

APPENDIX VII

PARAMETERS FOR BIOMASS AND YIELD CALCULATIONS

CROPS	Growth cycle (GC)	Adaptability group	High Inputs		Intermediate Inputs		Low Inputs		Dependence of Rate of Leaf Photosynthesis (Pm) on Temperature (°C)								
			HI	Max. LAI	HI	Max. LAI	HI	Max. LAI	5	10	15	20	25	30	35	40	45
Wheat (winter)	30-90 days	C3/I	0.45	4.5	0.35.	3.5	0.25	2.5	5	15	25	25	20	10	0	0	0
Wheat (winter)	35-105 days	C3/I	0.45	5.0	0.35.	3.8	0.25	2.5	5	15	25	25	20	10	0	0	0
Wheat (winter)	40-120 days	C3/I	0.50	5.5	0.40.	4.0	0.30	2.5	5	15	25	25	20	10	0	0	0
Wheat (winter)	45-135 days	C3/I	0.50	5.5	0.40.	4.0	0.30	2.5	5	15	25	25	20	10	0	0	0
Wheat (spring)	105 days	C3/I	0.40	3.5	0.30	2.6	0.20	1.8	5	15	20	20	15	5	0	0	0
Wheat (spring)	120 days	C3/I	0.40	4.0	0.30	3.0	0.20	2.0	5	15	20	20	15	5	0	0	0
Wheat (spring)	135 days	C3/I	0.40	4.5	0.30	3.4	0.20	2.3	5	15	20	20	15	5	0	0	0
Wheat (spring)	150 days	C3/I	0.40	5.0	0.30	3.8	0.20	2.5	5	15	20	20	15	5	0	0	0
Wheat (sub-tropics)	105 days	C3/I	0.45	4.0	0.35	3.0	0.25	2.0	5	15	25	25	20	15	5	0	0
Wheat (sub-tropics)	120 days	C3/I	0.45	4.5	0.35	3.3	0.25	2.0	5	15	25	25	20	15	5	0	0
Wheat (sub-tropics)	135 days	C3/I	0.45	5.0	0.35	3.8	0.25	2.5	5	15	25	25	20	15	5	0	0
Wheat (sub-tropics)	150 days	C3/I	0.45	5.0	0.35	3.8	0.25	2.5	5	15	25	25	20	15	5	0	0
Wheat (tropics)	100 days	C3/I	0.40	3.5	0.30	2.6	0.20	1.8	5	15	25	25	20	15	5	0	0
Wheat (tropics)	130 days	C3/I	0.40	4.5	0.30	3.4	0.20	2.3	5	15	25	25	20	15	5	0	0
Wheat (tropics)	160 days	C3/I	0.40	5.0	0.30	3.8	0.20	2.5	5	15	25	25	20	15	5	0	0
Wheat (tropics)	190 days	C3/I	0.40	5.0	0.30	3.8	0.20	2.5	5	15	25	25	20	15	5	0	0
Japonica Rice (wetland)	105 days	C3/II	0.40	5.0	0.35.	3.7	0.30	2.5	0	5	15	30	35	35	30	5	0
Japonica Rice (wetland)	120 days	C3/II	0.40	5.0	0.35.	4.0	0.30	2.5	0	5	15	30	35	35	30	5	0
Japonica Rice (wetland)	135 days	C3/II	0.40	5.5	0.35.	4.3	0.30	3.0	0	5	15	30	35	35	30	5	0
Japonica Rice (wetland)	150 days	C3/II	0.40	6.0	0.35.	4.5	0.30	3.0	0	5	15	30	35	35	30	5	0
Indica Rice (wetland)	105 days	C3/II	0.45	5.0	0.38.	3.8	0.30	2.5	0	0	15	30	35	35	30	5	0
Indica Rice (wetland)	120 days	C3/II	0.45	5.5	0.38.	4.0	0.30	2.5	0	0	15	30	35	35	30	5	0
Indica Rice (wetland)	135 days	C3/II	0.45	6.0	0.38.	4.5	0.30	3.0	0	0	15	30	35	35	30	5	0
Indica Rice (wetland)	150 days	C3/II	0.45	6.5	0.38.	4.8	0.30	3.0	0	0	15	30	35	35	30	5	0
Rice (dryland)	105 days	C3/II	0.30	3.5	0.23	2.6	0.15	1.8	0	0	15	30	35	35	30	5	0
Rice (dryland)	120 days	C3/II	0.30	4.0	0.23	3.0	0.15	2.0	0	0	15	30	35	35	30	5	0
Rice (dryland)	135 days	C3/II	0.30	4.5	0.23	3.4	0.15	2.3	0	0	15	30	35	35	30	5	0
Maize (grain) (lowland)	90 days	C4/III	0.40	3.0	0.30	2.3	0.20	1.5	0	0	5	45	65	65	65	45	5
Maize (grain) (lowland)	105 days	C4/III	0.40	3.5	0.30	2.8	0.20	2.0	0	0	5	45	65	65	65	45	5
Maize (grain) (lowland)	120 days	C4/III	0.45	4.0	0.35	3.3	0.25	2.5	0	0	5	45	65	65	65	45	5
Maize (grain) (lowland)	135 days	C4/III	0.45	4.5	0.35	3.3	0.25	2.5	0	0	5	45	65	65	65	45	5
Maize (grain) (highland)	105 days	C4/IV	0.35	3.5	0.25	2.5	0.15	1.5	0	5	40	50	50	50	40	5	0
Maize (grain) (highland)	180 days	C4/IV	0.35	4.0	0.27	3.0	0.20	2.0	0	5	40	50	50	50	40	5	0
Maize (grain) (highland)	300 days	C4/IV	0.35	4.0	0.27	3.0	0.20	2.0	0	5	40	50	50	50	40	5	0

PARAMETERS FOR BIOMASS AND YIELD CALCULATIONS

CROPS	Growth cycle (GC)	Adaptability group	High Inputs		Intermediate Inputs		Low Inputs		Dependence of Rate of Leaf Photosynthesis (Pm) on Temperature (°C)								
			HI	Max. LAI	HI	Max. LAI	HI	Max. LAI	5	10	15	20	25	30	35	40	45
Maize (grain) (sub-tropics)	105 days	C4/IV	0.40	3.0	0.30	2.3	0.20	1.5	0	5	40	50	50	50	40	5	0
Maize (grain) (sub-tropics)	120 days	C4/IV	0.40	3.5	0.30	2.5	0.20	2.0	0	5	40	50	50	50	40	5	0
Maize (grain) (sub-tropics)	135 days	C4/IV	0.45	4.0	0.33	3.0	0.20	2.0	0	5	40	50	50	50	40	5	0
Maize (grain) (sub-tropics)	150 days	C4/IV	0.45	4.5	0.33	3.5	0.20	2.5	0	5	40	50	50	50	40	5	0
Maize (grain) (sub-tropics)	165 days	C4/IV	0.45	5.0	0.35	3.8	0.25	2.5	0	5	40	50	50	50	40	5	0
Maize (grain) (sub-tropics)	180 days	C4/IV	0.45	5.5	0.35	4.3	0.25	3.0	0	5	40	50	50	50	40	5	0
Maize (silage)	105 days	C4/IV	0.60	6.0	0.50	4.5	0.40	3.0	0	5	40	50	50	50	40	5	0
Maize (silage)	120 days	C4/IV	0.60	6.0	0.50	4.5	0.40	3.0	0	5	40	50	50	50	40	5	0
Maize (silage)	135 days	C4/IV	0.60	6.0	0.50	4.5	0.40	3.0	0	5	40	50	50	50	40	5	0
Maize (silage)	150 days	C4/IV	0.65	6.5	0.55	5.0	0.45	3.5	0	5	40	50	50	50	40	5	0
Maize (silage)	165 days	C4/IV	0.65	6.5	0.55	5.0	0.45	3.5	0	5	40	50	50	50	40	5	0
Maize (silage)	180 days	C4/IV	0.65	7.0	0.55	5.5	0.45	4.0	0	5	40	50	50	50	40	5	0
Barley (winter)	30-90 days	C3/I	0.45	4.5	0.35	3.5	0.25	2.5	5	15	25	25	20	10	0	0	0
Barley (winter)	35-105 days	C3/I	0.45	5.0	0.35	3.8	0.25	2.5	5	15	25	25	20	10	0	0	0
Barley (winter)	40-120 days	C3/I	0.50	5.5	0.40	4.0	0.30	2.5	5	15	25	25	20	10	0	0	0
Barley (winter)	45-135 days	C3/I	0.50	5.5	0.40	4.0	0.30	2.5	5	15	25	25	20	10	0	0	0
Barley (spring)	90 days	C3/I	0.40	3.5	0.30	2.8	0.20	2.0	5	15	20	20	15	5	0	0	0
Barley (spring)	105 days	C3/I	0.40	3.5	0.30	2.8	0.20	2.0	5	15	20	20	15	5	0	0	0
Barley (spring)	120 days	C3/I	0.40	4.0	0.30	3.3	0.20	2.5	5	15	20	20	15	5	0	0	0
Barley (spring)	135 days	C3/I	0.40	4.5	0.30	3.5	0.20	2.5	5	15	20	20	15	5	0	0	0
Barley (sub-tropics)	90 days	C3/I	0.45	4.0	0.35	3.0	0.25	2.0	5	15	20	20	15	5	0	0	0
Barley (sub-tropics)	105 days	C3/I	0.45	4.5	0.35	3.3	0.25	2.0	5	15	20	20	15	5	0	0	0
Barley (sub-tropics)	120 days	C3/I	0.45	5.0	0.35	3.8	0.25	2.5	5	15	20	20	15	5	0	0	0
Barley (sub-tropics)	135 days	C3/I	0.45	5.0	0.35	3.8	0.25	2.5	5	15	20	20	15	5	0	0	0
Barley (tropics)	100 days	C3/I	0.40	3.5	0.30	2.5	0.20	1.5	5	15	20	20	15	5	0	0	0
Barley (tropics)	130 days	C3/I	0.40	4.0	0.30	3.0	0.20	2.0	5	15	20	20	15	5	0	0	0
Barley (tropics)	160 days	C3/I	0.40	5.0	0.30	3.8	0.20	2.5	5	15	20	20	15	5	0	0	0
Barley (tropics)	190 days	C3/I	0.40	5.0	0.30	3.8	0.20	2.5	5	15	20	20	15	5	0	0	0
Sorghum (lowland)	90 days	C4/III	0.35	3.5	0.25	2.5	0.15	1.5	0	0	5	45	65	65	65	45	5
Sorghum (lowland)	105 days	C4/III	0.35	4.0	0.25	3.0	0.15	2.0	0	0	5	45	65	65	65	45	5
Sorghum (lowland)	120 days	C4/III	0.35	4.5	0.25	3.3	0.15	2.0	0	0	5	45	65	65	65	45	5
Sorghum (lowland)	135 days	C4/III	0.35	4.5	0.25	3.3	0.15	2.0	0	0	5	45	65	65	65	45	5
Sorghum (highland)	105 days	C4/IV	0.20	3.5	0.16	2.5	0.12	1.5	0	5	40	50	50	50	40	5	0
Sorghum (highland)	180 days	C4/IV	0.20	4.0	0.16	3.0	0.12	2.0	0	5	40	50	50	50	40	5	0
Sorghum (highland)	300 days	C4/IV	0.20	4.0	0.16	3.0	0.12	2.0	0	5	40	50	50	50	40	5	0

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CROPS	Growth cycle (GC)	Adaptability group	High Inputs		Intermediate inputs		Low Inputs		Dependence of Rate of Leaf Photosynthesis (Pm) on Temperature (°C)								
			HI	Max. LAI	HI	Max. LAI	HI	Max. LAI	5	10	15	20	25	30	35	40	45
Rye (winter)	30-90 days	C3/I	0.35	3.5	0.28	2.8	0.20	2.0	5	15	20	20	15	5	0	0	0
Rye (winter)	35-105 days	C3/I	0.35	4.0	0.28	3.0	0.20	2.0	5	15	20	20	15	5	0	0	0
Rye (winter)	40-120 days	C3/I	0.35	4.0	0.28	3.0	0.20	2.0	5	15	20	20	15	5	0	0	0
Rye (winter)	45-135 days	C3/I	0.35	4.5	0.28	3.5	0.20	2.5	5	15	20	20	15	5	0	0	0
Rye (spring)	90 days	C3/I	0.35	3.0	0.25	2.3	0.15	1.5	5	15	20	20	15	5	0	0	0
Rye (spring)	105 days	C3/I	0.35	3.5	0.25	2.5	0.15	1.8	5	15	20	20	15	5	0	0	0
Rye (spring)	120 days	C3/I	0.35	4.0	0.25	3.0	0.15	2.0	5	15	20	20	15	5	0	0	0
Rye (spring)	135 days	C3/I	0.35	4.0	0.25	3.0	0.15	2.0	5	15	20	20	15	5	0	0	0
Pearl Millet	70 days	C4/III	0.25	3.0	0.18	2.3	0.12	1.5	0	0	5	45	65	65	65	45	5
Pearl Millet	90 days	C4/III	0.25	3.5	0.18	2.8	0.12	2.0	0	0	5	45	65	65	65	45	5
Foxtail Millet	75 days	C4/IV	0.30	3.5	0.25	2.6	0.15	1.5	0	5	40	50	50	50	40	5	0
Foxtail Millet	90 days	C4/IV	0.30	4.0	0.25	3.0	0.15	2.0	0	5	40	50	50	50	40	5	0
Foxtail Millet	105 days	C4/IV	0.35	4.5	0.28	3.5	0.20	2.5	0	5	40	50	50	50	40	5	0
Foxtail Millet	120 days	C4/IV	0.35	5.0	0.28	3.8	0.20	2.5	0	5	40	50	50	50	40	5	0
White Potato	90 days	C3/I	0.60	3.5	0.45	2.8	0.30	2.0	5	15	25	25	20	15	5	0	0
White Potato	120 days	C3/I	0.60	4.5	0.45	3.2	0.30	2.0	5	15	25	25	20	15	5	0	0
White Potato	150 days	C3/I	0.60	5.0	0.45	3.7	0.30	2.5	5	15	25	25	20	15	5	0	0
White Potato	180 days	C3/I	0.60	5.5	0.45	4.0	0.30	2.5	5	15	25	25	20	15	5	0	0
Cassava	≤ 365 days	C3/II	0.50	3.0	0.40	2.3	0.30	1.5	0	0	15	30	35	35	30	5	0
Sweet Potato	120 days	C3/II	0.55	4.0	0.42	3.0	0.30	2.0	0	0	15	30	35	35	30	5	0
Sweet Potato	150 days	C3/II	0.55	4.0	0.42	3.0	0.30	2.0	0	0	15	30	35	35	30	5	0
Sweet Potato	180 days	C3/II	0.55	4.5	0.42	3.5	0.30	2.5	0	0	15	30	35	35	30	5	0
Sugarcane	≤ 365 days	C4/III	0.15	7.0	0.12	5.3	0.10	3.5	0	0	5	45	65	65	65	45	5
Sugarbeet	150 days	C3/I	0.15	5.0	0.10	3.5	0.08	2.0	5	15	20	25	25	25	25	5	0
Sugarbeet	165 days	C3/I	0.15	5.5	0.10	4.0	0.08	2.5	5	15	20	25	25	25	25	5	0
Sugarbeet	180 days	C3/I	0.15	5.5	0.10	4.0	0.08	2.5	5	15	20	25	25	25	25	5	0
Sugarbeet	195 days	C3/I	0.15	6.0	0.10	4.5	0.08	3.0	5	15	20	25	25	25	25	5	0
Sugarbeet	210 days	C3/I	0.15	6.0	0.10	4.5	0.08	3.0	5	15	20	25	25	25	25	5	0
Phaseolus Bean (lowland)	90 days	C3/II	0.30	3.5	0.23	2.6	0.15	1.8	0	0	15	30	35	35	30	5	0
Phaseolus Bean (lowland)	120 days	C3/II	0.30	4.0	0.23	3.0	0.15	2.0	0	0	15	30	35	35	30	5	0
Phaseolus Bean (lowland)	150 days	C3/II	0.30	4.0	0.23	3.0	0.15	2.0	0	0	15	30	35	35	30	5	0
Phaseolus Bean (highland)	120 days	C3/I	0.30	4.0	0.23	3.0	0.15	2.0	5	15	25	25	20	15	5	0	0
Phaseolus Bean (highland)	150 days	C3/I	0.30	4.0	0.23	3.0	0.15	2.0	5	15	25	25	20	15	5	0	0
Phaseolus Bean (highland)	180 days	C3/I	0.30	4.0	0.23	3.0	0.15	2.0	5	15	25	25	20	15	5	0	0
Phaseolus Bean (temperate)	90 days	C3/I	0.30	3.0	0.23	2.3	0.15	1.5	5	15	25	25	20	15	5	0	0
Phaseolus Bean (temperate)	120 days	C3/I	0.30	4.0	0.23	3.0	0.15	2.0	5	15	25	25	20	15	5	0	0
Phaseolus Bean (temperate)	150 days	C3/I	0.30	4.0	0.23	3.0	0.15	2.0	5	15	25	25	20	15	5	0	0

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CROPS	Growth cycle (GC)	Adaptability group	High Inputs		Intermediate Inputs		Low Inputs		Dependence of Rate of Leaf Photosynthesis (Pm) on Temperature (°C)								
			HI	Max. LAI	HI	Max. LAI	HI	Max. LAI	5	10	15	20	25	30	35	40	45
Chickpea	90 days	C3/I	0.30	3.0	0.23	2.3	0.15	1.5	0	5	15	30	35	35	30	5	0
Chickpea	105 days	C3/I	0.30	3.5	0.23	2.7	0.15	1.8	0	5	15	30	35	35	30	5	0
Chickpea	120 days	C3/I	0.30	4.0	0.23	3.0	0.15	2.0	0	5	15	30	35	35	30	5	0
Chickpea (CR)	150 days	C3/I	0.30	4.0	0.23	3.0	0.15	2.0	0	5	15	30	35	35	30	5	0
Chickpea (CR)	180 days	C3/I	0.30	4.0	0.23	3.0	0.15	2.0	0	5	15	30	35	35	30	5	0
Cowpea	80 days	C3/II	0.30	3.0	0.23	2.3	0.15	1.5	0	0	15	30	35	35	30	5	0
Cowpea	100 days	C3/II	0.30	3.5	0.23	2.7	0.15	1.8	0	0	15	30	35	35	30	5	0
Cowpea	120 days	C3/II	0.30	4.0	0.23	3.0	0.15	2.0	0	0	15	30	35	35	30	5	0
Groundnut	90 days	C3/II	0.30	3.0	0.23	2.3	0.15	1.5	0	0	15	30	35	35	30	5	0
Groundnut	105 days	C3/II	0.30	3.5	0.23	2.7	0.15	1.8	0	0	15	30	35	35	30	5	0
Groundnut	120 days	C3/II	0.30	4.0	0.23	3.0	0.15	2.0	0	0	15	30	35	35	30	5	0
Soybean (tropics)	90 days	C3/II	0.30	3.0	0.23	2.3	0.15	1.5	0	0	15	30	35	35	30	5	0
Soybean (tropics)	105 days	C3/II	0.30	3.5	0.23	2.7	0.15	1.8	0	0	15	30	35	35	30	5	0
Soybean (tropics)	120 days	C3/II	0.30	4.0	0.23	3.0	0.15	2.0	0	0	15	30	35	35	30	5	0
Soybean (sub-tropics)	105 days	C3/II	0.30	3.5	0.23	2.7	0.15	1.8	0	5	15	30	35	35	30	5	0
Soybean (sub-tropics)	120 days	C3/II	0.30	4.0	0.23	3.0	0.15	2.0	0	5	15	30	35	35	30	5	0
Soybean (sub-tropics)	135 days	C3/II	0.30	4.0	0.23	3.0	0.15	2.0	0	5	15	30	35	35	30	5	0
Sunflower (tropics)	135 days	C3/II	0.25	4.0	0.20	3.0	0.15	2.0	0	0	15	30	35	35	30	5	0
Sunflower (tropics)	150 days	C3/II	0.25	4.5	0.20	3.5	0.15	2.5	0	0	15	30	35	35	30	5	0
Sunflower (tropics)	165 days	C3/II	0.25	5.0	0.20	3.8	0.15	2.5	0	0	15	30	35	35	30	5	0
Sunflower (sub tropics)	135 days	C3/I	0.25	4.0	0.20	3.0	0.15	2.0	5	15	25	25	20	15	5	0	0
Sunflower (sub tropics)	150 days	C3/I	0.25	4.5	0.20	3.5	0.15	2.5	5	15	25	25	20	15	5	0	0
Sunflower (sub tropics)	165 days	C3/I	0.25	5.0	0.20	3.8	0.15	2.5	5	15	25	25	20	15	5	0	0
Rape (winter)	35-105 days	C3/I	0.25	3.5	0.18	2.5	0.12	1.5	5	15	25	25	20	15	5	0	0
Rape (winter)	45-120 days	C3/I	0.25	4.0	0.18	3.0	0.12	2.0	5	15	25	25	20	15	5	0	0
Rape (spring)	135 days	C3/I	0.25	3.5	0.18	2.5	0.12	1.5	5	15	25	25	20	15	5	0	0
Rape (spring)	150 days	C3/I	0.25	4.0	0.18	3.0	0.12	2.0	5	15	25	25	20	15	5	0	0
Rape (spring)	165 days	C3/I	0.25	4.0	0.18	3.0	0.12	2.0	5	15	25	25	20	15	5	0	0
Rape (sub-tropics/tropics)	135 days	C3/I	0.25	3.5	0.18	2.5	0.12	1.5	5	15	20	25	25	25	25	5	0
Rape (sub-tropics/tropics)	150 days	C3/I	0.25	4.0	0.18	3.0	0.12	2.0	5	15	20	25	25	25	25	5	0
Rape (sub-tropics/tropics)	165 days	C3/I	0.25	4.0	0.18	3.0	0.12	2.0	5	15	20	25	25	25	25	5	0
Oil palm	≤ 365 days	C3/II	0.20	6.0	0.15	4.5	0.10	3.0	0	0	15	30	35	35	30	5	0
Olive	≤ 365 days	C3/I	0.20	3.5	0.15	2.5	0.10	1.5	5	15	20	25	25	25	25	5	0
Banana/Plantain	≤ 365 days	C3/II	0.25	6.0	0.20	4.5	0.15	3.0	0	0	15	30	35	35	30	5	0

PARAMETERS FOR BIOMASS AND YIELD CALCULATIONS

CROPS	Growth cycle (GC)	Adaptability group	High Inputs		Intermediate Inputs		Low Inputs		Dependence of Rate of Leaf Photosynthesis (Pm) on Temperature (°C)								
			HI	Max. LAI	HI	Max. LAI	HI	Max. LAI	5	10	15	20	25	30	35	40	45
Cotton (tropics)	135 days	C3/II	0.07	2.5	0.05	2.0	0.03	1.5	0	0	15	30	35	35	30	5	0
Cotton (tropics)	150 days	C3/II	0.07	2.5	0.05	2.0	0.03	1.5	0	0	15	30	35	35	30	5	0
Cotton (tropics)	165 days	C3/II	0.07	3.0	0.05	2.5	0.03	2.0	0	0	15	30	35	35	30	5	0
Cotton (tropics)	180 days	C3/II	0.07	3.0	0.05	2.5	0.03	2.0	0	0	15	30	35	35	30	5	0
Cotton (sub-tropics)	135 days	C3/II	0.07	2.5	0.05	2.0	0.03	1.5	0	0	15	30	35	35	30	5	0
Cotton (sub-tropics)	150 days	C3/II	0.07	2.5	0.05	2.0	0.03	1.5	0	0	15	30	35	35	30	5	0
Cotton (sub-tropics)	165 days	C3/II	0.07	3.0	0.05	2.5	0.03	2.0	0	0	15	30	35	35	30	5	0
Alfalfa	≤ 365 days	C3/I	0.65	6.0	0.45	4.5	0.25	3.0	5	15	20	25	25	25	25	5	0
Grass + Legume (temp.)	≤ 365 days	C3/I	0.65	4.0	0.40	3.0	0.30	2.5	5	15	20	20	15	5	0	0	0
Grass + Legume (tropics)	≤ 365 days	C3/II	0.65	4.0	0.40	3.0	0.30	2.5	2.5	10	20	25	25	20	10	5	0
Grasses (temp.)	≤ 365 days	C3/I	0.65	4.0	0.40	3.0	0.30	2.5	5	15	20	20	15	5	0	0	0
Grasses (tropics)	≤ 365 days	C3/II	0.65	4.0	0.40	3.0	0.30	2.5	0	2.5	15	35	37.5	37.5	30	5	0
Grasses (temp.)	≤ 365 days	C4/IV	0.65	4.0	0.40	3.0	0.30	2.5	2.5	15	37.5	50	50	37.5	25	10	0
Grassess (tropics)	≤ 365 days	C4/III	0.65	4.0	0.40	3.0	0.30	2.5	0	2.5	30	40	47.5	50	47.5	40	5

- Main Sources:** **FAO, 1978-81b.** Crop Adaptability Inventory in: Report on the Agro-ecological zones project. World Soil Resources Report48/1. FAO, Rome.
FAO, 1980. Land Resources for Populations of the Future. FAO, Rome.
FAO, 1988. Land Resources Appraisal of Bangladesh, Report 6, FAO, Rome.
FAO, 1993. Agroecological Assessment for National Planning: The Example of Kenya. FAO, Rome
Hackett, C., 1991. PLANTGRO: A Software Package for Coarse Prediction of Plant Growth. CSIRO, Melbourne Australia
Cheng Chunshu (ed.), 1993. Climate and Agriculture in China. Beijing.
Boons-Prins, E.R., G.H.J de Koning, C.A. van Diepen, F.W.T. Penning de Vries, 1993. Crop specific simulation parameters for yield forecasting across the European Community. Simulation Reports CABO-TT, no 32. Wageningen.
Heemst H.D.J. van, 1988. Plant data values required for simple crop growth simulation models: review and bibliography. Simulation Report Cabo-TT Centre for Agrobiological Research (CABO) and Department of Theoretical Production Ecology, Agricultural University Wageningen, 100p.
Velthuisen H.T. van, 1992. Agroecological Suitability of Chickpea and European Olive. Internal Report. FAO, Rome.

Notes: When the growth cycle is curtailed due to the growing period being shorter, both harvest index *and* maximum leaf area index are to be reduced proportionately relative to the normal yield formation period.

It is assumed that yield formation periods relate to growth cycles as follows: cereals 33%; roots and tubers 66%; legumes 50%; oil crops except for olive and oil palm 50%; fiber crops 50%. sugar crops 66%; and pastures 100%. The yield formation period of winter crops is relative to the postwinter (dormancy) part of the growth cycle.

PARAMETERS FOR CALCULATION OF WATER-LIMITED YIELDS

CROPS	Length of Crop Stage (% of growth cycle)				Crop water requirements relative to reference evapotranspiration				Yield loss factors				
	$d1$	$d2$	$d3$	$d4$	$k1^c$	$k2^c$	$k3^c$	$k0^c$	k_1^y	k_2^y	k_3^y	k_4^y	k_0^y
Wheat (winter)	10	30	35	25	0.40	1.10	0.40	0.85	0.20	0.60	0.75	0.50	1.05
Wheat (spring)	10	20	45	25	0.40	1.10	0.40	0.85	0.20	0.65	0.80	0.55	1.15
Rice (wetland)	10	30	30	30	1.10	1.20	1.00	1.10	1.00	2.00	2.50	1.00	2.00
Rice (dryland)	10	30	30	30	0.50	1.20	0.60	0.90	0.40	0.90	1.50	0.50	1.25
Maize /grain)	15	30	35	20	0.40	1.10	0.60	0.85	0.40	0.90	1.50	0.50	1.25
Barley (winter)	10	30	35	25	0.40	1.10	0.40	0.85	0.20	0.60	0.75	0.50	1.05
Barley (spring)	10	20	45	25	0.40	1.10	0.40	0.85	0.20	0.65	0.80	0.55	1.15
Sorghum	10	25	40	25	0.40	1.05	0.55	0.80	0.20	0.60	0.90	0.50	0.90
Rye (winter)	10	30	35	25	0.40	1.10	0.40	0.85	0.20	0.60	0.75	0.50	1.05
Rye (spring)	10	20	45	25	0.40	1.10	0.40	0.85	0.20	0.65	0.80	0.55	1.15
Pearl Millet	10	25	40	25	0.35	1.05	0.40	0.80	0.20	0.60	0.80	0.50	0.90
Foxtail Millet	10	25	40	25	0.40	1.05	0.40	0.85	0.20	0.60	0.80	0.50	1.00
White Potato	20	25	35	20	0.50	1.10	0.75	0.85	0.50	0.80	0.80	0.70	1.10
Sweet Potato	20	25	35	20	0.50	1.10	0.75	0.85	0.50	0.80	0.80	0.70	1.10
Sugarbeet	15	30	35	20	0.50	1.10	0.70	0.85	1.00	1.00	1.00	0.50	1.10
Phaseolous Bean	20	33	33	14	0.40	1.10	0.90	0.85	0.20	0.60	1.10	0.75	1.15
Chickpea	20	33	33	14	0.40	1.10	0.70	0.85	0.20	0.60	1.10	0.75	1.15
Cowpea	20	33	33	14	0.40	1.10	0.70	0.85	0.20	0.60	1.10	0.75	1.15
Groundnut	20	30	30	20	0.50	1.05	0.60	0.80	0.20	0.80	0.80	0.60	0.70
Soybean	15	20	45	20	0.40	1.10	0.50	0.85	0.20	0.80	1.00	0.80	0.85
Sunflower	17	28	35	20	0.40	1.10	0.40	0.80	0.25	0.60	1.00	0.80	0.95
Rape	15	25	40	20	0.50	1.10	0.50	0.80	0.20	0.80	1.00	0.80	0.85
Cotton	15	30	30	25	0.50	1.15	0.70	0.85	0.20	0.50	0.75	0.50	0.85

Notes: The coefficients $d1, \dots, d4$ relate to the characteristics of the crop growth cycle, denoting here the relative length (in percent) of four crop development stages, namely, initial stage, vegetative stage, reproductive stage, and maturation stage. Parameters $k1^c, k2^c$, and $k3^c$ define crop water requirements respectively for the initial stage, the reproductive phase, and the end of the maturation stage. Coefficient $k0^c$ indicates water requirements relative to reference evapotranspiration over the entire growth cycle. Finally, factors k^y quantify the expected yield loss in relation to a crop evapotranspiration deficit, by crop stage and for the entire growth cycle, respectively. For calculation details, see Appendix 6.