7 Regional forests

Several sites for which a wide range of forest models can be rather easily initialized have been selected for carrying out ISIMIP regional forest simulations. The PROFOUND Database is available as Reyer et al. (2019), please contact reyer@pik-potsdam.de for further questions. The management scenarios were prepared by the FORMASAM project with contributions of the following persons: Christopher Reyer, Mart-Jan Schelhaas, Annikki Mäkelä, Mikko Peltoniemi, Martin Gutsch, Mats Mahnken, Denis Loustau, Simon Martel, Katarína Merganičová, Henning Meesenburg, Thomas Rötzer, Michael Heym, Alessio Collalti, Ettore D'Andrea, Giorgio Matteucci, Andreas Ibrom, Vivian Kvist Johannsen.

1) **Climate and other data:** For the FORMASAM Management scenarios, please use the ISIMIP2BLBC climate data available in the PROFOUND database as a first priority and then the ISIMIP2B data from the grid cell as available in the PROFOUND DB. Please use historical CO_2 data and then switch to RCP CO_2 concentrations in 2005. Please use the future N deposition (NDEPOSITION_ISIMIP2B data files in PROFOUND DB) and also the tree, stand and soil data (TREE, STAND, SOIL data files in PROFOUND DB) provided by the PROFOUND database.
2) **Calibration:** Some models may require some kind of calibration or model development before they can contribute to ISIMIP. Such alterations of the model can influence the results of a model comparison and "model calibration" is understood differently by different modellers. All alterations to the model in the framework of this exercise should be reported in the model experiment documentation provided together with the upload of the simulations. Whenever the model calibration or development is driven by an improvement of the model after a comparison to data that were originally made available in ISIMIP for model evaluation, a part of those data should be kept aside for model evaluation and not used for calibration.
    a. Model development needed to run a model at specific sites is welcomed and needs to be transparent/ properly documented (e.g., adjustment of phenology model to include chilling effects). This is also applicable for more general calibration (i.e., fixing parameters once but not changing afterwards) for example to include a new tree species in a model.
    b. Manual or automatic site-specific "tuning" of species-specific and process-specific parameters should be avoided. The same "model" (i.e., also with the same parameter values) should be used in all simulations. If needed, any tuning needs to be documented in a transparent way and should be backed up by existing data (e.g., from TRY-database). If your model contains genetic processes where the change in parameters is part of the model processes, this is naturally part of "your model approach" and should be clearly spelled out as part of the documentation of your model. In this specific case, please contact the sectoral coordinators to discuss if it makes sense to include a "genetic adaptation" and a "parameter-fixed, control" run.
3) **Reporting Period**: Each phase of ISIMIP has its own reporting period but you should always start your reporting period for the first time-step for which stand data is available (e.g., 1948 for the Peitz stand) and run your model until the last point in time where climate data is available.
4) Management 1: DBH is defined as diameter at breast height of 1.30m. The first available data point is used for model initialization (Ini). Following data points are used to mimic historic management (HM). When no more observed data is available, the management rules from **Table 18**-**Table 36** need to be used (FM). Note that depending on how models represent the planting/regeneration information from **Table 18**-**Table 36**, the overall stand- age maybe slightly higher than in **Table 18**-**Table 36** (e.g. seedlings planted with an age of 2 in 2033 will be harvested at an age of 142 after 140 years of rotation in 2173).
5) Management 2: Le Bray has two bioenergy scenarios, Solling-Beech has two adaptation scenarios and no HWP scenario, Solling-Spruce has no HWP scenario.

6) Management 3: The use of socioeconomic identifiers such as rcp26soca and rcp60soca are for the purpose of keeping consistency with ISIMIP naming conventions, the underlying management is identical.

7) Management 4: The transition from historical management to future managements start in 2020. E.g., Bily Kriz is 34 years old in 2015, hence theoretically in 2016 at age 35 the first thinning from the new management should start (15% BA under current site-specific management guidelines). Yet, because this is before 2020, it is not included but only the next thinning in 2026 at age 45 (10% BA under current site-specific management guidelines is modelled). Exceptions exist for Le-bray and Solling-beech for the current generic scenarios.

8) Management 5: When harvesting and planting are scheduled in the same year, i.e., in a sheltercut system, the new stand age starts counting from the planting year. In the subsequent management intervention, usually, the harvesting then takes place and refers to trees still present from the old rotation. The Thinning intensity then refers to the trees of the new rotation. E.g., in Collelongo in 2126, the 95-year-old trees are thinned (TB15 under the maximize bioenergy scenario) and at the same time new trees are planted according to the plantation guidelines. Then, in 2141, the 120-year-old remaining trees are harvested, and the newly planted 15-year-old trees are thinned (TB35).

9) Management 6: If models are unable to simulate natural regeneration as a continuous process as required for the Bily Kriz MFA management, the suggestion is to mimic continuous natural regeneration by simulating plantings every 5 years depending on how the model works).

7.1 Scenarios

Climate scenarios	
picontrol	Pre-industrial climate and 286ppm CO$_2$ concentration. The climate data for the entire period (1661-2299) are unique – no (or little) recycling of data has taken place. The regional forest simulation should start at the first point in time for which initialisation data is available (**Table 18**-**Table 36**).
historical	Historical climate and CO$_2$ concentration.
rcp26	Future climate and CO$_2$ concentration from RCP2.6.
rcp60	Future climate and CO$_2$ concentration from RCP6.0.
rcp85	Future climate and CO$_2$ concentration from RCP8.5.
2005co2	CO2 concentration fixed at 2005 levels at 378.81ppm.
Human influences scenarios	
histsoc	Manage forests according to historical management guidelines without species change and keeping the same rotation length and thinning types (see **Table 18**-**Table 36**). The standard management ("histsoc") during the historical period is the observed management as defined by the data available for each site (Please only use the, species information, thinning type and reduction in stem numbers from the PROFOUND DB to mimic management, no other information (such as dbh or height should be used))
2005soc	Manage future forests according to present-day generic management guidelines without species change and keeping the same rotation length and thinning types (see **Table 18**-**Table 36**). This generic management (2005soc) corresponds best to "intensive even-aged forestry" as defined by Duncker et al. 2012. After harvesting the stands (c.f. **Table 18**-**Table 36**), please proceed after harvest as your model usually does, e.g. plant the same tree species again or allow for regeneration of the same species according to the regeneration guidelines outlined in (see **Table 18**-**Table 36**).
2005socsite	Manage future forests according to present-day site-specific management guidelines (see **Table 18**-**Table 36**).
rcp26soc	Future forest can be managed either to maximize bioenergy (**rcp26socbe**), harvested wood products (**rcp26sochwp**) or a multifunctional, adapted forest (**rcp26soca**) as described in **Table 18**-**Table 36**. For some sites, further subscenarios exist, 1) a bioenergy-biomass (**rcp26socbeb**) scenario in leBray, 2) a multifunctional, adapted scenario in Solling-beech with focus on admixing native species (**rcp26socam**).
rcp60soc	Future forest can be managed either to maximize bioenergy (**rcp60socbe**), harvested wood products (**rcp60sochwp**) or a multifunctional, adapted forest (**rcp60soca**) as described in **Table 18**-**Table 36**. For some sites, further subscenarios exist, 1) a bioenergy-biomass (**rcp60socbeb**) scenario in leBray, 2) a multifunctional, adapted scenario in Solling-beech with focus on admixing native species (**rcp60socam**). The managements under rcp60soc are the same as in rcp26soc.
rcp85soc	Future forest can be managed either to maximize bioenergy (**rcp85socbe**), harvested wood products (**rcp85sochwp**) or a multifunctional, adapted forest (**rcp85soca**) as described in **Table 18**-**Table 36**. For some sites, further subscenarios exist, 1) a bioenergy-biomass (**rcp85socbeb**) scenario in leBray, 2) a multifunctional, adapted scenario in Solling-beech with focus on admixing native species (**rcp85socam**). The managements under rcp85soc are the same as in rcp26soc..

2100rcp26soc	This scenario means managing future forests according to rcp26soc guidelines. **NOTE:** Not really applicable for the forest sector as the rcp26socs, rcp60socs and rcp85socs are all designed until 2300.
nosoc	No forest management (but nitrogen deposition should be included). If your model includes natural regeneration, please only regeneration those species previously present on the plot. A "natural reference run (nosoc)" without any management will help assessing the influence of forest management.

Table 16 ISIMIP2b scenarios for the regional forest simulations.

	Experiment	**Input**	**Pre-industrial 1661-1860**	**Historical 1861-2005**	**Future 2006-2100**	**Extended future 2101-2299**
I	no climate change, pre-industrial CO_2	Climate & CO_2	not simulated	**picontrol**	**picontrol**	**picontrol**
	varying LU & human influences up to 2005, fixed present-day management afterwards	Human & LU		**histsoc**	**2005soc**	**2005soc**
II	RCP2.6 climate & CO_2	Climate & CO_2	not simulated	**historical**	**rcp26**	**rcp26**
	varying LU & human influences up to 2005, fixed present-day management afterwards	Human & LU		**histsoc**	**2005soc**	**2005soc**
IIa	RCP2.6 climate, CO_2 fixed after 2005	Climate & CO_2	not simulated	Experiment II	**rcp26, 2005co2**	**rcp26, 2005co2**
	fixed present-day management after 2005	Human & LU			**2005soc**	**2005soc**
III	RCP6.0 climate & CO_2	Climate & CO_2	not simulated	Experiment II	**rcp60**	not simulated
	fixed present-day management after 2005	Human & LU			**2005soc**	
IV	no climate change, pre-industrial CO_2	Climate & CO_2	not simulated	Experiment I	**Picontrol**	**picontrol**
	varying management	Human & LU			**rcp26soc (i.e. rcp26socbe, rcp26sochwp, rcp26soca)**	
V	no climate change, pre-industrial CO_2	Climate & CO_2	not simulated	Experiment I	**Experiment IV**	not simulated
	varying management	Human & LU				
VI	RCP2.6 climate & CO_2	Climate & CO_2	not simulated	Experiment II	**rcp26**	**rcp26**
	varying management	Human & LU			**rcp26soc (i.e. rcp26socbe, rcp26sochwp, rcp26soca)**	
VII	RCP6.0 climate & CO_2	Climate & CO_2	not simulated	Experiment II	**rcp60**	not simulated
	varying management	Human & LU			**rcp60soc (i.e. rcp60socbe,**	

					rcp60sochwp, rcp60soca)	
VIII	RCP8.5 climate & CO_2	Climate & CO_2	Experiment I	Experiment II	**rcp85**	not simulated
	fixed present-day management after 2005	Human & LU			**2005soc**	

Table 17 Additional sector-specific simulations for the regional forest sector.

	Experiment	Input	Pre-industrial 1661-1860	Historical 1861-2005	Future 2006-2099	Extended future 2100-2299
Ia	no climate change, pre-industrial CO_2	Climate & CO_2	not simulated	**picontrol**	**picontrol**	**picontrol**
	No forest management	Human & LU		**nosoc**	**nosoc**	**Nosoc**
Ib	no climate change, pre-industrial CO_2	Climate & CO_2	not simulated	Experiment I	**picontrol**	**picontrol**
	varying LU & human influences up to 2005, fixed present-day, site specific management afterwards	Human & LU			**2005socsite**	**2005socsite**
IIb	RCP2.6 climate & CO_2	Climate & CO_2	not simulated	**historical**	**rcp26**	**rcp26**
	No forest management	Human & LU		**nosoc**	**nosoc**	**Nosoc**
IIc	RCP2.6 climate, CO_2 fixed after 2005	Climate & CO_2	not simulated	Experiment II	**rcp26, 2005co2**	**rcp26, 2005co2**
	No forest management	Human & LU			**nosoc**	**Nosoc**
IId	RCP2.6 climate & CO_2	Climate & CO_2	not simulated	Experiment II	**rcp26**	**rcp26**
	varying LU & human influences up to 2005, fixed present-day, site-specific management afterwards	Human & LU			**2005socsite**	**2005socsite**
IIe	RCP2.6 climate, CO_2 fixed after 2005	Climate & CO_2	not simulated	Experiment II	**rcp26, 2005co2**	**rcp26, 2005co2**
	varying LU & human influences up to 2005, fixed present-day, site-specific management afterwards	Human & LU			**2005socsite**	**2005socsite**
IIIa	RCP6.0 climate, CO_2 after 2005 fixed at 2005 levels	Climate & CO_2	not simulated	Experiment II	**rcp60, 2005co2**	not simulated
	LU & human influences fixed at 1860 levels	Human & LU			**2005soc**	

IIIb	RCP6.0 climate & CO_2	Climate & CO_2	not simulated	Experiment II	**rcp60**	not simulated
	No forest management	Human & LU			**nosoc**	
IIIc	RCP6.0 climate, CO_2 after 2005 fixed at 2005 levels	Climate & CO_2	not simulated	Experiment II	**rcp60, 2005soc**	not simulated
	No forest management	Human & LU			**nosoc**	
IIId	RCP6.0 climate & CO_2	Climate & CO_2	not simulated	Experiment II	**rcp60**	not simulated
	fixed present-day, site-specific management after 2005	Human & LU			**2005socsite**	
IIIe	RCP6.0 climate, CO_2 after 2005 fixed at 2005 levels	Climate & CO_2	Experiment I	Experiment II	**rcp60, 2005co2**	not simulated
	fixed present-day, site-specific management after 2005	Human & LU			**2005socsite**	
VIa	RCP2.6 climate & CO_2 after 2005 fixed at 2005 levels	Climate & CO_2	not simulated	Experiment II	**rcp26, 2005co2**	**rcp26, 2005co2**
	varying management	Human & LU			**rcp26soc (i.e. rcp26socbe, rcp26sochwp, rcp26soca)**	
VIIa	RCP6.0 climate & CO_2 after 2005 fixed at 2005 levels	Climate & CO_2	not simulated	Experiment II	**rcp60, 2005co2**	
	varying management	Human & LU			**rcp60soc (i.e. rcp60socbe, rcp60sochwp, rcp60soca)**	
VIIIa	RCP8.5 climate & CO2	Climate & CO_2	not simulated	Experiment II	**rcp85**	not simulated
	fixed present-day, site-specific management after 2005	Human & LU			**2005socsite**	
VIIIb	RCP8.5 climate, CO_2 after 2005 fixed at 2005 levels	Climate & CO_2	not simulated	Experiment II	**rcp85, 2005co2**	not simulated
	fixed present-day, site-specific management after 2005	Human & LU			**2005socsite**	
VIIIc	RCP8.5 climate & CO2	Climate & CO_2	not simulated	Experiment II	**rcp85**	not simulated

	varying management	Human & LU			**rcp85soc (i.e. rcp85socbe, rcp85sochwp, rcp85soca)**	
VIIId	RCP8.5 climate, CO_2 after 2005 fixed at 2005 levels	Climate & CO_2	not simulated	Experiment II	**rcp85, 2005co2**	not simulated
	varying management	Human & LU			**rcp85soc (i.e. rcp85socbe, rcp85sochwp, rcp85soca)**	
VIIIe	RCP8.5 climate & CO2	Climate & CO_2	not simulated	Experiment II	**rcp85**	not simulated
	No forest management	Human & LU			**Nosoc**	
VIIIf	RCP8.5 climate, CO_2 after 2005 fixed at 2005 levels	Climate & CO_2	not simulated	Experiment II	**rcp85, 2005co2**	not simulated
	No forest management	Human & LU			**Nosoc**	
VIIIg	RCP8.5 climate, CO_2 after 2005 fixed at 2005 levels	Climate & CO_2	not simulated	Experiment II	**rcp85, 2005co2**	not simulated
	Fixed present day management after 2005	Human & LU			**2005soc**	

7.1.1 Bily-Kriz

Table 18 FORMASAM management guidelines for Bily-Kriz. Grey=already covered in ISIMIP2b, green = new FORMASAM runs

Scenario [ISIMIP-scenario-name]	Silvicultural system	Species	Harvest type (stem / branches)	Thinning type	Intensity	Rotation length [years]	Thinning frequency	Replanting species	Planting density	Planting age [years]	Planting seedling height [m]	Planting DBH [cm]	Age when DBH is reached [years]	Remarks
Current generic ISIMIP [2005soc]	even-aged clearcut	piab	stem	below	30% BA	120	15 30 45 60 75 90 105	piab	4500	4	0.5	na	9	historical planting density was 5000/ha but current practices are 4500/ha only
No management [nosoc]	na	piab	na	na	na	na	na	na	na	na	na	na	na	allow any NR of species formerly present on plot
Current Site-specific [2005socsite]	even-aged clearcut	piab	stem	below	50 20 15 10 10 30 40% BA	110	15 25 35 45 60 95 105	piab + NR of fasy & abal (about 5%)	4000/ha piab + 1000/ha fasy + 500/ ha abal to mimic NR	4	0.3	na	8	fasy and abal are "allowed" in NR but not managed, only sanitary removal of dead trees, the final cut is split into two (at age 105 and age 110)
Bioenergy	even-aged	piab	stem+	below	40% BA	45	20	piab	4000	4	0.3	na	8	regenerate

[rcp26socbe / rcp60socbe / rcp85socbe]	clearcut		branches											as pure piab stand
HWP [rcp26sochwp / rcp60sochwp / rcp85sochwp]	even-aged clearcut	piab	stem	above	50 20 15 10 10 10 30 40% BA	120	15 25 35 45 60 80 100 110	piab	4000	4	0.3	na	8	thinning from above mimics selection of future crop trees (400 trees per hectare)
Multifunctional-Adapted [rcp26soca / rcp60soca / rcp85soca]	shelterwood transition to mixed selection forest (regenerating continuously, whenever there are gaps)	piab, fasy, abal	stem	Above Above Random Random Above_piab (Target DBH 55cm)/Random_fasy,abal,piab2 Above (Target DBH 55cm)	25 piab 10 piab 15 piab 10 piab, 5 fasy & abal 15 piab, 5 fasy & abal & piab 2nd generation 15%BA all	after transition: target DBH 55cm	40 45 55 65-75-85 95-105-115-125-135-145 155-165…every 10 years	during transition: planting of fasy & abal + NR of piab, after transition only NR	4000/ha piab + 1000/ha fasy + 500/ ha abal to mimic NR	4	0.3	na	8	any species, but mainly piab, fasy, abal are "allowed" in NR

Table 19 Detailed FORMASAM management schedule for Bily-Kriz. Ini = Initialization data, HM = Historic Management, FM = Future Management, TB=Thinning from below, TA = Thinning from above, H= Harvest, P=Planting, T = Random Thinning

Name	Ini	HM	FM1	FM2	FM3	FM4	FM5	FM6	FM7	FM8	FM9	FM10	FM11	FM12	FM13	FM14	FM15	FM16	FM17	FM18	FM19	Remarks
Current generic	1997	1998-2015	2030	2045	2060	2075	2090	2100	2101	2116	2131	…	2221	2222	2238	…	2297					
		TB	TB30	TB30	TB30	TB30	TB30	H	P	TB30	TB30	TB30	H	P	TB30	TB30	TB30					
Current Site-specific	1997	1998-2015	2026	2041	2076	2086	2091	2092	2107	2117	2127	2137	2152	2187	2197	2202	2203	…	2313			
		TB	TB10	TB10	TB30	TB40	H	P	TB50	TB20	TB15	TB10	TB10	TB30	TB40	H	P	…	H			
Bioenergy	1997	1998-2015	2026	2027	2047	2072	2073	2093	2118	2119	2139	2164	2165	2185	2210	2211	2231	2256	2257	…	2302	
		TB	H	P	TB40	H	P	TB40	H	P	TB40	H	P	TB40	H	P	TB40	H	P		H	
HWP	1997	1998-2015	2026	2041	2061	2081	2091	2101	2102	2117	2127	2137	2147	2162	2182	2202	2212	2222	2223	…	2303	
		TB	TA10	TA10	TA10	TA30	TA40	H	P	TA50	TA20	TA15	TA10	TA10	TA10	TA30	TA40	H	P	…	TA10	
Multifunctional-Adapted	1997	1998-2015	2021	2026	2036	2046	2056	2066	2076	2086	2096	2106	2116	2126	2136	2146	2156	2166	2176	..	2306	special settings as continuous cover forestry is implemented
		TB	TA25	TA10	T15	T10			TA15, NR						TA15, NR							Spruce management
						NR			T05						TA15, NR							2^{nd} generation Spruce management
			P			T05, NR									TA15, NR							Beech and Abies management

7.1.2 Collelongo

Table 20 FORMASAM management guidelines for Collelongo. Grey=already covered in ISIMIP2b, green = new FORMASAM runs

Scenario	Silvicultural system	Species	Harvest type (stem / branches)	Thinning type	Intensity	Rotation length [years]	Thinning frequency	Replanting species	Planting density	Planting age [years]	Planting seedling height [m]	Planting DBH [cm]	Age when DBH is reached [years]	Remarks
Current generic ISIMIP [2005soc]	even-aged clearcut	fasy	stem	above	30% BA	140	15	fasy	10000	4	1.3	0.1	4	the planting data is only a rough approximation, usually NR is the regeneration method
							30							
							45							
							60							
							75							
							90							
							105							
							120							
							135							
No management [nosoc]	na	fasy	na	na	na	na	na	na	na	na	na	na	na	allow any NR of species formerly present on plot
Current Site-specific [2005socsite]	shelterwood (start regenerating at age 105)	fasy	stem	below	35%	120	15	fasy	NR 9000 (8000-10000)	1	0.1	0.1	5	the first thinning is precommercial, The planting data is only a rough approximation, usually NR is the regeneration method.
				below	25%		35							
				below	25%		60							
				below	25%		85							
				above	35% BA		105							
Bioenergy [rcp26socbe / rcp60socbe / rcp85socbe]	shelterwood (start regenerating at age 105)	fasy	stem+ branches	below	35%	120	15	fasy	NR 9000 (8000-10000)	1	0.1	0.1	5	the planting data is only a rough approximation, usually NR is the regeneration method.
					15%		35							
					15%		55							
					15%		75							
					15%		95							
					15% BA		105							
HWP [rcp26sochwp / rcp60sochwp / rcp85sochwp]	shelterwood (start regenerating at age 140)	fasy	stem	below	35%	160	15	fasy	NR 9000 (8000-10000)	1	0.1	0.1	5	the planting data is only a rough approximation, usually NR is the regeneration method.
				below	25%		35							
				below	25%		60							
				below	25%		85							
				above	35%		105							
				above	35% BA		140							

Multifunctional-Adapted [rcp26soca / rcp60soca / rcp85soca]	even-aged clearcut	fasy + qupu	stem	 below below below below below above below below below below below above	fasy: 35% 15% 15% 15% 15% 15% BA qupu: 40% 20% 20% 20% 20% 20% BA	120	 15 35 55 75 95 105 15 35 55 75 95 105	fasy + qupu	400 qupu, NR with fasy approximated using 600 samplings	3	0.5	1	5	

Table 21 Detailed FORMASAM management schedule for Collelongo. Ini = Initialization data, HM = Historic Management, FM = Future Management, TB=Thinning from below, TA = Thinning from above, H= Harvest, P=Planting

Name	Ini	HM	FM1	FM2	FM3	FM4	FM5	FM6	FM7	FM8	FM9	FM10	FM11	FM12	FM13	FM14	FM15	FM16	FM17	FM18	FM19	FM20	FM21	Remarks
Current Generic	1992	1997-2012	2027	2032	2033	2048	2063	2078	2093	…	2258	2173	2174	2189	…	2294								
		TA	TA30	H	P	TA30	TA30	TA30	TA30	TA30	TA30	H	P	TA30		TA30								
Current Site-specific	1992	1997-2012	2020	2021	2036	2056	2081	2106	2126	2141	2161	2186	2211	2231	2246	2266	2286							
		TA	H	P	TB35	TB25	TB25	TB25	TA35, P	H, TB35	TB25	TB25	TB25	TA35, P	H, TB35	TB35	TB25							
Bioenergy	1992	1997-2012	2020	2021	2036	2056	2076	2096	2116	2126	2141	2161	2181	2201	2221	2231	2246	2266	2286					
		TA	H	P	TB35	TB15	TB15	TB15	TB15	TB15, P	H, TB35	TB15	TB15	TB15	TB15	TB15, P	H, TB35	TB15	TB15					
HWP	1992	1997-2012	2032	2052	2053	2068	2088	2113	2138	2158	2193	2213*	2228	2253	2278	2298								
		TA	TA35	H	P	TB35	TB25	TB25	TB25	TA35	TA35, P	H, TB35	TB25	TB25	TB25	TA35								
Multifunctional-Adapted	1992	1997-2012	2020	2021	2036	2056	2076	2096	2116	2126	2141	2142	2157	2177	2197	2217	2237	2247	2262	2263	2278	2298	2318	
		TA	H	P	TB35, TB40	TB15, TB20	TB15, TB20	TB15, TB20	TB15, TB20	TA15, TA20	H	P	TB35, TB40	TB15, TB20	TB15, TB20	TB15, TB20	TB15, TB20	TA15, TA20	H	P	TB35, TB40	TB15, TB20	TB15, TB20	first number fasy, second qupu

*exceptionally this thinning happens at age 20 and not age 15

7.1.3 Hyytiälä

Table 22 FORMASAM management guidelines for Hyytiälä. Grey=already covered in ISIMIP2b, green = new FORMASAM runs

Scenario	Silvicultural system	Species	Harvest type (stem / branches)	Thinning type	Intensity	Rotation length [years]	Thinning frequency	Replanting species	Planting density	Planting age [years]	Planting seedling height [m]	Planting DBH [cm]	Age when DBH is reached [years]	Remarks
Current generic ISIMIP [2005soc]	even-aged clearcut	pisy	stem	below	20% BA	140	15 30 45 60 75 90 105 120 135	pisy	2250 (2000-2500)	2	0.25 (0.2-0.3)	na	6 (5-7)	regenerate as pure pisy stand
No management [nosoc]	na	pisy	na	na	na	na	na	na	na	na	na	na	na	allow any NR of species formerly present on plot
Current Site-specific [2005socsite]	even-aged clearcut	pisy	stem	below below above	20% BA	90	20 50 70	pisy	2000	2	0.25 (0.2-0.3)	na	7 (5-7)	regenerate as pure pisy stand
Bioenergy [rcp26socbe / rcp60socbe / rcp85socbe]	even-aged clearcut	pisy	stem+ branches	below	25% BA	60	20	pisy	2500	2	0.25 (0.2-0.3)	na	8 (5-7)	regenerate as pure pisy stand
HWP [rcp26sochwp / rcp60sochwp / rcp85sochwp]	even-aged clearcut	pisy	stem	below below above above	10% BA	120	20 50 70 110	pisy	2500	2	0.25 (0.2-0.3)	na	9 (5-7)	regenerate as pure pisy stand
Multifunctional-Adapted [rcp26soca / rcp60soca / rcp85soca]	even-aged clearcut	pisy	stem	below below above	20% BA	80	20 40 60	pisy	2000 +NR	2	0.25 (0.2-0.3)	na	10 (5-7)	regenerate as pure pisy stand

Table 23 Detailed FORMASAM management schedule for Hyytiälä. Ini = Initialization data, HM = Historic Management, FM = Future Management, TB=Thinning from below, TA = Thinning from above, H= Harvest, P=Planting

Name	Ini	HM	FM1	FM2	FM3	FM4	FM5	FM6	FM7	FM8	FM9	FM10	FM11	FM12	FM13	FM14	FM15	FM16	FM17	FM18	FM19	Remarks
Current generic	1995	1996-2011	2026	2041	2056	2071	2086	2101	2102	2117	…	2242	2243	2258	…							Only simulate pine and spruce (no hard-woods) and regenerate as pure pine stand.
		TB	TB20	TB20	TB20	TB20	TB20	H	P	TB20	TB20	H	P	TB20	TB20							
Current Site-specific	1995	1996-2011	2031	2051	2052	2072	2102	2122	2142	2143	2163	2193	2213	2233	2234	2254	2284	2304				
		TB	TA20	H	P	TB20	TB20	TA20	H	P	TB20	TB20	TA20	H	P	TB20	TB20	TA20				
Bioenergy	1995	1996-2011	2021	2022	2042	2082	2083	2103	2143	2144	2164	2204	2205	2225	2265	2266	2286	2326				
		TB	H	P	TB25	H	P	TB25	H	P	TB25	H	P	TB25	H	P	TB25	H				
HWP	1995	1996-2011	2031	2071	2081	2082	2102	2132	2152	2192	2202	2203	2223	2253	2273	2313						
		TB	TA10	TA10	H	P	TB10	TB10	TA10	TA10	H	P	TB10	TB10	TA10	TA10						
Multifunctional-Adapted	1995	1996-2011	2021	2041	2042	2062	2082	2102	2122	2123	2143	2163	2183	2203	2204	2224	2244	2264	2284	2285	2305	
		TB	TA20	H	P	TB20	TB20	TA20	H	P	TB20	TB20	TA20	H	P	TB20	TB20	TA20	H	P	TB20	

7.1.4 Kroof (mixed beech & spruce forest)

Table 24 FORMASAM management guidelines for Kroof (beech). Grey=already covered in ISIMIP2b, green = new FORMASAM runs.

Scenario	Silvicultural system	Species	Harvest type (stem / branches)	Thinning type	Intensity	Rotation length [years]	Thinning frequency	Replanting species	Planting density	Planting age [years]	Planting seedling height [m]	Planting DBH [cm]	Age when DBH is reached [years]	Remarks
Current generic ISIMIP [2005soc]	even-aged clearcut	fasy	stem	above	30% BA	140	15 30 45 60 75 90 105 120 135	fasy	6000 (5000-7000)	2	0.6 (0.5-0.7)	na	5	the planting density is for single-species stands, hence when regenerating the stand as a 2-species-stand (fasy, piab), the planting density of each species should be halved
No management [nosoc]	na	fasy	na	na	na	na	na	na	na	na	na	na	na	allow any NR of species formerly present on plot
Current Site-specific [2005socsite]	target DBH mimicked through rotation length	fasy	stem	above	15% BA	120	20 30 40 50 60 70 80 90 100 110	NR; fasy	4000 after 10 years (2500-5000)	2	0.6 (0.5-0.7)	na	7	the planting density is a 2-species-stand (fasy,piab), planting density for a single stand should be doubled
Bioenergy [rcp26socbe / rcp60socbe / rcp85socbe]	target DBH mimicked through rotation length	fasy	stem + branches	above	15% BA	80	20 25 30 35 40 45 50 60	NR; fasy	4000 after 10 years (2500-5000)	2	0.6 (0.5-0.7)	na	7	the planting density is a 2-species-stand (fasy,piab), planting density for a single stand should be doubled

							70							
HWP [rcp26sochwp / rcp60sochwp / rcp85sochwp]	target DBH mimicked through rotation length	fasy	stem	above	10% BA	130	20 30 35 40 45 50 55 60 70 80 90 100 110 120	NR; fasy	4000 after 10 years (2500-5000)	2	0.6 (0.5-0.7)	na	7	the planting density is a 2-species-stand (fasy,piab), planting density for a single stand should be doubled
Multifunctional-Adapted [rcp26soca / rcp60soca / rcp85soca]	Same as Current Site-specific													

Table 25 FORMASAM management guidelines for Kroof (spruce). Grey=already covered in ISIMIP2b, green = new FORMASAM runs.

Scenario	Silvicultural system	Species	Harvest type (stem / branches)	Thinning type	Intensity	Rotation length [years]	Thinning frequency	Replanting species	Planting density	Planting age [years]	Planting seedling height [m]	Planting DBH [cm]	age when DBH is reached [years]	Remarks
Current generic ISIMIP [2005soc]	even-aged clearcut	piab	stem	below	30% BA	120	15 30 45 60 75 90 105	piab	2250 (2000-2500)	2	0.35 (0.3-0.4)	na	7	the planting density is for single-species stands, hence when regenerating the stand as a 2-species-stand (fasy, piab), the planting density of each species should be halved
No management [nosoc]	na	piab	na	na	na	na	na	na	na	na	na	na	na	allow any NR of species formerly

														present on plot
Current Site-specific [2005socsite]	target DBH mimicked through rotation length	piab	stem	above	12.5% BA	90	10 25 30 35 40 45 55 65 75	piab	1500 (1000-2000)	2	0.35 (0.3-0.4)	na	5	the planting density is for single-species stands, hence when regenerating the stand as a 2-species-stand (fasy, piab), the planting density of each species should be halved, planting is delayed until beech is also planted
Bioenergy [rcp26socbe / rcp60socbe / rcp85socbe]	target DBH mimicked through rotation length	piab	stem + branches	below	10% BA	50	15 25 35 45	piab	1500 (1000-2000)	2	0.35 (0.3-0.4)	na	5	the planting density is a 2-species-stand (fasy, piab), planting density for a single stand should be doubled, planting is delayed until beech is also planted
HWP [rcp26sochwp / rcp60sochwp / rcp85sochwp]	target DBH mimicked through rotation length	piab	stem	above	7.5% BA	110	10 20 30 40 50 60 70 80 90	piab	1500 (1000-2000)	2	0.35 (0.3-0.4)	na	5	the planting density is a 2-species-stand (fasy, piab), planting density for a single stand should be doubled, planting is delayed until beech is also planted
Multifunctional-Adapted [rcp26soca / rcp60soca / rcp85soca]	Same as Current Site-specific													

Table 26 Detailed FORMASAM management schedule for Kroof (beech+spruce). Ini = Initialization data, HM = Historic Management, FM = Future Management, TB=Thinning from below, TA = Thinning from above, H= Harvest, P=Planting, ***plantings are delayed until beech is also harvested to harmonize the planting dates.

Name	Ini	HM	FM1	FM2	FM3	FM4	FM5	FM6	FM7	FM8	FM9	FM10	FM11	FM12	FM13	FM14	FM15	FM16	FM17	FM18	FM19	FM20	FM21	FM22	FM23	FM24	Remarks
Current Generic	1997	1999-2010	2025	2040	2055	2070	2085	2100	2101	2102	2117	…	2222	2223	2238	…											Beech part of stand, maximum age extended a bit to avoid harvesting just before the end of the simulation
		TB	TA30	TA30	TA30	TA30	TA30	TA30	H	P	TA30	TA30	H	P	TA30	TA30											
	1997	1999-2010	2025	2040	2055	2070	2085	2100	2101	2102	2117	…	2222	2223	2238	…											Spruce part of stand, maximum age extended a bit to avoid harvesting just before the end of the simulation
		TB	TB30	TB30	TB30	TB30	TB30	TB30	H	P	TB30	TB30	H	P	TB30	TB30											
Current Site-specific	1997	1999-2010	2023	2033	2043	2053	2063	2064	2084	2094	2104	2114	2124	2134	2144	2154	2164	2174	2184	2185	…	2295					Beech part of stand
		TB	TA15	TA15	TA15	TA15	H	P	TA15	TA15	TA15	TA15	TA15	TA15	TA15	TA15	TA15	TA15	H	P	…	TA15					
		1999-2010	2025	2040	2064	2074	2089	2094	2099	2104	2109	2119	2129	2139	2154	2185	…	2275									Spruce part of stand
		TB	TA12.5	H	P***	TA12.5	TA12.5	TA12.5	TA12.5	TA12.5	TA12.5	TA12.5	TA12.5	TA12.5	H	P***	…	H									
Bioenergy	1997	1999-2010	2023	2024	2044	2049	2054	2059	2064	2069	2074	2084	2094	2104	2105	…	2185	2186	…	2266	2267	…	2297				Beech part of stand
		TB	H	P	TA15	TA15	TA15	TA15	TA15	TA15	TA15	TA15	TA15	H	P	…	H	P	…	H	P	…	TA15				
		1999-2010	2020	2024	2039	2049	2059	2069	2074	2105	2120	2130	2140	2150	2155	2186	…	2236	2267	…	2292						Spruce part of stand
		TB	H	P***	TB10	TB10	TB10	TB10	H	P***	TB10	TB10	TB10	TB10	H	P***	…	H	P***	…	TB10						

HWP	1997	1999-2010	2023	2033	2043	2053	2063	2073	2074	2094	2104	2109	2114	2119	2124	2129	2134	2144	2154	2164	2174	2184	2194	2204	2205	…	Beech part of stand
		TB	TA10	TA10	TA10	TA10	TA10	H	P	TA10	TA10	TA10	TA10	TA10	TA10	TA10	TA10	TA10	TA10	TA10	TA10	TA10	TA10	H	P	…	
		1999-2010	2020	2030	2040	2060	2074	2084	2094	2104	2114	2124	2134	2144	2154	2164	2184	2205	…	2295							Spruce part of stand
		TB	TA7.5	TA7.5	TA7.5	H	P***	TA7.5	TA7.5	TA7.5	TA7.5	TA7.5	TA7.5	TA7.5	TA7.5	TA7.5	H	P***	…	TA7.5							

7.1.5 Le-bray

Table 27 FORMASAM management guidelines for Le-bray. Grey=already covered in ISIMIP2b, green = new FORMASAM runs

Scenario	Silvicultural system	Species	Harvest type (stem / branches)	Thinning type	Intensity	Rotation length [years]	Thinning frequency	Replanting species	Planting density	Planting age [years]	Planting seedling height [m]	Planting DBH [cm]	Age when DBH is reached [years]	Remarks
Current generic ISIMIP [2005soc]	even-aged clearcut	pipi	stem	below	20% BA	45	10 20 30 40	pipi	1250 (1000-14000)	1	0.2 (0.1-0.25)	na	3 (2-5)	these are the current practices (De Lary, 2015) and should be used for future regeneration. Historically, the site was seeded with 3000-5000 seedlings per ha and then cleared once or twice to reach a density of 1250/ha at 7-year old when seedlings reach the size for DBH recruitment. If a model requires to be initialised at planting for the historical simulations as well. modellers could mimic this by "planting" trees with DBH of 7.5cm and 6m height in 1978 with a density of 1250 trees/ha
No management [nosoc]	na	pipi	na	na	na	na	na	na	na	na	na	na	na	allow any NR of species formerly present on plot

Current Site-specific [2005socsite]	even-aged clearcut	pipi	stem	below	20% BA	45	10 20 30 40	pipi	2500	1	0.1	na	7	this is to mimic the change in managed from sowing to planting, timing of thinnings and final cut is mimicking a target-oriented harvesting schedule.
Bioenergy-flexible [rcp26socbef / rcp60socbef / rcp85socbef]	even-aged clearcut	pipi	stem+ branches+ stump	below	50% 20% 20% 20% 20% BA	45	7 12 20 30 40	pipi	2500	1	0.1	na	7	stumps only harvested after final cut, not after thinnings
Bioenergy-biomass [rcp26socbeb / rcp60socbeb / rcp85socbeb]	even-aged clearcut	pipi	stem+ branches+ stump	below	na	30	na	pipi	2500	1	0.1	na	7	stumps only harvested after final cut, not after thinnings
HWP [rcp26sochwp / rcp60sochwp / rcp85sochwp]	even-aged clearcut	pipi	stem	below	15% BA	60	15 30 40 50	pipi	1600	1	0.1	na	7	
Multifunctional-Adapted [rcp26soca / rcp60soca / rcp85soca]	even-aged clearcut	pipi	stem	below	30% BA	45	10 20 30 40	pipi	1250	1	0.1	na	7	

Table 28 Detailed FORMASAM management schedule for Le-bray. Ini = Initialization data, HM = Historic Management, FM = Future Management, TB=Thinning from below, TA = Thinning from above, H= Harvest, P=Planting

Name	Ini	HM	FM1	FM2	FM3	FM4	FM5	FM6	FM7	FM8	FM9	FM10	FM11	FM12	FM13	FM14	FM15	FM16	FM17	FM18	FM19	FM20	Remarks
Current generic	1986	1987-2009	2015	2016	2026	2036	2046	2056	2061	2062	2072	…	2107	2108	2118	…	2153	…	2199	…	2245	…	
		TB	H	P	TB20	TB20	TB20	TB20	H	P	TB20	TB20	H	P	TB20	TB20	H	TB20	H	TB20	H	TB20	
Current Site-specific	1986	1987-2009	2020	2021	2031	2041	2051	2061	2066	2067	2077	2087	2097	2107	2112	2113	…	2158	…	2203	…	2295	
		TB	H	P	TB20	TB20	TB20	TB20	H	P	TB20	TB20	TB20	TB20	H	P	…	H	…	H	…	H	
Bioenergy-flexible	1986	1987-2009	2020	2021	2028	2033	2041	2051	2061	2066	2067	2074	2079	2087	2097	2107	2112	2113	…	2158	…	2295	
		TB	H	P	TB50	TB20	TB20	TB20	TB20	H	P	TB50	TB20	TB20	TB20	TB20	H	P	…	H	…	H	
Bioenergy-biomass	1986	1987-2009	2020	2021	2051	2052	2082	2083	2113	2114	2144	2145	2175	2176	2206	2207	2237	2238	2268	…	2300		
		TB	H	P	H	P	H	P	H	P	H	P	H	P	H	P	H	P	H		P		
HWP	1986	1987-2009	2020	2030	2031	2046	2061	2071	2081	2091	2092	2107	2122	2132	2142	2152	2153	…	2274	2275	…	2305	
		TB	TB15	H	P	TB15	TB15	TB15	TB15	H	P	TB15	TB15	TB15	TB15	H	P		H	P	…	TB15	
Multifunctional-Adapted	1986	1987-2009	2020	2021	2031	2041	2051	2061	2066	2067	2077	2087	2097	2107	2112	2213	…	2258	2259	…	2304		
		TB	H	P	TB30	TB30	TB30	TB30	H	P	TB30	TB30	TB30	TB30	H	P	…	H	P	…	H		

7.1.6 Peitz

Table 29 FORMASAM management guidelines for Peitz. Grey=already covered in ISIMIP2b, green = new FORMASAM runs

Scenario	Silvicultural system	Species	Harvest type (stem / branches)	Thinning type	Intensity	Rotation length [years]	Thinning frequency	Replanting species	Planting density	Planting age [years]	Planting seedling height [m]	Planting DBH [cm]	Age when DBH is reached [years]	Remarks
Current generic ISIMIP [2005soc]	even-aged clearcut	pisy	stem	below	20% BA	140	15 30 45 60 75 90 105 120 135	pisy	9000 (8000-10000)	2	0.175 (0.1-0.25)	na	5	The “age when DBH is reached = 5” is an estimate
No management [nosoc]	na	pisy	na	na	na	na	na	na	na	na	na	na	na	allow any NR of species formerly present on plot
Current Site-specific [2005socsite]	even-aged clearcut	pisy	stem	below below above	10% 20% 20% BA	120	55 75 95	pisy	9000	2	0.175 (0.1-0.25)	na	5	regenerate as pure pisy stand
Bioenergy [rcp26socbe / rcp60socbe / rcp85socbe]	even-aged clearcut	pisy	stem+ branches	below (pulp+ bioenergy)	25% BA	95	55	pisy	7000	2	0.175 (0.1-0.25)	na	5	regenerate as pure pisy stand
HWP [rcp26sochwp / rcp60sochwp / rcp85sochwp]	even-aged clearcut	pisy	stem	below below above above	10% BA	120	20 50 70 110	pisy	9000	2	0.175 (0.1-0.25)	na	5	regenerate as pure pisy stand
Multifunctional-Adapted [rcp26soca / rcp60soca / rcp85soca]	even-aged clearcut with few remaining seed trees	pisy	stem	below below above	15% BA	100	40 60 80	pisy, quro/qupe, bepe in NR	4000 (pisya) +1500 (qupe/qupo) +1500 (bepe)	2	0.175 (0.1-0.25)	na	5	qupe/quro, fasy, rops, bepe allowed in NR

Table 30 Detailed FORMASAM management schedule for Peitz. Ini = Initialization data, HM = Historic Management, FM = Future Management, TB=Thinning from below, TA = Thinning from above, H= Harvest, P=Planting. **= some GCM data only starts in 1950, hence for future runs, you have to initialize these forests at the first time step after 1949 (i.e. 1952 for Peitz). For the historical validation runs you can start with the first available stand initialization.

Name	Ini	HM	FM1	FM2	FM3	FM4	FM5	FM6	FM7	FM8	FM9	FM10	FM11	FM12	FM13	FM14	FM15	Remarks
Current Generic	1948**	1952-2011	2026	2040	2041	2056	2071	2086	2101	…	2181	2182	2197	…				
		TB	TB20	H	P	TB20	TB20	TB20	TB20	TB20	H	P	TB20	TB20				
Current Site-specific	1948**	1952-2011	2020	2021	2076	2096	2116	2141	2142	2197	2217	2237	2262	2263	2318			
		TB	H	P	TB10	TB20	TA20	H	P	TB10	TB20	TA20	H	P	TB10			
Bioenergy	1948**	1952-2011	2020	2021	2076	2116	2117	2172	2212	2213	2268	2308						
		TB	H	P	TB25	H	P	TB25	H	P	TB25	H						
HWP	1948**	1952-2011	2020	2021	2041	2071	2091	2131	2141	2142	2162	2192	2212	2252	2262	2263	2283	
		TB	H	P	TB10	TB10	TA10	TA10	H	P	TB10	TB10	TA10	TA10	H	P	TB10	
Multifunctional-Adapted	1948**	1952-2011	2020	2021	2061	2081	2101	2121	2122	2162	2182	2202	2222	2223P	2263	2283	2303	
		TB	H	P	TB15	TB15	TA15	H	P	TB15	TB15	TA15	H	P	TB15	TB15	TA15	

7.1.7 Solling-beech

Table 31 FORMASAM management guidelines for Solling-beech. Grey=already covered in ISIMIP2b, green = new FORMASAM runs

Scenario	Silvicultural system	Species	Harvest type (stem / branches)	Thinning type	Intensity	Rotation length [years]	Thinning frequency	Replanting species	Planting density	Planting age [years]	Planting seedling height [m]	Planting DBH [cm]	Age when DBH is reached [years]	Remarks
Current generic ISIMIP [2005soc]	even-aged clearcut	fasy	stem	above	30% BA	140	15 30 45 60 75 90 105 120 135	fasy	6000 (5000-7000)	2	0.6 (0.5-0.7)	na	5	The actual stand was established in 1847 from natural regeneration. Until begin of measurements in 1966, the stand was regularly thinned. All figures in table are estimates. Natural regeneration is the recommended regeneration method of stand establishment; stem count in 2014: 130
No management [nosoc]	na	fasy	na	na	na	na	na	na	na	na	na	na	na	allow any NR of species formerly present on plot
Current Site-specific [2005socsite]	even-aged clearcut	fasy	stem	above above above above above above above above above above below below	20% BA	120	5 10 15 20 25 30 35 50 65 80 95 110	fasy	8500 (7000-10000)	2	0.3 (0.2-0.4)	na	4	

Bioenergy [rcp26socbe / rcp60socbe / rcp85socbe]	even-aged clearcut	fasy	stem+ branches	below	30% BA	90	45	fasy	8500 (7000-10000)	2	0.3 (0.2-0.4)	na	4	
HWP [rcp26sochwp / rcp60sochwp / rcp85sochwp]	same as Current Site-specific													
Multifunctional-Adapted [rcp26soca / rcp60soca / rcp85soca]	even-aged clearcut transition to mixed forest with psme	fasy (40%) + psme (60%)	stem	above above above above above above above above below below	20% BA	90	5 10 15 20 25 30 35 50 65 80	fasy + psme	4000 (3500-4500) fasy + 6000 (5000-7000) psme	2	0.3 (0.2-0.4)	na	4	
Multifunctional-Adapted [rcp26socam / rcp60socam / rcp85socam]	even-aged clearcut transition to mixed forest with piab, bepe and soau	Fasy, piab, bepe, soau	stem	above above above above above above above above above above below below	20% BA	120	5 10 15 20 25 30 35 50 65 80 95 110	Fasy + NR 30% piab, 5% bepe, 3% soau	6200 + natural regeneration (3000 piab, 500 bepe 300 soau)	2	0.35 (0.25-0.5)	0.6	3	

Table 32 Detailed FORMASAM management schedule for Solling-beech. Ini = Initialization data, HM = Historic Management, FM = Future Management, TB=Thinning from below, TA = Thinning from above, H= Harvest, P=Planting

Name	**Ini**	**HM**	**FM1**	**FM2**	**FM3**	**FM4**	**FM5**	**FM6**	**FM7**	**FM8**	**FM9**	**FM10**	**FM11**	**FM12**	**FM13**	**FM14**	**FM15**	**FM16**	**FM17**	**FM18**	**FM19**	**FM20**	**FM21**	**Remarks**
Current Generic	1967	1968-2014	2015	2016	2031	2046	2061	2076	2091	…	2156	2157	2172	…	2297	2298								maximum age extended a bit to match local management during observed period
		TA	H	P	TA30	TA30	TA30	TA30	TA30	TA30	H	P	TA30	TA30	H	P								
Current Site-specific	1967	1968-2014	2020	2021	2026	2031	2036	2041	2046	2051	2056	2071	2086	2101	2116	2131	2141	2142	…	2262	2263	…	2298	
		TA	H	P	TA20	TA20	TA20	TA20	TA20	TA20	TA20	TA20	TA20	TA20	TB20	TB20	H	P		H	P		TA20	
Bioenergy	1967	1968-2014	2020	2021	2066	2111	2112	2157	2202	2203	2248	2293	2294	2339										
		TA	H	P	TB30	H	P	TB30	H	P	TB30	H	P	TB30										
HWP	Same as Current Site Specific																							
Multifunctional-Adapted	1967	1968-2014	2020	2021	2026	2031	2036	2041	2046	2051	2056	2071	2086	2101	2111	2112	…	2202	2203	…	2293	…	2304	management for fasy & psme
		TA	H	P	TA20	TA20	TA20	TA20	TA20	TA20	TA20	TA20	TB20	TB20	H	P	…	H	P	…	H	…	TA20	
Multifunctional-Adapted	1967	1968-2014	2020	2021	2026	2031	2036	2041	2046	2051	2056	2071	2086	2101	2116	2131	2141	2142	…	2262	2263	…	2298	Management for piab, fasy, bepe, soau
		TA	H	P	TA20	TA20	TA20	TA20	TA20	TA20	TA20	TA20	TA20	TA20	TB20	TB20	H	P	…	H	P	…	TA20	

7.1.8 Solling-spruce

Table 33 FORMASAM management guidelines for Solling-spruce. Grey=already covered in ISIMIP2b, green = new FORMASAM runs

Scenario	Silvicultural system	Species	Harvest type (stem / branches)	Thinning type	Intensity	Rotation length [years]	Thinning frequency	Replanting species	Planting density	Planting age [years]	Planting seedling height [m]	Planting DBH [cm]	Age when DBH is reached [years]	Remarks
Current generic ISIMIP [2005soc]	even-aged clearcut	piab	stem	below	30% BA	120	15 30 45 60 75 90 105	piab	2250 (2000-2500)	2	0.35 (0.3-0.4)	na	7	The actual stand was planted in 1891 on a former meadow. Until begin of measurements in 1966, the stand was regularly thinned. All figures in table are estimates.; stem count in 2014: 290
No management [nosoc]	na	piab	na	na	na	na	na	na	na	na	na	na	na	allow any NR of species formerly present on plot
Current Site-specific [2005socsite]	even-aged clearcut	piab	stem	above above above above above above above above above above below below	15% BA	120	5 10 15 20 25 30 35 50 65 80 95 110	piab	3000 (2500-3500)	2	0.35 (0.25-0.5)	0.6	3	
Bioenergy [rcp26socbe / rcp60socbe / rcp85socbe]	even-aged clearcut	piab	stem+ branches	below	25% BA	60	30	piab	3000 (2500-3500)	2	0.35 (0.25-0.5)	0.6	3	
HWP	same as Current Site-specific													

[rcp26sochwp / rcp60sochwp / rcp85sochwp]														
Multifunctional-Adapted [rcp26soca / rcp60soca / rcp85soca]	even-aged clearcut transition to mixed forest with fasy, bepe and soau	piab, fasy, bepe, soau	stem	above above above above above above above above above above below below	15% BA	120	5 10 15 20 25 30 35 50 65 80 95 110	piab + NR 12% fasy, 5% bepe, 3% soau	2400 + NR (360 fasy, 150 bepe, 90 soau)	2	0.35 (0.25-0.5)	0.6	3	

Table 34 Detailed FORMASAM management schedule for Solling-spruce. Ini = Initialization data, HM = Historic Management, FM = Future Management, TB=Thinning from below, TA = Thinning from above, H= Harvest, P=Planting

Name	Ini	HM	FM1	FM2	FM3	FM4	FM5	FM6	FM7	FM8	FM9	FM10	FM11	FM12	FM13	FM14	FM15	FM16	FM17	FM18	FM19	FM20	Remarks
Current Generic	1967	1968-2014	2024	2025	2040	2055	2070	2085	…	2145	2146	2161	…	2266	2267	…							maximum age extended a bit to match local management during observed period
		TB	H	P	TB30	TB30	TB30	TB30	TB30	H	P	TB30	TB30	H	P	TB30							
Current Site-specific	1967	1968-2014	2020	2021	2026	2031	2036	2041	2046	2051	2056	2071	2086	2101	2116	2131	2141	2142	…	2262	…	2298	
		TB	H	P	TA15	TA15	TA15	TA15	TA15	TA15	TA15	TA15	TA15	TA15	TB15	TB15	H	P	…	H	…	TA15	
Bioenergy	1967	1968-2014	2020	2021P	2051	2081	2082	2112	2142	2143	2173	2203	2204	2234	2264	2265	2295	2325					
		TB	H	P	TB25	H	P	TB25	H	P	TB25	H	P	TB25	H	P	TB25	H					
HWP	Same as Current Site-specific																						
Multifunctional-Adapted	1967	1968-2014	2020	2021	2026	2031	2036	2041	2046	2051	2056	2071	2086	2101	2116	2131	2141	2142	…	2262	…	2298	piab, fasy, bepe, soau
		TB	H	P	TA15	TA15	TA15	TA15	TA15	TA15	TA15	TA15	TA15	TA15	TB15	TA15	H	P	…	H	…	TA15	

7.1.9 Soro

Table 35 FORMASAM management guidelines for Soro. Grey=already covered in ISIMIP2b, green = new FORMASAM runs

Scenario	Silvicultural system	Species	Harvest type (stem / branches)	Thinning type	Intensity	Rotation length [years]	Thinning frequency	Replanting species	Planting density	Planting age [years]	Planting seedling height [m]	Planting DBH [cm]	Age when DBH is reached [years]	Remarks
Current generic ISIMIP [2005soc]	even-aged clearcut	fasy	stem	above	30% BA	140	15 30 45 60 75 90 105 120 135	fasy	6000	4	0.82	na	6	Planted in 1921, stem count in 288 ha-1 in 2010, (Wu et al. 2013)
No management [nosoc]	na	fasy	na	na	na	na	na	na	na	na	na	na	na	allow any NR of species formerly present on plot
Current Site-specific [2005socsite]	sheltercut with NR	fasy	stem	below below below below below below below below below above above above above	20% 20% 20% 20% 20% 10% 10% 10% 10% 10% 10% 10% 10% BA	140 (keep a few shelter trees until age 160, if possible)	15 20 25 30 35 45 50 60 70 80 90 105 120	fasy	6000 from NR	2	0.4	na	7	at age 70 move to Future crop tree management, models could simulate as thinning from above because all trees have similar size anyway, overall this is a strategy to manage for high quality timber (veneer)
Bioenergy [rcp26socbe / rcp60socbe / rcp85socbe]	even-aged clearcut	fasy	stem+ branches	below	20% BA	100	15 30 45 60 75 90	fasy	5000	2	0.4	na	7	

HWP [rcp26sochwp / rcp60sochwp / rcp85sochwp]	even-aged clearcut	fasy	stem	below below below below below below below below below above above above	20% 20% 20% 20% 20% 10% 10% 10% 10% 10% 10% 10% BA	120	15 20 25 30 35 45 50 60 70 80 90 105	fasy	6000	2	0.4	na	7	planting for quality
Multifunctional-Adapted [rcp26soca / rcp60soca / rcp85soca]	even-aged clearcut	fasy + psme	stem	below below below below below below below below below above above above above	20% 20% 20% 20% 20% 10% 10% 10% 10% 10% 10% 10% 10% BA	140	15 20 25 30 35 45 50 60 70 80 90 105 120	fasy, psme	4000 fasy, 2000 psme	fasy 2, psme 4	both 0.4	na	7	transition to mixed forest with clear-cut, Douglas-fir at age 70 move to Future crop tree management, models could simulate as thinning from above because all trees have similar size anyway

Table 36 Detailed FORMASAM management schedule for Soro. Ini = Initialization data, HM = Historic Management, FM = Future Management, TB=Thinning from below, TA = Thinning from above, H= Harvest, P=Planting. Some GCM data only starts in 1950, hence for future runs, you have to initialize these forests at the first time step after 1949 (i.e. 1950 for Soro). For the historical validation runs you can start with the first available stand initialization.

Name	Ini	HM	FM1	FM2	FM3	FM4	FM5	FM6	FM7	FM8	FM9	FM10	FM11	FM12	FM13	FM14	FM15	FM16	FM17	FM18	FM19	FM20	FM21	Remarks
Current Generic	1944	1945-2010	2020	2035	2050	2061	2062	2077	2092	---	2202	2203	2218	…										
		TA	TA30	TA30	TA30	H	P	TA30	TA30	TA30	H	P	TA30											
Current Site-specific	1944	1945-2010	2026	2041	2061	2062	2077	2082	2087	2092	2097	2107	2112	2122	2132	2142	2152	2167	2182	2202	2203	…	2308	
		TA	TA10	TA10	H	P	TB20	TB20	TB20	TB20	TB20	TB10	TB10	TB10	TB10	TA10	TA10	TA10	TA10	H	P	…	TA10	
Bioenergy	1944	1945-2010	2021	2022	2037	2052	2067	2082	2097	2112	2122	2123	2138	2153	2168	2183	2198	2213	2223	2224	….	2314		
		TA	H	P	TB20	TB20	TB20	TB20	TB20	TB20	H	P	TB20	TB20	TB20	TB20	TB20	TB20	H	P	…	TB20		
HWP	1944	1945-2010	2026	2041	2042	2057	2062	2067	2072	2077	2087	2092	2102	2112	2122	2132	2147	2162	2163	…	2283	…	2304	
		TA	TA10	H	P	TB20	TB20	TB20	TB20	TB20	TB10	TB10	TB10	TB10	TB10	TB10	TB10	H	P	…	H	…	TB20	
Multifunctional-Adapted	1944	1945-2010	2026	2041	2061	2062	2077	2082	2087	2092	2097	2107	2112	2122	2132	2142	2152	2167	2182	2202	2203	…	2308	
		TA	TA10	TA10	H	P	TB20	TB20	TB20	TB20	TB20	TB10	TB10	TB10	TB10	TA10	TA10	TA10	TA10	H	P	…	TA10	

7.2 Output data

Table 37 Variables to be reported by forest models.

Variable (long name)	Variable name	Unit (NetCDF format)		Resolution	DBH class resolution	Comment
Essential outputs						
Mean DBH	**dbh-<species/total>**	cm	per species and stand total	annual	None	
Mean DBH of 100 highest trees	**dbhdomhei**	cm	stand total	annual	None	100 highest trees per hectare.
Stand Height	**hei-<species/total>**	m	per species and stand total	annual	None	For models including natural regeneration this variable may not make sense, please report dom_height
Dominant Height	**domhei**	m	stand total	annual	None	Mean height of the 100 highest trees per hectare.
Stand Density	**density-<species/total>**	ha-1	per species and stand total	annual	None	As trees per hectare
Basal Area	**ba-<species/total>**	m2 ha-1	per species and stand total	annual	None	
Volume of Dead Trees	**mort-<species/total>**	m3 ha-1	per species and stand total	annual	None	
Harvest by dbh-class	**harv-<species/total>**	m3 ha-1	per species and stand total and dbh-class	annual	Either dbh classes or total	
Remaining stem number after disturbance and management by dbh class	**stemno-<species/total>**	ha-1	per species and stand total	annual	Either dbh classes or total	As trees per hectare, dbhclass_name as specific in **Table 20**.
Stand Volume	**vol-<species/total>**	m3 ha-1	per species and stand total	annual	None	
Carbon Mass in Vegetation biomass	**cveg-<species/total>**	kg m-2	per species and stand total	annual	None	As kg carbon*m^{-2}
*Carbon Mass in	**cvegag-<species/total>**	kg m-2	per species and stand	annual	None	As kg carbon*m^{-2}

aboveground vegetation biomass			total			
*Carbon Mass in belowground vegetation biomass	**cvegbg-<species/total>**	kg m-2	per species and stand total	annual	None	As kg carbon*m^{-2}
Carbon Mass in Litter Pool	**clitter-<species/total>**	kg m-2	per species and stand total	annual	None	As kg carbon*m^{-2}, Info for each individual pool.
Carbon Mass in Soil Pool	**csoil-<species/total>**	kg m-2	per species and stand total	annual	None	As kg carbon*m^{-2}, Info for each individual soil layer
Tree age by dbh class	**age-<species/total>**	yr	per species and stand total	annual	Either dbh classes or total	dbhclass_name as specified in **Table 20**.
Gross Primary Production	**gpp-<species/total>**	kg m-2 s-1	per species and stand total	daily	None	As kg carbon*m^{-2}*s^{-1}
Net Primary Production	**npp-<species/total>**	kg m-2 s-1	per species and stand total	daily	None	As kg carbon*m^{-2}*s^{-1}
Autotrophic (Plant) Respiration	**ra-<species/total>**	kg m-2 s-1	per species and stand total	daily	None	As kg carbon*m^{-2}*s^{-1}
Heterotrophic Respiration	**rh-< total>**	kg m-2 s-1	stand total	daily	None	As kg carbon*m^{-2}*s^{-1}
Net Ecosystem Exchange	**nee-<total>**	kg m-2 s-1	per stand	daily	None	As kg carbon*m^{-2}*s^{-1}
Mean Annual Increment	**mai-<species/total>**	m^3 ha-1	per species and stand total	annual	None	
Fraction of absorbed photosynthetically active radiation	**fapar-<species/total>**	%	per species and stand total	daily	None	Value between 0 and 100.
Leaf Area Index	**lai-<species/total>**	m2 m-2	per species and stand total	monthly	None	
Species composition	**species-<species>**	%	per ha	annual (or once if static)	None	As % of basal area; the categories may differ from model to model, depending on their species and stand definitions.
Total Evapotranspiration	**evap**	kg m-2 s-1	stand total	daily	None	Sum of transpiration, evaporation, interception and sublimation. (=intercep + esoil +

						trans)
Evaporation from Canopy (interception)	**intercep-<species/total>**	kg m-2 s-1	per species and stand total	daily	None	The canopy evaporation+ sublimation (if present in model).
Water Evaporation from Soil	**esoil**	kg m-2 s-1	per stand	daily	None	Includes sublimation.
Transpiration	**trans-<species/total>**	kg m-2 s-1	per species and stand total	daily	None	
Soil Moisture	**soilmoist**	kg m-2	per stand	daily	None	If possible, please provide soil moisture for all depth layers (i.e. 3D-field), and indicate depth in m. Otherwise, provide soil moisture of entire column.
Optional outputs						
Removed stem numbers by size class by natural mortality	**mortstemno-<species/total>**	ha-1	per species and stand total	annual	Either dbh classes or total	As trees per hectare, dbhclass_name as specific in **Table 20**.
Removed stem numbers by size class by management	**harvstemno-<species/total>**	ha-1	per species and stand total	annual	Either dbh classes or total	As trees per hectare, dbhclass_name as specific in **Table 20**.
Volume of disturbance damage	**dist-<dist-name>**	m3 ha-1	per species and stand total	annual	None	dist_name as specific in **Table 20**.
Nitrogen of annual Litter	**nlit-<species/total>**	g m-2 a-1	per species and stand total	annual	None	As g Nitrogen m^{-2} a^{-1}
Nitrogen in Soil	**nsoil-<total>**	g m-2 a-1	stand total	annual	None	As g Nitrogen m^{-2} a^{-1}
Net Primary Production allocated to leaf biomass	**nppleaf-<species>**	kg m-2 s-1	per species and stand total	daily	None	As kg carbon*m^{-2}*s^{-1}
Net Primary Production allocated to fine root biomass	**npproot-<species>**	kg m-2 s-1	per species and stand total	daily	None	As kg carbon*m^{-2}*s^{-1}
Net Primary Production allocated to above ground wood biomass	**nppagwood-<species>**	kg m-2 s-1	per species and stand total	daily	None	As kg carbon*m^{-2}*s^{-1}
Net Primary	**nppbgwood-**	kg m-2 s-1	per species and stand	daily	None	As kg carbon*m^{-2}*s^{-1}

Production allocated to below ground wood biomass	**<species>**		total			
Root autotrophic respiration	**rr-<species/total>**	kg m-2 s-1	per species and stand total	daily	None	As kg carbon$*m^{-2}*s^{-1}$
Carbon Mass in Leaves	**cleaf-<species>**	kg m-2	per species and stand total	annual	None	
Carbon Mass in Wood	**cwood-<species>**	kg m-2	per species and stand total	annual	None	Including sapwood and hardwood
Carbon Mass in Roots	**croot-<species>**	kg m-2	per species and stand total	annual	None	Including fine and coarse roots
Temperature of Soil	**tsl**	K	per stand	daily	None	Temperature of each soil layer

Note: If you cannot provide the data at the temporal or spatial resolution specified, please provide it the highest possible resolution of your model. Please contact the coordination team (info@isimip.org) to for any further clarification, or to discuss the equivalent variable in your model.

Table 38 Codes for management, species, disturbance names and dbh classes as used in protocol (species, dist-name, dbhclass).

Long name	**Short name**
Thinning	T
Thinning from above removing XX% of Basal Area	TAXX
Thinning from below removing XX% of Basal Area	TBXX
Thinning of random individuals for structural diversity (XX of Basal Area)	TXX
Harvest	H
Planting/Regeneration	P
Natural Regeneration	NR
Fagus sylvatica	fasy
Quercus robur	quro
Quercus petraea	qupe
Pinus sylvestris	pisy
Picea abies	piab
Pinus pinaster	pipi
Larix decidua	lade
Acer platanoides	acpl
Eucalyptus globulus	eugl
Betula pendula	bepe
Betula pubescens	bepu
Robinia pseudoacacia	rops

Fraxinus excelsior	frex
Populus nigra	poni
Sorbus aucuparia	soau
Pseudotuga Menzies	psme
Quercus pubescens	qupu
Abies alba	abal
C3 grass	c3gr
hard woods	hawo
fire	fi
wind	wi
insects	ins
drought	dr
grazing	graz
diseases	dis
DBH-class_<X>-<X+5>*	dbh-c<X>
DBH-class_>140*	dbh-c140

*the boundaries of the dbh classes should be interpreted as follows: dbh-class-0-5 = 0 to<5 5 cm; dbh-class-5-10 =5 to<10 cm, etc.... the dbh class dbh-c140 includes all trees of 140cm dbh and larger.

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