Table 12. *Cont.*

II Optical Species*soil Covariance	Crop /Species [1)]		Model	R^2	RMSE	Model equation
	Swh * sandy clay		2.6 (I)	0.764	282.3	$y_{b(swheat,clay)} = 6765.5 - 38407.0 \times rf3_{ap} - 14979.0 \times rf4_{ap} - 23698.0 \times rf3_{bp} + 9552.7 \times rf4_{bp} + 7261.4 \times rf3_{cp} - 22022.0 \times rf4_{cp}$
	Brl * sandy clay		2.7 (I)	0.166	1382	$y_{b(barley,clay)} = 7141.4\text{-}3842.1 \times rf3_{ap}\text{-}2612.4 \times rf4_{ap} - 3032.1 \times rf3_{bp}\text{-}11708.0 \times rf4_{bp} - 28637.0 \times rf3_{cp} - 1636.2 \times rf4_{cp}$
III Optical Species* Cultivar Cov.	Swh* cv. Manu		3.1 (I)	0.089	1292	$y_{b\ (cv.\ Manu*clay)} = 5696.5 + 2293.8 \times rf3_{bp} + 5387.9 \times rf3_{cp} - 736396.0 \times (rf3_{bp})^2$
	Swh * cv. Satu		3.2 (I)	0.046	1031	$y_{b\ (cv.\ Satu*clay)} = -9798.2 + 736440.0 \times rf2_{bp} - 9925014.0 \times (rf2_{bp})^2$
	Brl * cv. Inari		3.3 (I)	0.144	1220	$y_{b\ (cv.\ Inari*clay)} = 8336.8 - 71506.0 \times rf3_{bp} - 45627.0 \times (rf3_{bp})^2$
IV Microwave SAR	Sensor	Cereal specie	Model[4)]	R^2	RMSE	Model equation
	ERS SAR[(4)]	Brl	4.1(III)	0.448	482.7	$y_{b\ (brl,\ ERS2)} = 4345.7 + 109.4 \times NDVI_{ap} - 211.6 \times NDVI_{bp} - 983.3 \times NDVI_{cp} - 0.57 \times VV_{(5GHz,cp)} + 5.61 \times VV_{(5GHz,dp)}$
		Oats	4.2(III)	0.417	584.2	$y_{b\ (oats,\ ERS2)} = 3739.5 + 108.9 \times NDVI_{ap} - 212.1 \times NDVI_{bp} - 938.8 \times NDVI_{cp} - 0.47 \times VV_{(5GHz,cp)} + 4.28*VV_{(5GHz,dp)}$
	Radarsat SAR[4)]	Swh	5.1(III)	0.731	300.8	$y_{b\ (swh,\ Radarsat)} = 4690.7 + 111.8 \times NDVI_{ap} - 213.4 \times NDVI_{bp} - 982.6 \times NDVI_{cp} - 2.69 \times HH_{(5GHz,cp)} + 3.9 \times HH_{(5GHz,dp)}$
		Brl	5.2(III)	0.702	322.8	$y_{b(brl,Radarsat)} = 4430.1 + 109.4 \times NDVI_{ap} - 211.6 \times NDVI_{bp} - 983.3 \times NDVI_{cp} - 0.52 \times HH_{(5GHz,cp)} + 5.07 \times HH_{(5GHz,dp)}$
		Oats	5.3(III)	0.624	483.6	$y_{b\ (oats,\ Radarsat)} = 3843.3 + 108.9 \times NDVI_{ap} - 212.1 \times NDVI_{bp} - 983.8 \times NDVI_{cp} - 0.47 \times HH_{(5GHz,cp)} + 4.03 \times HH_{(5GHz,dp)}$
	Envisat ASAR[(4)]	Swh	6.1(III)	0.723	302.1	$y_{b(swh,Envisat)} = 4701.1 + 108.2 \times NDVI_{ap} - 208.8 \times NDVI_{bp} - 983.1 \times NDVI_{cp} - 3.9 \times VH_{(5GHz,cp)} + 17.4 \times VV_{(5GHz,cp)} - 3.1 \times VH_{(5GHz,dp)} + 5.2 \times VV_{(5GHz,dp)}$
		Brl	6.2(III)	0.694	349.8	$y_{b\ (brl,\ Envisat)} = 4261.4 + 109.4 \times NDVI_{ap} - 211.6 \times NDVI_{bp} - 983.3 \times NDVI_{cp} - 4.59 \times VH_{(5GHz,cp)} + 18.24 \times VV_{(5GHz,cp)} - 4.04 \times VH_{(5GHz,dp)} + 6.15 \times VV_{(5GHz,dp)}$
		Oats	6.3(III)	0.617	389.7	$y_{b\ (oats,\ Envisat)} = 3635.7 + 108.9 \times NDVI_{ap} - 212.8 \times NDVI_{bp} - 983.8 \times NDVI_{cp} - 2.59 \times VH_{(5GHz,cp)} + 16.46 \times VV_{(5GHz,cp)} - 2.03 \times VH_{(5GHz,dp)} + 4.05 \times VV_{(5GHz,dp)}$
	HUTSCAT Scattero meter[(3),(4)]	Swh	7.1(III)	0.582	416.8	$y_{b(swh,HUTSCAT)} = 4258.4 + 109.4 \times NDVI_{ap} - 198.2 \times NDVI_{bp} - 937.4 \times NDVI_{cp} + 5.2 \times VV_{(5GHz,cp)} + 18.4 \times HH_{(5GHz,cp)} - 2.9 \times VH_{(5GHz,cp)} - 16.4 \times HV_{(5GHz,cp)} + 4.4 \times VV_{(5GHz,dp)} + 12.4 \times HH_{(5GHz,dp)} - 2.3 \times VH_{(5GHz,dp)} - 14.4 \times HV_{(5GHz,dp)}$
		Brl	7.2(III)	0.518	490.1	$y_{b\ (brl,\ HUTSCAT)} = 4294.2 + 107.2 \times NDVI_{ap} - 209.2 \times NDVI_{bp} - 928.2 \times NDVI_{cp} + 3.2 \times VV_{(5GHz,cp)} + 17.4 \times HH_{(5GHz,cp)} - 3.9 \times VH_{(5GHz,cp)} - 15.4 \times HV_{(5GHz,cp)} + 5.4 \times VV_{(5GHz,dp)} + 11.4 \times HH_{(5GHz,dp)} - 4.3 \times VH_{(5GHz,dp)} - 15.4 \times HV_{(5GHz,dp)}$
		Oats	7.3(III)	0.424	544.2	$y_{b(oats,HUTSCAT)} = 3782.5 + 106.8 \times NDVI_{ap} - 207.2 \times NDVI_{bp} - 942.5 \times NDVI_{cp} + 4.2 \times VV_{(5GHz,cp)} + 15.2 \times HH_{(5GHz,cp)} - 5.9 \times VH_{(5GHz,cp)} - 17.1 \times HV_{(5GHz,cp)} + 4.8 \times VV_{(5GHz,dp)} + 11.8 \times HH_{(5GHz,dp)} - 4.3 \times VH_{(5GHz,dp)} - 12.2 \times HV_{(5GHz,dp)}$

[(1)] For abbreviations refer to Table 9 [(2)] Independent variables classified with SatPhenClass-algorithm (Figure 3a,b). [(3)] HUTSCAT used for calibration verification purposes only (helicopter mounted) [(4)] Only in Part I (SAR+Optical models) [(5)] Only in Part II (Optical models)

Appendix D. SatPhenClass Classification Algorithm for Satellite Data

Appendix figures and tables can be downloaded from the link:
http://koti.armas.fi/~hlaurila/download/Pb4.
The SatPhenClass classification algorithm can be downloaded from the link:
http://koti.armas.fi/~hlaurila/download/Pb4 file: SatPhenClass-Appendix.pdf