

Appendix 1. Net Present Value (NPV) calculations

Table A 1.1. NPV of fresh fruit bunch (FFB) production in mineral soil, modified from Fairhurst and McLaughlin (2009) with a discount rate of 10% and FFB price of € 130/ton, values are rounded.

Year		0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	NPV
FFB yield	ton/ha	0	0	0	5	10	15	20	24	26	27	27	27	27	27	27	27	26	25	24	23	22	
FFB price	€/ton	130	130	130	130	130	130	130	130	130	130	130	130	130	130	130	130	130	130	130	130	130	
Gross revenue	€/ha	0	0	0	650	1300	1950	2600	3120	3380	3510	3510	3510	3510	3510	3510	3445	3380	3250	3120	2990	2860	
Planting and other farming costs	€/ha	1083	1094	701	1246	729	729	729	729	729	729	729	729	729	729	729	729	729	729	729	729	729	
Land lease costs	€/ha	342	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Harvesting costs	€/ha	0	0	0	38	76	114	152	183	198	205	205	205	205	205	205	202	198	190	183	175	167	
Depreciation cost	€/ha	0	0	0	47	94	94	94	94	94	94	94	94	94	94	94	94	94	94	94	94	94	
Costs of fixed assets	€/ha	0	0	0	165	160	151	141	132	122	113	104	94	85	75	66	56	47	38	28	19	9	
Total costs	€/ha	1425	1094	701	1496	1060	1088	1117	1138	1144	1142	1132	1123	1114	1104	1095	1082	1068	1051	1034	1017	1000	
Net benefit	€/ha	-1425	-1094	-701	-846	240	862	1483	1982	2236	2368	2378	2387	2396	2406	2415	2363	2312	2199	2086	1973	1860	
PV	€/ha	-1425	-995	-579	-635	164	535	837	1017	1043	1004	917	837	764	697	636	566	503	435	375	323	276	7294

Note: This NPV applies for oil palm production in the period of 2011, after 25 years and after 50 years

Table A 1.2. NPV of FFB production on peat soil with no flooding problems, modified from Fairhurst and McLaughlin (2009) and FFB price of € 130/ton with a discount rate of 10%, values are rounded.

Year		0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	NPV
FFB yield	ton/ha	0	0	0	5	10	15	20	24	26	27	27	27	27	27	27	27	26	25	24	23	22	
FFB price	€/ton	130	130	130	130	130	130	130	130	130	130	130	130	130	130	130	130	130	130	130	130	130	
Revenue	€/ha	0	0	0	650	1300	1950	2600	3120	3380	3510	3510	3510	3510	3510	3510	3445	3380	3250	3120	2990	2860	
Planting, drainage and other farming costs	€/ha	1082	2018	700	1245	729	729	729	729	729	729	729	729	729	729	729	729	729	729	729	729	729	
Land lease costs	€/ha	342	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Harvesting and transportation costs	€/ha	0	0	0	38	76	114	152	182	198	205	205	205	205	205	205	201	198	190	182	175	167	
Depreciation cost	€/ha	0	0	0	94	188	188	188	188	188	188	188	188	188	188	188	188	188	188	188	188	188	
Costs of fixed assets	€/ha	0	0	0	329	320	301	282	263	245	226	207	188	169	150	132	113	94	75	56	38	19	
Total costs	€/ha	1424	2018	700	1706	1313	1332	1351	1362	1359	1348	1329	1310	1291	1272	1254	1231	1208	1182	1156	1129	1103	
Net benefit	€/ha	-1424	-2018	-700	-1056	-13	618	1249	1758	2021	2162	2181	2200	2219	2238	2256	2214	2172	2068	1964	1861	1757	
PV	€/ha	-1424	-1834	-579	-793	-9	384	705	902	943	917	841	771	707	648	594	530	473	409	353	304	261	5104

Note: This NPV applies for oil palm production in the period of 2011, after 25 years and after 50 years

Table A 1.3. NPVs of FFB production under increasing flood risks within a plantation cycle in the period of 2011, after 25 years and after 50 years.

Number of years (no flooding – impaired drainability)	21-0	20-1	19-2	18-3	17-4	16-5	15-6	14-7	13-8	12-9	11-10	10-11	9-12	8-13	7-14	6-15	5-16	4-17	3-18	2-19	1-20
NPV (€/ha)	5104	4998	4875	4735	4574	4390	4184	3953	3699	3419	3112	2773	2401	2007	1607	1240	937	715	593	593	593
Number of years (impaired drainability – prolonged flooding)	21-0	20-1	19-2	18-3	17-4	16-5	15-6	14-7	13-8	12-9	11-10	10-11	9-12	8-13	7-14	6-15	5-16	4-17	3-18	2-19	1-20
NPV (€/ha)	593	487	365	224	64	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Number of years (prolonged flooding – near-permanent inundation)	21-0	20-1	19-2	18-3	17-4	16-5	15-6	14-7	13-8	12-9	11-10	10-11	9-12	8-13	7-14	6-15	5-16	4-17	3-18	2-19	1-20
NPV (€/ha)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Note: Given the assumptions on subsidence rate and drainage levels used in this study, the maximum peat subsidence in a plantation cycle is about 70 cm, hence an area will experience maximum two flood risks (no flooding - impaired drainability, impaired drainability - prolonged flooding, or prolonged flooding – near-permanent inundation).

Table A 1.4. NPV of Jelutung production (€/ha), modified from Harun (2011) with a discount rate of 10%, values are rounded.

	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Revenue	0	0	0	0	0	0	0	0	0	0	56	56	101	101	182	182
Equipments and inputs	0	102	125	163	142	131	125	125	135	125	190	128	167	128	157	128
Land lease costs	342	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Land preparation costs	127	364	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Planting	0	50	10	0	0	0	0	0	0	0	0	0	0	0	0	0
Plant maintenance	0	18	18	18	18	18	68	309	18	18	18	13	63	304	13	13
Total costs	469	534	153	180	159	149	193	434	153	143	207	140	230	432	169	140
Net value	-469	-534	-153	-180	-159	-149	-193	-434	-153	-143	-151	-84	-128	-330	13	42
PV	-469	-485	-126	-135	-109	-92	-109	-223	-71	-60	-58	-29	-41	-96	3	10

	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	NPV
Revenue	328	328	590	590	1063	1063	1913	1913	3444	3444	6199	6199	11158	11158	35834	
Equipments and inputs	167	128	157	128	196	128	157	128	167	128	157	128	167	128	159	
Land lease costs	342	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Land preparation	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Planting	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Plant maintenance	13	13	63	13	13	13	13	13	13	13	13	13	13	13	13	
Total costs	180	140	219	140	209	140	169	140	180	140	169	140	180	140	172	
Net value	148	188	371	450	854	923	1744	1773	3264	3304	6030	6059	10978	11018	35662	
PV	32	37	67	74	127	125	214	198	331	305	506	462	761	695	2044	3887

Table A 1.5. NPVs of carbon sequestration (€/ha), values are rounded.

Year	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	NPV	
carbon sequestration of oil palm in mineral soil (ton C/ha/year)	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	
SCC (€/ton C)	103	103	103	103	103	103	103	103	103	103	103	103	103	103	103	103	103	103	103	103	103	103	
Value of carbon sequestration (€/ha/year)	196	196	196	196	196	196	196	196	196	196	196	196	196	196	196	196	196	196	196	196	196	196	
PV (€/ha)	196	178	162	147	134	122	110	100	91	83	75	69	62	57	52	47	43	39	35	32	29	1862	
carbon sequestration of oil palm on peat (ton C/ha/year)	-15	-15	-15	-15	-15	-15	-15	-15	-15	-15	-15	-15	-15	-15	-15	-15	-15	-15	-15	-15	-15	-15	
SCC (€/ton C)	103	103	103	103	103	103	103	103	103	103	103	103	103	103	103	103	103	103	103	103	103	103	
Value of carbon sequestration (€/ha/year)	-1545	-1545	-1545	-1545	-1545	-1545	-1545	-1545	-1545	-1545	-1545	-1545	-1545	-1545	-1545	-1545	-1545	-1545	-1545	-1545	-1545	-1545	
PV (€/ha)	-1545	-1405	-1277	-1161	-1055	-959	-872	-793	-721	-655	-596	-542	-492	-448	-407	-370	-336	-306	-278	-253	-230	-14698	
carbon sequestration of peat forest and Jelutung forest (ton C/ha/year)	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	
SCC (€/ton C)	103	103	103	103	103	103	103	103	103	103	103	103	103	103	103	103	103	103	103	103	103	103	
Value of carbon sequestration (€/ha/year)	546	546	546	546	546	546	546	546	546	546	546	546	546	546	546	546	546	546	546	546	546	546	
PV (€/ha)	546	496	451	410	373	339	308	280	255	232	210	191	174	158	144	131	119	108	98	89	81	5193	

Table A 1.6. Total NPV of FFB production under increasing flood risks in the first plantation cycle of the ‘OP’ scenario.

Number of years (no flooding – impaired drainability)	21-0	20-1	19-2	18-3	17-4	16-5	15-6	14-7	13-8	12-9	11-10	10-11	9-12	8-13	7-14	6-15	5-16	4-17	3-18	2-19	1-20	
Area (ha)	140,600	1,200	1,200	1,300	1,200	1,300	1,200	1,300	1,300	1,300	1,300	1,300	1,300	1,400	1,400	1,400	1,500	1,500	1,500	1,600	1,600	
NPV (€/ha)	4063	3963	3848	3715	3563	3390	3196	2979	2739	2476	2186	1867	1516	1145	768	421	136	0	0	0	0	
NPV (€ million)	717.6	6.1	6.1	6.0	5.7	5.5	5.2	5.0	4.7	4.5	4.1	3.7	3.2	2.8	2.3	1.8	1.4	1.1	1.0	0.9	0.9	790
Number of years (impaired drainability – prolonged flooding)	21-0	20-1	19-2	18-3	17-4	16-5	15-6	14-7	13-8	12-9	11-10	10-11	9-12	8-13	7-14	6-15	5-16	4-17	3-18	2-19	1-20	
Area (ha)	30,000	2,700	2,100	2,900	2,200	5,400	0	3,100	2,300	3,000	2,200	2,900	2,100	2,700	2,000	2,600	2,000	2,800	2,100	2,900	2,200	
NPV (€/ha)	593	487	365	224	64	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
NPV (€ million)	18	1.3	0.8	0.6	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	21
Total NPV (€ million)																						811