SUPPLEMENTARY MATERIAL

Table S1. Total rainfall and mean temperature recorded in the experimental years at the reference weather station of Passo Rolle (2004 m a.s.l.).

YEAR	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	Year mean
Total rainfall (mm)											
January	6	30	9	7	25	83	65	99	31	27	38
February	43	4	82	9	56	24	35	23	54	41	37
March	65	8	91	41	65	155	83	192	62	72	83
April	153	76	90	78	150	102	144	162	34	28	102
May	282	121	133	110	115	157	247	38	208	161	157
June	143	119	102	144	54	132	222	138	132	257	144
July	149	139	148	127	147	137	169	155	100	100	137
August	172	153	120	139	241	261	165	110	169	102	163
September	119	115	73	117	104	93	124	135	152	219	125
October	106	216	216	217	96	160	220	180	146	144	170
November	575	185	87	45	202	126	182	99	228	192	192
December	66	72	50	53	114	4	74	136	162	12	74
Total	1880	1239	1202	1089	1369	1434	1732	1466	1478	1358	1424
Mean air temperature (°C)											
January	-2.7	-5.7	-6.0	-4.2	-4.2	-0.9	-2.3	-4.2	-7.1	-5.0	-4.2
February	-2.1	-7.8	-3.2	-8.1	-4.9	-1.8	-1.5	-3.9	-6.4	-2.7	-4.2
March	-0.5	-0.7	-2.8	-2.3	-3.9	-1.2	-2.2	-2.6	-3.9	-1.6	-2.2
April	0.0	-0.7	0.7	0.9	1.4	0.7	-0.1	0.5	0.8	3.1	0.7
May	5.0	7.1	3.4	6.5	5.5	5.7	5.8	7.7	4.0	6.6	5.7
June	10.6	12.8	9.1	9.9	9.8	9.5	9.8	9.0	9.4	9.4	9.9
July	10.7	12.0	10.6	10.2	12.2	11.2	10.9	11.5	12.7	9.9	11.2
August	9.6	14.2	11.0	9.2	7.9	10.5	11.5	12.6	10.4	12.8	11.0
September	5.4	6.6	8.2	7.8	10.1	6.2	6.3	8.6	6.5	10.5	7.6
October	3.4	1.1	5.1	5.1	6.5	3.1	4.8	5.1	2.3	4.3	4.1
November	-0.3	1.3	0.0	-1.5	-1.4	-1.6	0.4	0.8	-1.5	-0.4	-0.4
December	-2.8	-2.7	-1.8	-5.7	0.0	-3.2	-3.6	-5.9	-6.8	-3.3	-3.6
Mean	3.0	3.1	2.9	2.3	3.2	3.2	3.3	3.3	1.7	3.6	3.0

Table S2. Soil characteristics of the experimental area, the surrounding vegetation, and the donor site of the ski slope restoration experiment (soil layer 0-10 cm). na means not available.

Site	Receptor				Donor
Soil trait (1)	Experimental area	Not sown ski slope area close to the experimental area	Nardion strictae	Rhododendro ferruginei - Vaccinion myrtilli	Nardo-Agrostion
% gravel	66.0	64.5	49.5	48.2	6.4
% fine earth	34.0	35.5	50.5	51.8	93.6
% sand	71.3	72.1	65.0	67.5	61.6
% silt	22.7	21.9	27.6	25.2	26.8
% clay	6.1	6.0	7.4	7.3	11.6
% organic matter in the fine earth	0.03	0.06	20.5	16.8	7,6
% roots	0	0	14.2	7.4	na
pH (in water)	4.8	4.7	4.8	4.5	4.8
Total N %	0.0025	na	na	na	na
Plant-available P mg/kg	8.2	na	na	na	na
Exchangeable K mg/kg	74.2	na	na	na	na

(1) Methods of soil analysis. Soil fractions larger (gravel) and smaller (fine earth) than 2 mm separated by sieving. Fine earth analysed according to the official Italian methods of soil analysis (G. U., 1997 and 1999) for sand, silt and clay content (hydrometer, method II.6), organic matter content (Springer–Klee method, VII.2); pH (in water, III.1); total N (Kjeldhal method, XIV.3); assimilable P (Olsen method, XV.3); exchangeable K (ammonium acetate method, X.1). References. G.U., 1997. Approvazione dei "Metodi ufficiali di analisi fisica del suolo". Decreto Ministeriale 1/8/1997. Gazzetta Ufficiale dello Stato Italiano, Serie Generale n. 204 del 2/9/1997 - Suppl. Ordinario n. 173. G.U., 1999. Approvazione dei "Metodi ufficiali di analisi chimica del suolo". Decreto Ministeriale 13/09/1999. Gazzetta Ufficiale dello Stato Italiano, Serie Generale n. 248 del 21/10/1999 - Suppl. Ordinario n. 185.

Table S3. Species composition of 120 surveys from a grassland restoration experiment at a raw soil ski slope (percent ground cover as average of three replications). Ten surveys from donor and receptor site vegetation and species composition of the cultivar seed mixture are also included. Surveys were clustered with the van der Maarel coefficient as similarity function and the minimum variance as clustering method: species were clustered with the Pearson correlation coefficient and the average linkage (Legendre and Legendre, 2012). Before clustering, cover data were transformed according to the 1–9 scale of Maarel (1979) to reduce the importance of the most abundant species.

Species origin (1)	Species abbrev.	Survey code (2)
DRn	AchMil	Achillea millefolium aggr.
D	SteGra	Stellaria graminea
D	RhiFre	Rhinanthus freynii
D	CerFon	Cerastium fontanum
DRn	LeoHis	Leontodon hispidus
D	PlaMaj	Plantago major subsp. major
DC	PhlPra	Phleum phaseum...
D	AloGla	Alchemilla glaucescens
DRn	TriPra	Trifolium pratense
DRn	RanNem	Ranunculus nemorosus
DRn	DesCes	Deschampsia cespitosa
DRn	CenNer	Centaurea nervosa
DRn	CamSch	Campanula scheuchzeri
DRn	LeuVul	Leucanthemum vulgare
DRn	LotAlp	Lotus alpinus
D	PedVer	Pedicularis verticillata
DRn	PoaVio	Poa violacea
D	PoaAlp	Poa alpina
D	TriMon	Trifolium montanum
DRnC	TriRep	Trifolium repens
D	PruVul	Prunella vulgaris
D	BriMed	Briza media
Ro	AgrRup	Agrostis rupestris
Ro	PotAur	Potentilla aurea
DRn	EupRos	Euphrasia rostkoviana
DRnC	FesRub	Festuca rubra aggr.
DRn	AgrCap	Agrostis capillaris
DRn	AntAlp	Anthoxanthum alpinum
DRn	GeuMon	Geum montanum
D	PhyHem	Phyteuma hemisphaericum
Ro	AveFle	Avenella flexuosa
Ro	LuzMul	Luzula multiflora
Ro	NarStr	Nardus stricta
DRn	CalVul	Calluna vulgaris
DRn	ArnMon	Arnica montana
Ro	CamBar	Campanula barbata
Ro	HieGla	Hieracium glanduliferum
Ro	HieHir	Hieracium pilosella
Ro	SalCap	Salix caprea
Ro	SilRup	Silene rupestris
Ro	VerBel	Veronica bellidioides
Ro	EupMin	Euphrasia minima
Ro	LeoHel	Leontodon helveticus
D	CarCar	Carum carvi
DC	DacGlo	Dactylis glomerata
DRn	GalAni	Galium anisophyllon
D	KnaLon	Knautia longifolia
D	PimMaj	Pimpinella major
Ro	CarSem	Carex sempervirens
Ro	HomAlp	Homogyne alpina
Ro	GenKoc	Gentiana kochiana
Ro	RhoFer	Rhododendron ferrugineum
Ro	VacMyr	Vaccinium myrtillus
Ro	SenInc	Senecio incanus subsp. carniolicus
Ro	LoiPro	Loiseleuria procumbens
Ro	VacVit	Vaccinium vitis-idaea
Ro	SolVir	Solidago virgaurea
Ro	VerFru	Veronica fruticans
Ro	AntDio	Antennaria dioica
Ro	VacUli	Vaccinium uliginosum
Ro	SapPum	Saponaria pumila
Ro	EpiCol	Epilobium collinum
Ro	LarDec	Larix decidua
D	DiaSup	Dianthus superbus subsp. alpestris
DRn	AvePub	Avenula pubescens
DRn	TriAlp	Trifolium alpinum
C	PhlPra	Phleum pratense
Ro	JunTri	Juncus trifidus
C	JunCom	Juniperus communis subsp. alpina
Ro	FesVar	Festuca varia
C	PoaSup	Poa supina
Ro	SagSag	Sagina saginoides
Ro	GnaSyl	Gnaphalium sylvaticum
Ro	HieAng	Hieracium angustifolium
Ro	CarApr	Carex sp.
Ro	FesVal	Festuca halleri
Ro	AveVer	Avenula versicolor
D	SilVul	Silene vulgaris
D	LatPra	Lathyrus pratensis
D	TriFla	Trisetum flavescens
DRn	PotEre	Potentilla erecta
D	PolViv	Polygala vulgaris
D	EupCyp	Euphorbia cyparissias
D	CarPal	Carex pallescens
C	PhyBet	Phyteuma betonicifolium
C	VerAlb	Veratrum album
C	FesPra	Festuca pratensis
C	TroEur	Trollius europaeus
C	RumAlp	Rumex alpestris
C	GymCon	Gymnadenia conopsea
Ro	FesPan	Festuca paniculata
C	CroVer	Crocus vernus
C	GalSp.	Galeopsis sp.
C	GenAni	Gentianella anisodonta
C	HypMac	Hypericum maculatum
C	JunAlp	Juncus alpinoarticulatus
C	OrcSp.	Orchis sp.
C	PlaLan	Plantago lanceolata
C	PriVer	Primula veris
C	PulAlp	Pulsatilla alpina
C	ScaLuc	Scabiosa lucida subsp. lucida
C	SesCae	Sesleria caerulea
C	VicCra	Vicia cracca
C	LolPer	Lolium perenne
C	FesOvi	Festuca ovina
C	PoaPra	Poa pratensis
C	MedLup	Medicago lupulina
C	MedSat	Medicago sativa
C	TriHyb	Trifolium hybridum

Legend. (1) Species origin: D, from the donor grassland; DRn, from the donor grassland and the Nardion strictae grassland at the receptor site; Ro, from other vegetation at the receptor site; C, from the cultivar mixture. (2) Survey code. First letter, type of propagation material: G, green hay at high sowing rate; S, hay-flower from seed-stripping; g, green hay at low sowing rate; D, dry hay (low sowing density); N, not sown; C, cultivar mixture. Second letter, type of fertilisation: C, continous in the first four years; I, in the first two years; D, delayed, in the third and fourth year; N, no fertilisation. Number, L, 3, 5, 7, 8 and 9: number of years after sowing. NAb/NAm (donor grassland); NNa and NNb, not sown ski slope vegetation; Nara and Narb, Nardion strictae vegetation at the receptor site; RVa and RVb, Rhododendro ferrugineo-Vaccinion myrtilli vegetation at the receptor site; Mix, cultivar seed mixture (in this case, percent values are the species contribution in seed weight).

Table S4. Effect of four propagation materials and four fertilisation treatments on the main traits of a ski slope grassland restoration experiment.

Propagation material (1) / Fertilisation (2)	G Mean	S Mean	g Mean	D Mean	Mean CF	Mean IF	Mean DF	Mean NF	PM	F	PMxF	Y	PMxY	F x Y
Cover stones diam.>5cm %	13.9	15.5	9.7	11.6	11.6b	11.8b	13.2ab	14.1a	ns	***	***	***	ns	**
Cover earth+stones<5cm %	13.4	10.1	16.0	13.9	9.3b	10.8b	15.7a	17.8a	ns	***	*	***	*	***
Cover litter %	2.7ab	4.7a	0.4b	2.0ab	2.5	2.2	1.9	3.2	*	ns	ns	***	***	ns
Cover biological soil crust %	5.3	6.0	6.0	7.3	4.6b	6.9a	6.1a	7.0a	ns	***	**	***	**	ns
Cover vascular plants %	66.3	65.7	69.7	67.5	73.7a	70.1b	65.2c	60.2d	ns	***	**	***	*	***
Cover grasses %	57.0	58.8	60.8	57.8	65.0a	61.2b	57.2c	51.0d	ns	***	***	***	**	***
Cover forbs %	9.4	6.9	8.9	9.6	8.7	8.8	8.0	9.3	ns	ns	***	***	**	ns
No. species total	17.3b	20.0ab	18.4ab	21.7a	18.8b	17.6c	19.4b	21.6a	*	***	**	***	**	ns
No. species from donor grassland	3.90ab	3.35b	4.47ab	4.71a	4.17a	3.44b	4.28a	4.54a	*	***	*	***	ns	ns
No. sp. donor gr. and receptor site *Nardion* gr.	9.7	10.2	9.9	11.1	9.8b	9.6b	10.0b	11.6a	ns	***	***	***	ns	ns
No. species from receptor site	3.67	6.46	4.01	5.85	4.90ab	4.50b	5.14ab	5.44a	ns	***	***	***	ns	ns
No. species from sowing mixture	0.01	0	0.01	0	0.01	0.01	0	0	ns	ns	ns	ns	ns	ns
Van der Maarel coeff. vs. donor grassland	0.50	0.41	0.34	0.48	0.44	0.46	0.42	0.42	ns	ns	**	***	***	ns
Jaccard coefficient vs. donor grassland	0.28b	0.28b	0.31ab	0.33a	0.30b	0.28c	0.29b	0.31a	*	***	*	***	ns	ns
Jaccard coefficient vs. *Nardion* grassland	0.22b	0.34a	0.21b	0.29ab	0.27b	0.25b	0.27ab	0.28a	*	***	ns	***	***	ns

Legend. 1) G and g, green hay, high and low sowing rate, respectively; S, hay flower form seed stripping; D, dry hay. 2) CF, IF, DF and NF, continuous, initial, delayed and no fertilisation, respectively. 3) PM, propagation material; F, Fertilisation; Y, year; ns, not significant; * 0.05≥p>0.01; ** 0.01≥p>0.001; *** 0.001≥ p.
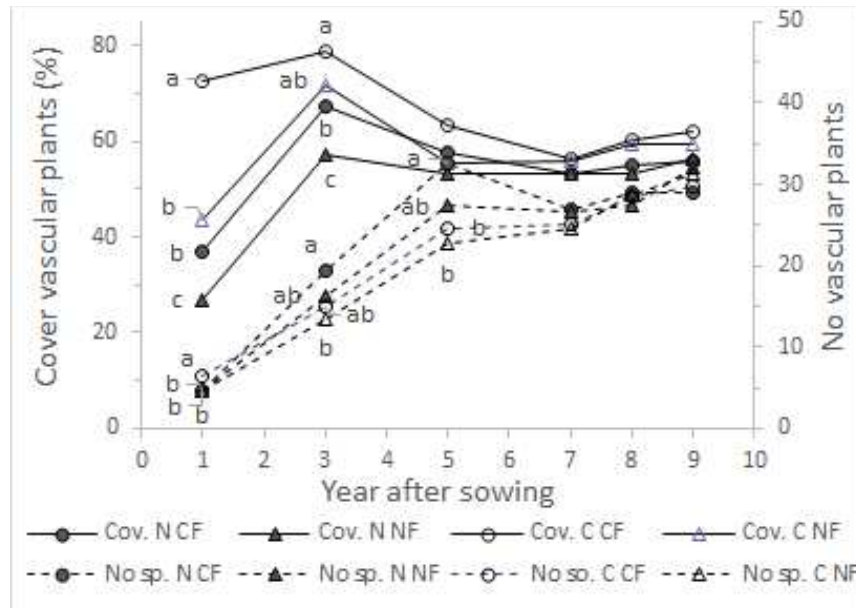
Fig. S1. Time pattern of the vascular plant cover and number at a ski slope grassland restoration experiment. Data show the results from four treatments obtained by combining two propagation materials (N, no sowing; C, cultivar mixture) combined with two fertilisation levels (with, CF, and without, NF, fertilisation in the first four years after sowing). Letters show results of among-treatment comparisons within each year. Means with common letters do not differ at p≤0.05. Missing letters means not significant treatment effect.
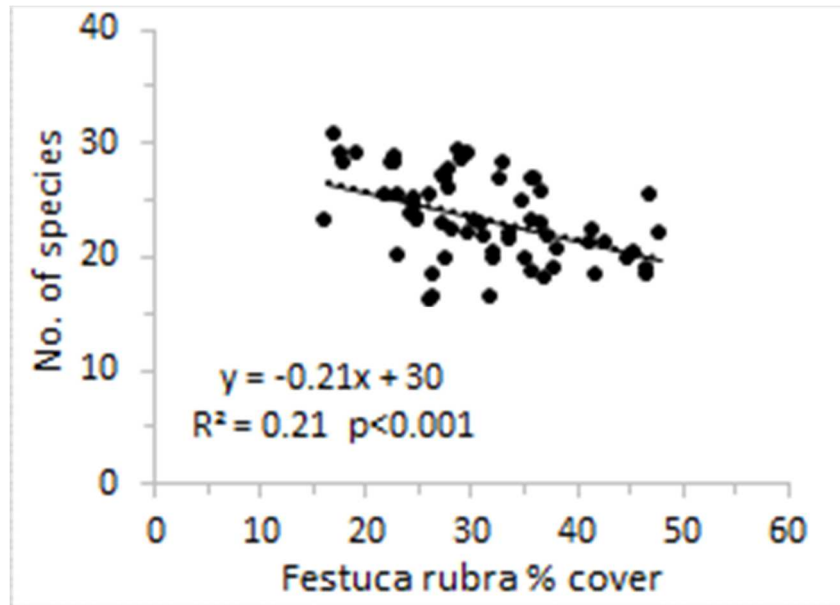
Fig. S2. Relationship between *Festuca rubra* cover and total number of species of the vegetation obtained with four types of propagation material from a *Nardo-Agrostion* donor grassland and four fertilisation levels at a ski slope grassland restoration experiment. Data refer to 7-11 years after sowing.