Table S1: Costs of agricultural operations

Agricultural operations	**Machine costs in € ha^{-1}**	**Working time requirement in hours**	**Costs per working hour in €**	**Number of operations**	**Cost in €**	**Reference**
Ploughing	93.66	2.55	17	1	137.01	KTBL, 2018
Tine Cultivator	30.56	0.91	17	2	92.06	KTBL, 2018
Ridging	36.1	1.72	17	1	65.34	KTBL, 2018
Planting of plantlets by hand in the scenario "*Standard procedure*"	0	30.58	17	1	519.86	KTBL, 2018
Planting of rhizomes in the scenario "*Direct planting*"	95.26	15.71	17	1	362.33	KTBL, 2018
Application of fertilizer	2.62	0.11	17	1	4.49	KTBL, 2018
Application of herbicides	5.57	0.24	17	2	19.30	KTBL, 2018
Harvest	325.36	16.65	17	1	608.41	KTBL, 2018
Separation of rhizomes and tubers by handy	0	69.62	17	1	1183.48	Expert opinion based on field trial

Table S2: Costs of input substrates

Input substrates	Unit	Costs in € Unit^{-1}	Quantity	Costs in €	Reference	Comment
Rhizomes	Piece	-	835	240.18	Kamp et al. 2019a	-
Nitrogen fertilizer	kg	3.08	0	0	Raiffeisen 2019	0 kg N level
			40	123		40 kg N level
			80	246		80 kg N level
Potassium fertilizer	kg	0.33	200.83	66	Agrarheute.com, 2019	-
Dual Gold	litre	8.98	1.25	11	Wernet et al. 2016	-
Stomp	litre	8.98	3.5	31	Wernet et al. 2016	-
Transport inputs by tractor	km*t	0.11	2.12	0.24	Wernet et al. 2016	0 kg N level
			2.41	0.28		40 kg N level
			2.71	0.31		80 kg N level
Transport inputs by truck	km*t	0.03	36.98	1.06	Wernet et al. 2016	0 kg N level
			59.20	1.70		40 kg N level
			81.42	2.34		80 kg N level
Land lease	ha	328	1	328	Statistisches Bundesamt, 2017	-

Table S3: Biomass transport costs

Red-shelled genotype		**Yield in t DM ha^{-1}**	**DM content in %**	**Yield in t FM ha^{-1}**	**Transport costs in € t^{-1} km^{-1}**	**Total transport costs in € ha^{-1}**	**Reference**
Direct planting	**0 kg N level**	7.25	17.04	42.52	0.1147	9.75	Wernet et al. 2016
	40 kg N level	7.35	17	43.22	0.1147	9.91	
	80 kg N level	7.98	17	46.96	0.1147	10.77	
Standard procedure	**0 kg N level**	10.35	17.04	60.74	0.1147	13.93	
	40 kg N level	10.50	17	61.74	0.1147	14.16	
	80 kg N level	11.41	17	67.09	0.1147	15.39	
Brown-shelled genotype		**Yield in t DM ha^{-1}**	**DM content in %**	**Yield in t FM ha^{-1}**	**Transport costs in € t^{-1} km^{-1}**	**Total transport costs in € ha^{-1}**	**Reference**
Direct planting	**0 kg N level**	3.30	10.58	31.20	0.1147	7.16	Wernet et al. 2016
	40 kg N level	3.16	10.45	30.24	0.1147	6.94	
	80 kg N level	3.97	11.31	35.11	0.1147	8.05	
Standard procedure	**0 kg N level**	4.72	10.58	44.57	0.1147	10.23	
	40 kg N level	4.52	10.45	43.21	0.1147	9.91	
	80 kg N level	5.67	11.31	50.15	0.1147	11.50	

Table S4: Propagation costs

Treatment	Agricultural operation	Other costs in €	Working time requirement in hours	Costs per working hour in €	Total costs in €	Reference
Standard procedure	**Storage**	28.86	0.145	17	31.32	KTBL
	Cutting of rhizomes	0	52.21	17	887.57	Kamp et al. 2019a
	Planting in trays*	26.30	52.22	17	914.04	Kamp et al. 2019a
	Infrastructure costs greenhouse	388.8	0	0	388.80	Wernet et al. 2016
	Heating costs greenhouse	664.1	0	0	664.10	Kamp et al. 2019a
Direct planting	**Storage**	28.86	0.145	17	31.32	KTBL, 2018
	Cutting of rhizomes	0	52.21	17	887.57	Kamp et al. 2019a
	* Costs for trays and potting soil is included					

Table S5: Environmental impacts and production costs per t FM yacon tubers

Genotype	**Red-shelled genotype**			**Brown-shelled genotype**		
Fertilization level in kg N ha^{-1}	0	40	80	0	40	80
Standard procedure						
Agricultural land occupation in m²*a per t FM	168.20	164.26	151.20	223.97	237.58	202.53
Climate change in kg CO_2-eq. per t FM	39.54	49.93	55.35	50.33	65.02	64.85
Marine eutrophication in kg N-eq. per t FM	0.04	0.20	0.33	0.05	0.29	0.45
Freshwater eutrophication in kg P-eq. per t FM	0.02	0.02	0.02	0.02	0.03	0.02
Human toxicity in kg 1,4-DCB-eq. per t FM	7.63	8.90	9.43	10.07	12.76	12.54
Marine ecotoxicity in kg 1,4-DCB-eq. per t FM	0.30	0.33	0.33	0.40	0.47	0.44
Freshwater ecotoxicity in kg 1,4-DCB-eq. per t FM	1.26	1.27	1.19	1.68	1.82	1.59
Production costs in € per t FM	103.20	102.72	96.35	137.36	148.49	129.00
Direct planting						
Agricultural land occupation in m²*a per t FM	240.39	234.77	216.10	320.12	339.57	289.47
Climate change in kg CO_2-eq. per t FM	36.05	51.37	60.69	44.79	64.15	68.12
Marine eutrophication in kg N-eq. per t FM	0.05	0.29	0.48	0.07	0.41	0.64
Freshwater eutrophication in kg P-eq. per t FM	0.03	0.03	0.03	0.03	0.04	0.03
Human toxicity in kg 1,4-DCB-eq. per t FM	10.01	11.83	12.65	13.23	17.00	16.85
Marine ecotoxicity in kg 1,4-DCB-eq. per t FM	0.39	0.43	0.43	0.51	0.61	0.58
Freshwater ecotoxicity in kg 1,4-DCB-eq. per t FM	1.71	1.72	1.62	2.27	2.48	2.16
Production costs in € per t FM	97.11	97.63	92.46	129.26	141.14	123.79