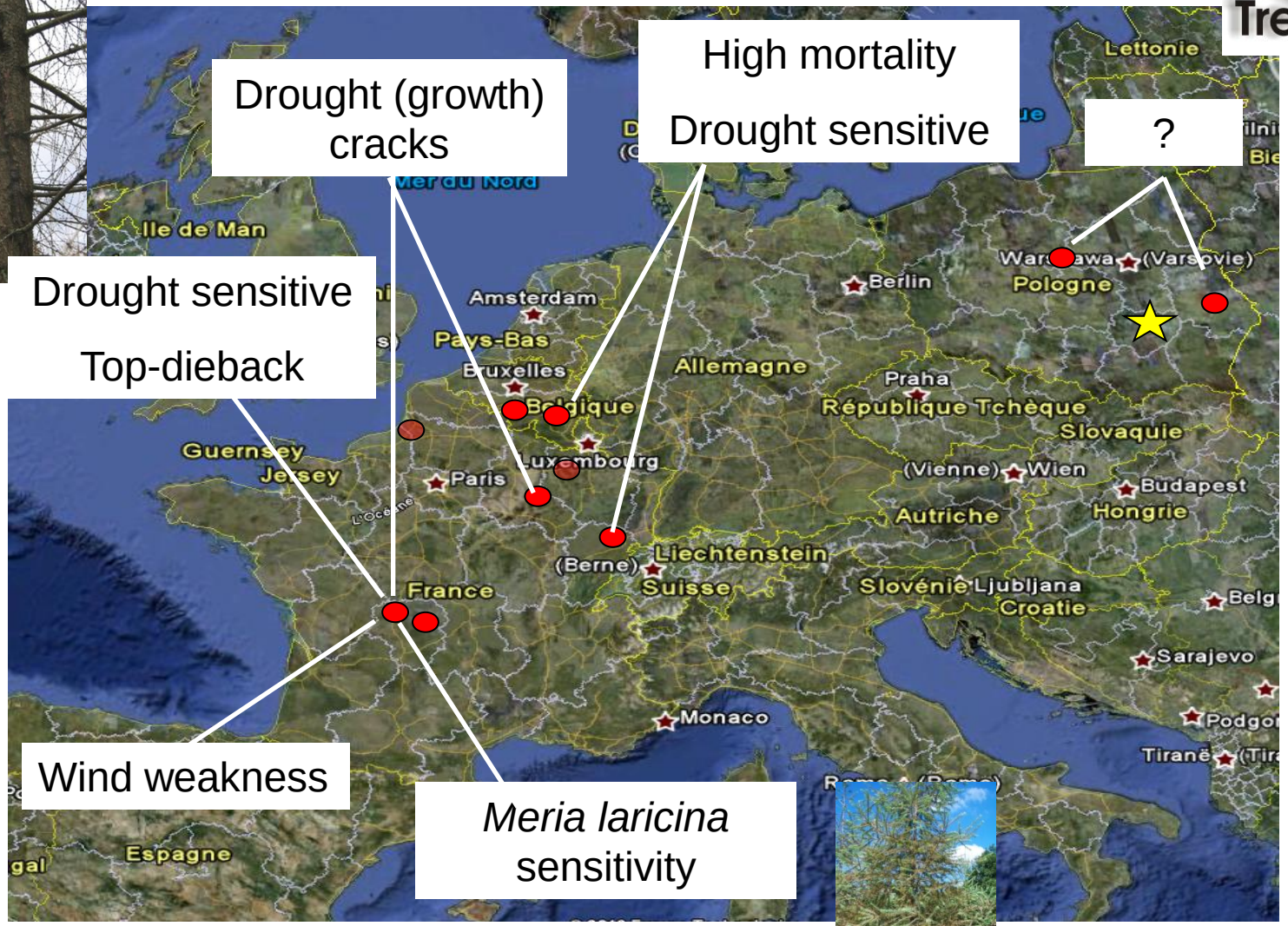
Results: 1) Adaptive traits



Results

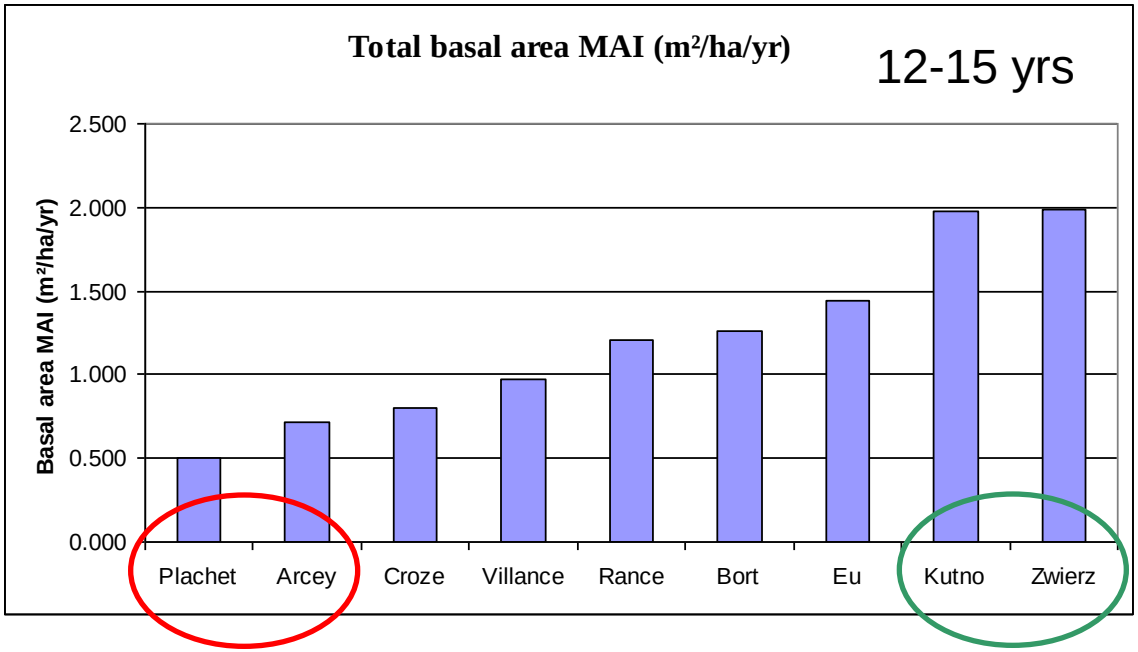
2) Growth and stem form

Field trial networks and difficulties

- Experimental design
- Site preparation
- Spacing
- Thinning
- Traits assessed and timing

		Arcey	Plachet	Bort	Croze	Eu	Rance	Villance	Kutno	Zwierzyniec
HT	1								x	
HT	2	x	x	x	x	x			x	x
HT	3								x	x
HT	4			x	x				x	x
HT	5	x		x	x		x	x		x
HT	6	x		x	x		x	x		x
HT	7	x	x				x	x		
HT	8	x	x	x	x					
HT	9	x	x	x	x					
HT	10	x	x		x					
HT	11		x	thinned						
HT	12		x						(x)	(x)
HT	13									
HT	14						(x)	(x)		
HT	15									
G	6								x	x
G	7	x								x
G	8									
G	9			x					x	x
G	10	x		x	x					
G	11			thinned						
G	12		x						x	x
G	13									
G	14						x	x		
G	15			x	x	x				
SS	4								x	
SS	5									
SS	6									
SS	7		x				x	x		x
SS	8									
SS	9			x						
SS	10	x			x					
SS	11			thinned						
SS	12		x						x	x
SS	13									
SS	14						x	x		
SS	15			x	x	x				

Site ‘fertility’

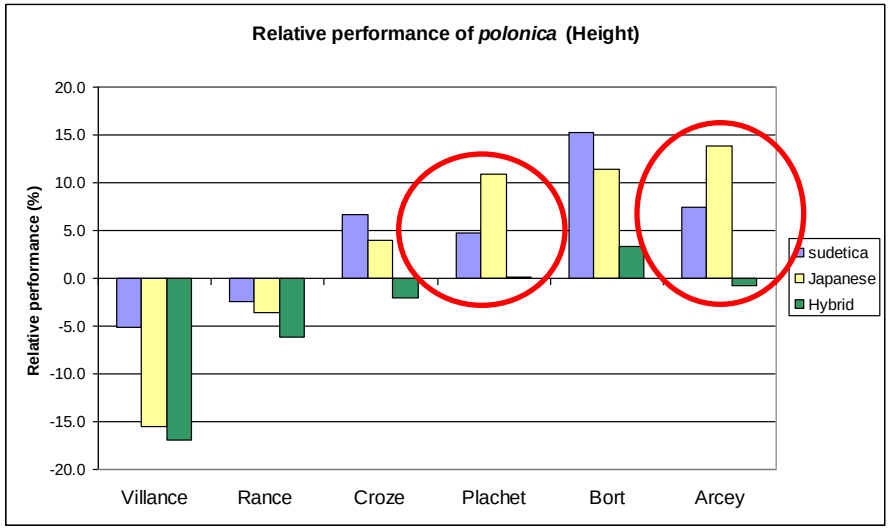


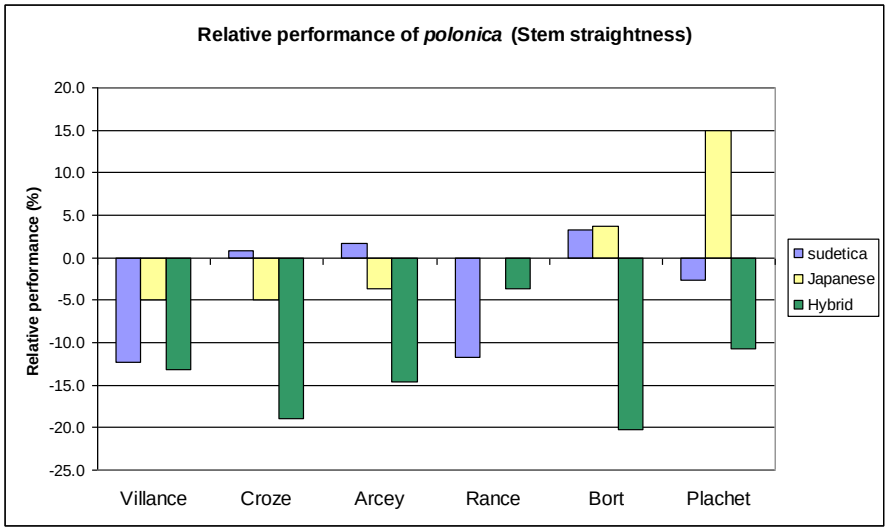
Correction for spacing/ mortality/ thinning/ age assessment

- *Polish sites more vigorous than FR/BE sites:*

up to 4x more BA MAI !! In France, ratio of 1 to 3 among sites.

Relative performance of *polonica* vs *sudetica* and other larch taxa





➢ *Even in less fertile sites in France, polonica grows better than or as well as other larch controls*

➢ *But stem form is worse in all sites*

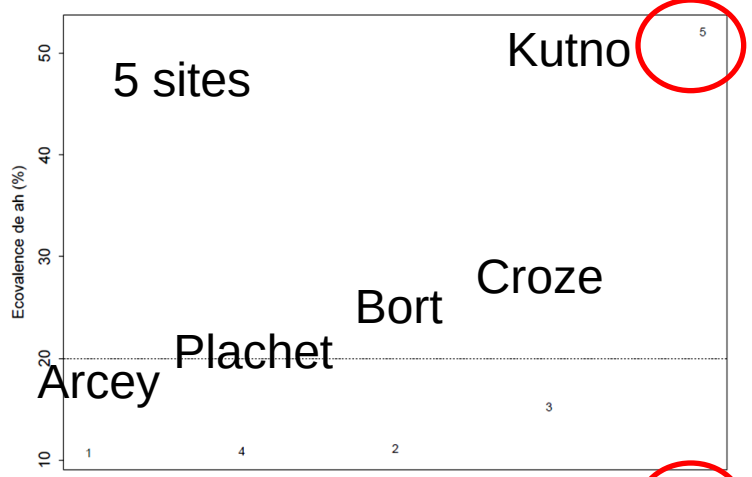
5 sites	146 progenies	Arcey	Plachet	Croze	Bort	Kutno	Overall
h^2	ah	0.109	0.140	0.255	0.248	0.325	0.099
	ac	0.136	0.190	0.262	0.380	0.225	0.139
	fl	0.296	0.300	0.384	0.343	0.109	0.254
CVA	ah	13.7	16.6	24.4	15.5	31.1	13.6
	ac	17.2	20.4	29.9	23.3	26.3	18.9
	fl	28.6	31.8	33.7	32.8	16.3	27.6

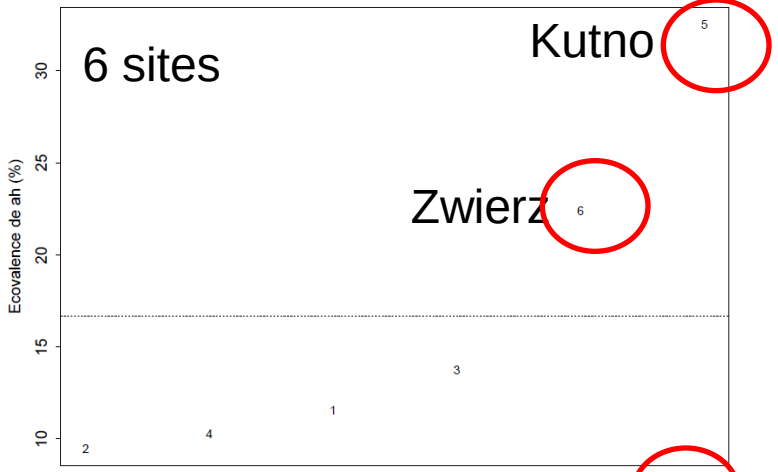
6 sites	70 progenies	Arcey	Plachet	Croze	Bort	Kutno	zwierz	Overall
h^2	ah	0.071	0.114	0.265	0.275	0.290	0.143	0.062
	ac	0.095	0.168	0.247	0.410	0.238	0.316	0.113
	fl	0.378	0.350	0.570	0.405	0.142	0.365	0.309
CVA	ah	11.0	15.2	25.1	16.2	28.9	19.9	12.0
	ac	14.1	19.5	29.4	24.1	27.2	28.1	16.3
	fl	31.9	34.6	39.9	35.3	16.7	30.9	29.1

8 sites	47 progenies	Arcey	Plachet	Croze	Bort	Kutno	zwierz	Rance	Villance	Overall
h^2	ah	0.084	0.104	0.302	0.277	0.300	0.263	0.154	0.523	0.087
	ac	0.071	0.135	0.282	0.342	0.215	0.298	0.127	0.304	0.090
	fl	0.339	0.366	0.560	0.462	0.121	0.393	0.587	0.660	0.318
CVA	ah	12.1	14.6	27.1	16.3	29.3	20.1	17.4	38.7	13.0
	ac	12.2	17.5	31.6	21.8	25.5	26.9	18.0	26.6	14.9
	fl	29.6	35.7	40.6	37.7	15.5	32.1	41.3	43.2	29.4

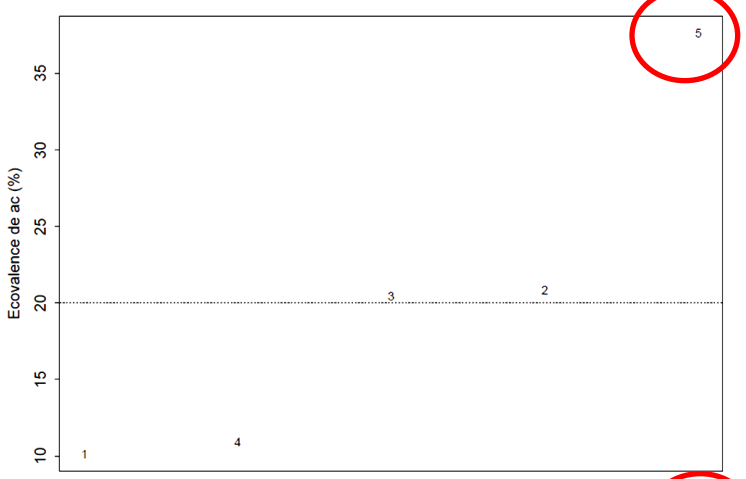
- CV_A, h^2 : $ah < ac < fl$
- h^2 >> *in good sites compared to poorest sites*

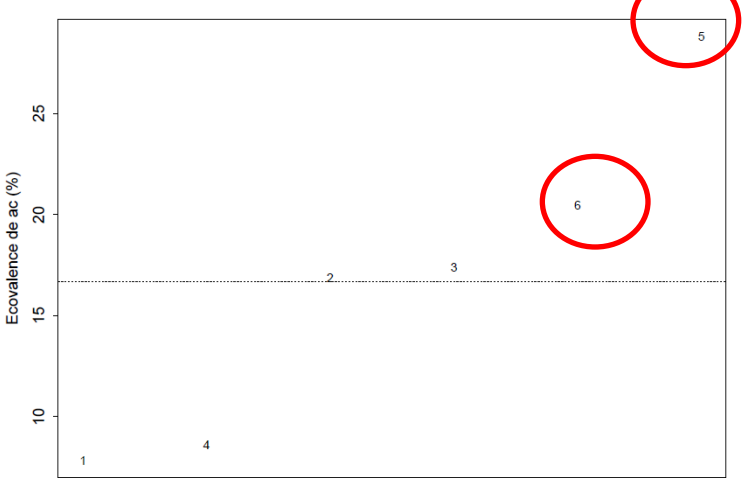
Height



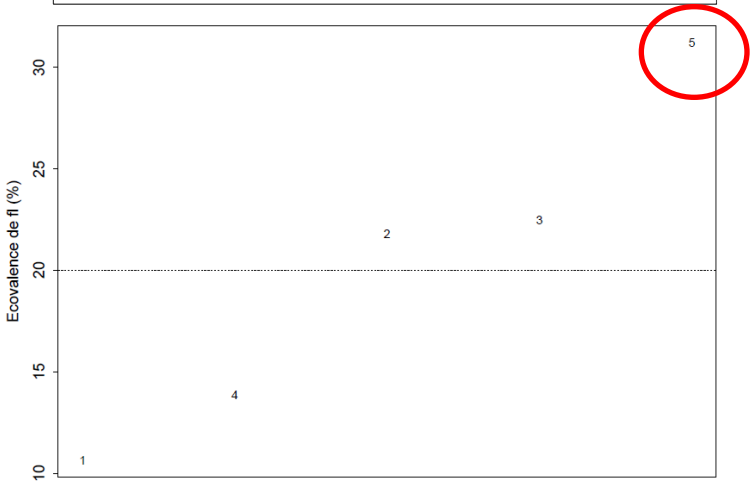


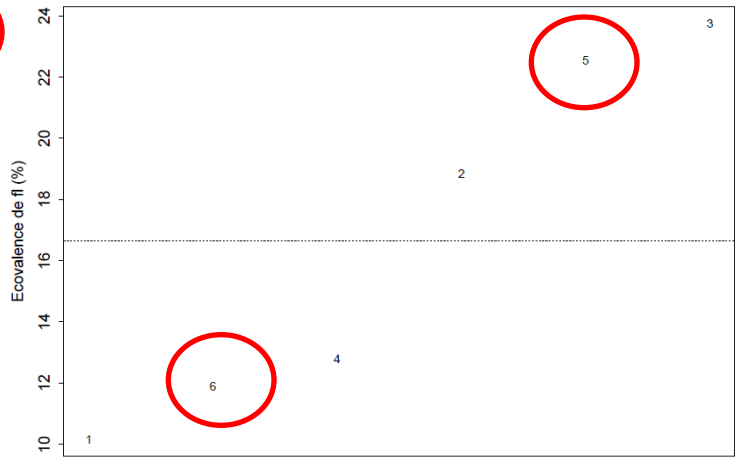
Girth

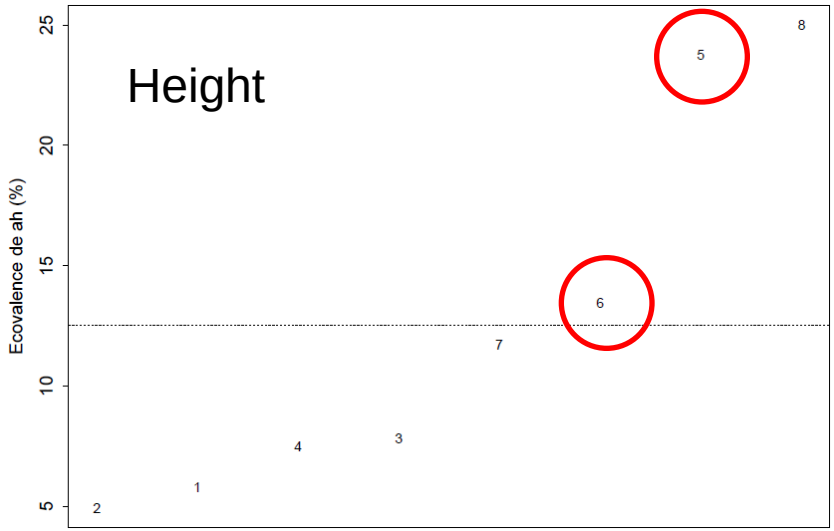




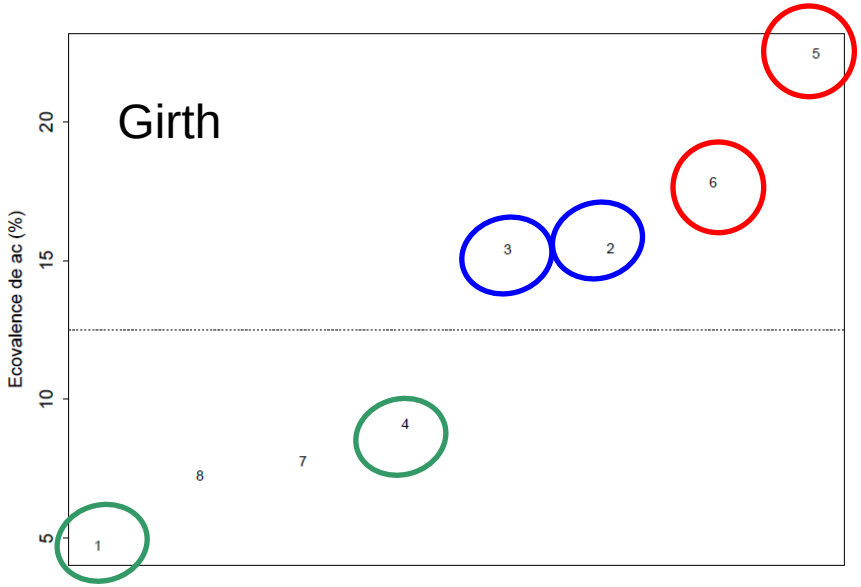
Stem form

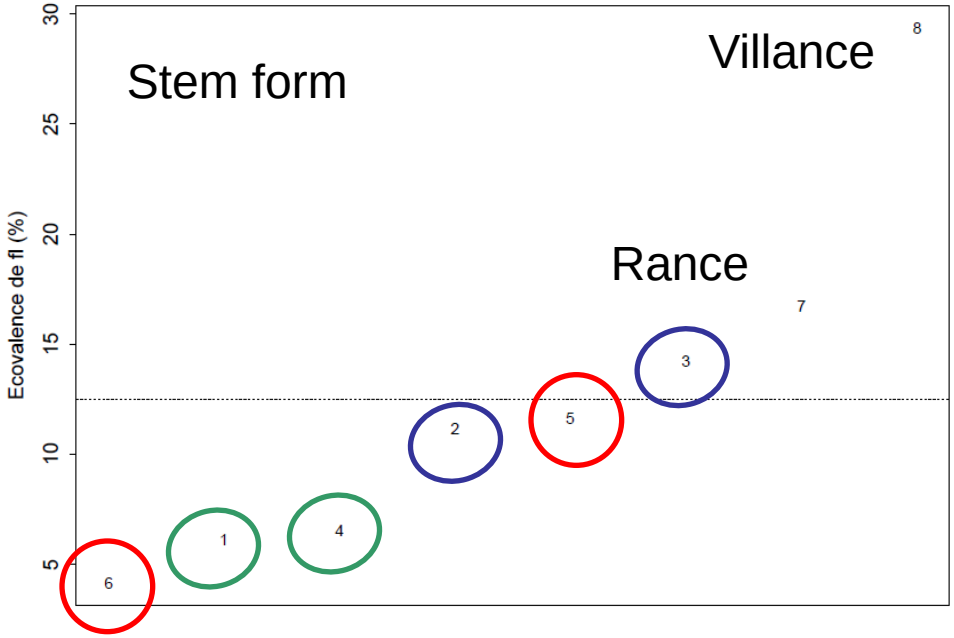




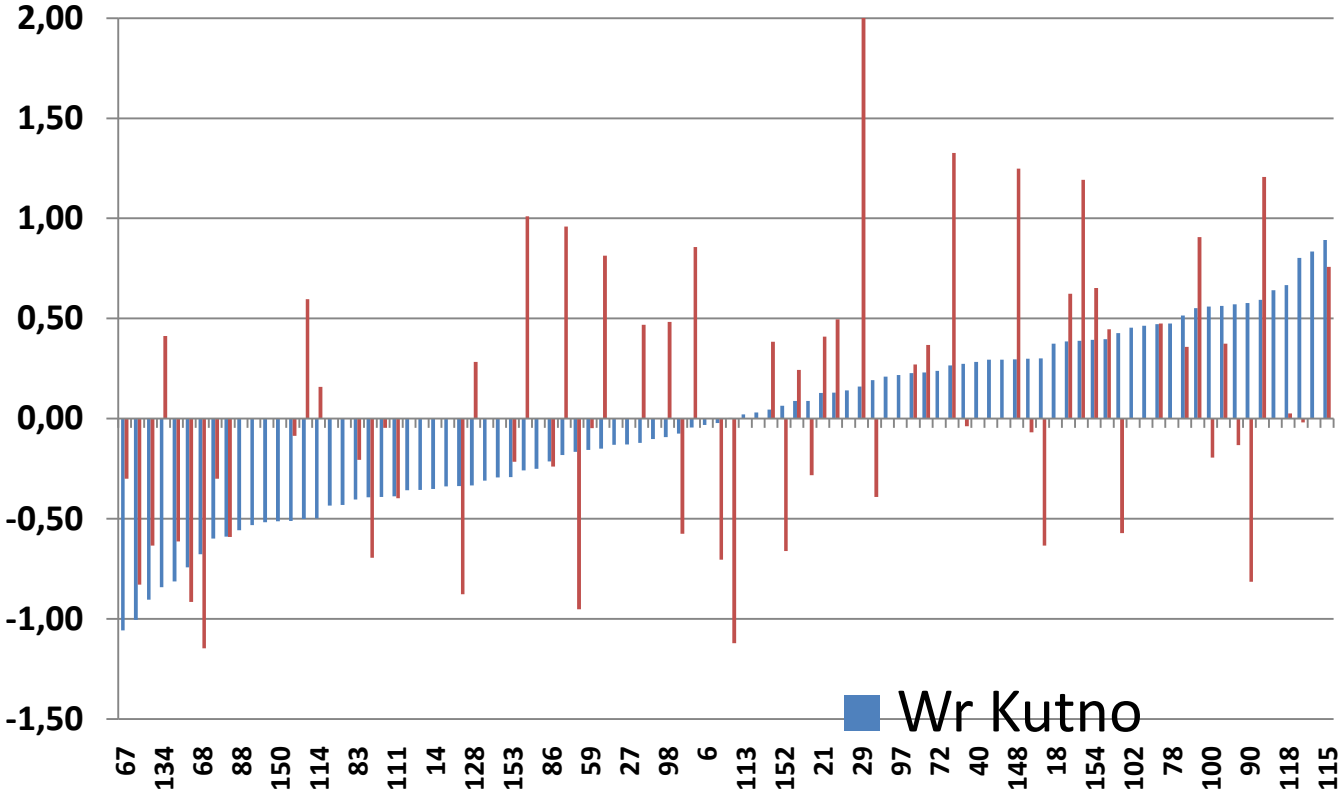


8 sites



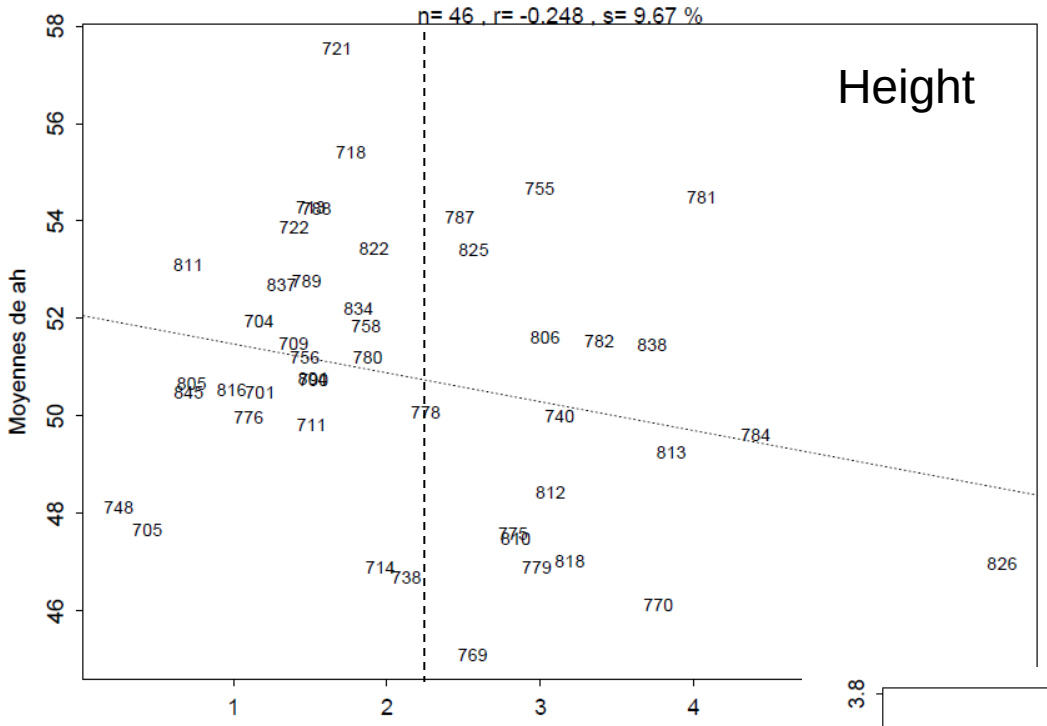


- *PL (B) sites more interactive than F sites for growth but not for stem form*
- *Low pH-soil sites in FR more interactive than high pH-soil sites*



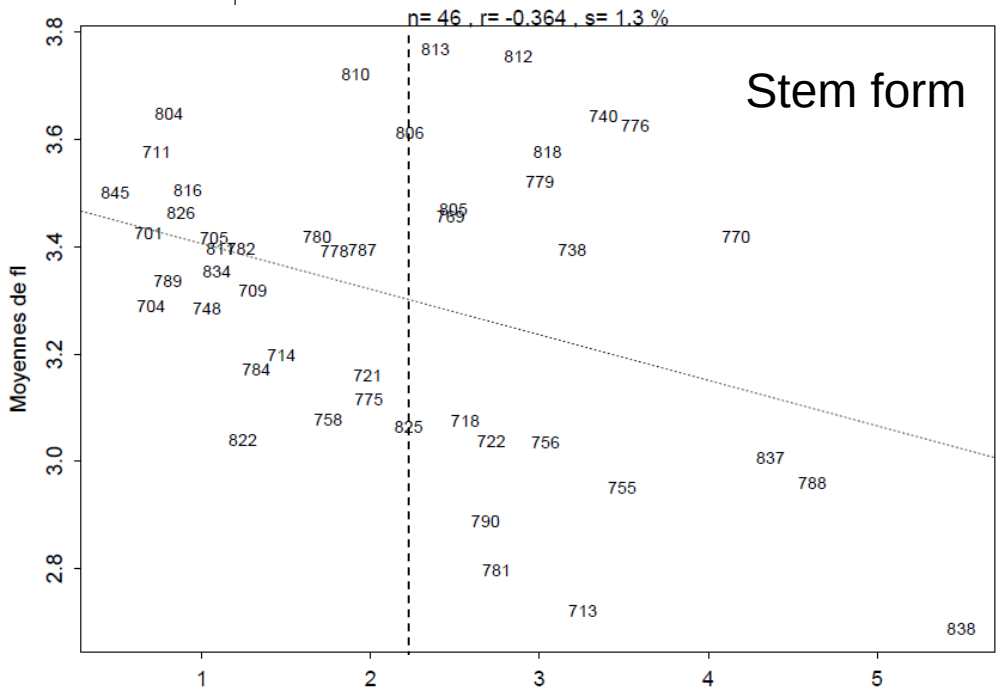
From Jan Kowalczyk (for index value), Bucharest meeting

➢ *High interactivity too among Polish sites*



Treebreedex

8 sites



➢ *No or negative link between ecovalence and performance*

Selection possibilities

Treebreedex

index Height-stem form

fa	eff	index1	fa	eff	index2	fa	eff	index3	fa	eff	index4	fa	eff	index5
723	43	34.88	718	16	49.532	764	38	36.86	804	41	33.336	712	20	127.98
712	43	34.5	815	34	49.042	715	35	36.743	813	39	32.651	789	31	122.41
761	46	34.461	844	32	48.472	732	28	36.688	712	35	32.546	732	44	122.11
815	45	34.454	763	35	48.247	828	26	36.615	811	36	32.304	752	13	121.98
765	42	34.305	788	18	48.04	773	22	36.583	701	37	32.244	844	11	121.58
707	34	34.106	843	26	47.876	721	38	36.451	815	41	31.973	804	21	121.14
715	47	34.009	789	34	47.861	699	31	36.303	694	30	31.907	715	75	120.69
828	48	33.869	721	35	47.798	821	16	36.218	816	43	31.86	719	18	120.58
708	33	33.714	776	29	47.623	765	36	36.055	803	31	31.856	791	45	119.97
740	42	33.662	715	35	47.604	756	37	36.019	775	27	31.762	806	34	119.59
787	39	33.622	813	31	47.525	839	18	35.985	778	37	31.758	776	25	119
722	42	33.503	755	35	47.479	772	39	35.925	810	38	31.576	701	13	118.52
805	39	33.417	828	32	47.312	708	19	35.869	837	34	31.555	812	34	118.37
700	49	33.394	765	34	47.216	841	35	35.747	740	38	31.452	793	33	118.14
776	28	33.387	821	24	47.136	843	21	35.716	792	40	31.409	813	18	118.02
718	41	33.289	722	34	47.132	838	38	35.693	806	37	31.393	826	18	117.93
782	43	33.23	743	21	47.087	815	29	35.634	820	34	31.304	834	56	117.54
806	43	33.221	784	30	47.038	726	39	35.562	695	37	31.153	718	85	117.44
831	43	33.146	732	34	47.023	780	40	35.327	805	40	31.072	829	50	117.41
824	37	33.132	739	25	46.982	722	34	35.277	831	37	30.941	843	21	117.39
773	48	33.118	831	35	46.916	819	38	35.215	832	38	30.882	729	18	117.25
756	40	33.094	712	34	46.843	792	21	35.203	812	38	30.88	778	23	117.11
845	41	33.07	823	32	46.784	763	25	35.132	785	32	30.87	810	26	117.06
696	42	33.012	692	30	46.777	836	28	35.025	782	31	30.803	808	33	116.97
721	45	32.942	804	33	46.746	696	22	35.008	723	34	30.798	704	30	116.82
804	43	32.931	702	24	46.679	711	40	35.006	716	35	30.741	781	25	116.75
839	39	32.921	719	25	46.628	720	36	34.973	839	33	30.732	705	52	116.68
711	45	32.892	824	33	46.608	695	21	34.962	722	32	30.732	816	60	116.55
786	44	32.887	834	33	46.602	768	22	34.954	826	51	30.715	779	31	116.43
836	41	32.856	720	33	46.524	831	39	34.924	715	34	30.691	721	143	116.29

- Among the 20 best out of 146 selected in Kutno, 60% common with French sites
- more common ones at the low elevation sites (Bort)

Some conclusions

- Polish larch has an interest in FR but improvement requested for stem straightness
- High GxE interaction (but most common in larch)
- GxE interaction looks not less important within PL than within FR
- A reasonable rate of clones selected in PL may be valuable in FR but some are poor

- Should help to identify limiting ecological factors (drought in Bort, humid soil in BE? Etc) and thereby the possible range of deployment
  - *Would need information on pedo-climatic parameters of all sites*

Partners

- IBL (PL)
- INRA (FR)
- CRNFB (BE)