



Supplementary

A GIS-driven suitability analysis of crop resilience to climate change in Son La province, Vietnam

Tuyet Thi Anh Truong^{a,*}, King Joshua Almadrones Reyes^a, Aaron Kingsbury^b

^a Thai Nguyen University of Agriculture and Forestry, Thai Nguyen City, Thai Nguyen, Vietnam, 25000

^b Maine Maritime Academy, Castine, Maine, United States, 04420

Supplementary

Table S1 Fruit tree growing conditions used in mapping procedure

Crop type	Growing conditions	Highly suitable	Moderately suitable	Marginally suitable	Unsuitable
Mango	Annual average temperature (°C)	24–30	16–23; 31–37	10–15; 38–45	≤10; 46
	Accumulated average rainfall (mm)	890–1,015	1000–1200	500–750; 1,200–1,400	≤500; >1,500
	Average annual air humidity (%)	50–70	55–75	<55; >75	≤50; >80
	Soil type	Pbe; Pe; Hj,D	Fv, Fn, Fk, Fu, Fe, Fj	Fs, d, Fa, Fq, Fp, X	Other
	Slope (°)	2	4	6	>6
	Soil depth	>100	50–100	30–50	≤30
Longan	Annual average temperature (°C)	> 25	> 22–25	>20–22	<20; >40
	Accumulated average rainfall	>2,100–2,500	> 2,100–2,500	>1,700–2,100	<1,700; >2,500
	Soil type	Pbe, Pbc, Pe, Pc, Fk, Fu	Fp, X, Fs	Fp, Fq, B	Other
	Slope (°)	0–8	15–8	15–20	> 20
	Soil depth	<100	<70–100	>50–70	<50
Custard apple	Annual average temperature (°C)	22–24	25–28	29–34; <22–18	>34; <18
	Accumulated average rainfall (mm)	1,200–1,400	>1,400–1,800; <1,200–1,000	<1,000–800; >1,800–2,000	>34; <18
	Average annual air humidity (%)	75	<75– 60; >80– 85	20–60; >85–90	<20
	Soil type	Fv, Fn, Fj, Fq, Fs, Pbe, Pbc	Pe, Pc, Fk, Fu, Fp, X, Fs, Hk, Hu	Hv, Fa, Fq, B	Other
	Slope (°)	1–8	9–19	20–30	>30
	Soil depth (cm)	>80	<80–50	30–50	<30

B= Degraded grey soil on old alluvium, D= Valley soil formed by colluvial deposits, Fa= Red-yellow soil on acidic igneous rock, Fd= Red-yellow soil on basic and neutral igneous rock, Fk= Red-brown soil on basic and neutral igneous rock, Fu= Yellow-brown soil on basic and neutral igneous rock, Fe= Purple-brown soil on purple shale, Fn= Yellow- brown soil on limestone, Fv= Red-brown soil on limestone, Fj= Yellow-red soil on metamorphic rock, Fs= Red-yellow soil on clay rock, Fq= Light-yellow soil on sandstone, Fp= Yellow-brown soil on old alluvium, Hk= Dark red-brown humus soil on basic and neutral igneous rock, Hu= Dark yellow-brown humus soil on basic and neutral igneous rock, Hv= Dark red-brown humus soil on limestone, Hj= Red-yellow humus soil on metamorphic rocks, Pbe= Regularly replenished neutral to slightly acidic, Pbc= Regularly replenished acidic alluvial soil, Pe= Infrequently replenished neutral to slightly acidic alluvial soil, Pc= Infrequently replenished acidic alluvial soil, X= Grey soil on old alluvium

* Corresponding author.

E-mail address: truongthianhtuyet@tuaf.edu.vn (T.T.A. Truong)

Table S2 Staple crop growing conditions used in mapping procedure

Crop Type	Growing conditions	Highly suitable	Moderately suitable	Marginally Suitable	Unsuitable
Maize	Annual average temperature (°C)	25–30	>30; >20–25	15–20	<15
	Accumulated average rainfall	> 800	700–800	600–700	< 600
	Soil type	Fv, Fn, Fj, Fq, Fs, Pbe, Pbc	Pe, Pc, Fk, Fu, Fp, X, Fs, Hk, Hu	Hv, Fa, Fq, B	Other
	Slope (°)	0–2	4–8	8–16	>16
	Soil depth	> 120	75–120	30–75	<30
Paddy rice	Annual average temperature (°C)	> 25–30	> 20–25	> 30, >15–20	<15
	Accumulated average rainfall (mm)	>2,000–2,500	>1500–2,000; >2,500	>1,300–1,500	<1,300
	Average annual air humidity (%)	50–70	55–75	< 55; >75	≤ 50; >80
	Soil type	Pb, Pf, Pg, Pe	B, Fl, Fp, Mi, D, Py	Fj, Fq, Fs, Fu, M, Mn, C, X	Other
	Slope (°)	0–3	3–8	8–15	>15
	Soil depth (cm)	> 100	> 70–100	>30–70	<30

B= Degraded grey soil on old alluvium, C = Coastal sandy soil, D= Valley soil formed by colluvial deposits, Fa= Red-yellow soil on acidic igneous rock, Fd= Red-yellow soil on basic and neutral igneous rock, Fk= Red-brown soil on basic and neutral igneous rock, Fu= Yellow-brown soil on basic and neutral igneous rock, Fe= Purple-brown soil on purple shale, Fn= Yellow-brown soil on limestone, Fv= Red-brown soil on limestone, Fj= Yellow-red soil on metamorphic rock, Fs= Red-yellow soil on clay rock, Fq= Light-yellow soil on sandstone, Fp= Yellow-brown soil on old alluvium, Fl= Altered red-yellow soil due to paddy rice cultivation, Hk= Dark red-brown humus soil on basic and neutral igneous rock, Hu= Dark yellow-brown humus soil on basic and neutral igneous rock, Hv= Dark red-brown humus soil on limestone, Hj= Red-yellow humus soil on metamorphic rocks, M= Moderately saline soil, Mi= Slightly saline soil, Mn= Highly saline soil, Pbe= Regularly replenished neutral to slightly acidic, Pbc= Regularly replenished acidic alluvial soil, Pe= Infrequently replenished neutral to slightly acidic alluvial soil, Pc= Infrequently replenished acidic alluvial soil, Pg= Gleyed alluvial soil, Pf= Alluvial soil with mottled yellow-red layers, X= Grey soil on old alluvium

Table S3 Area changes (in square kilometers) under current and future climate change scenarios for mango, longan, custard apple, maize and paddy rice

		Area (km ²)			% Change	
		Current (1970–2000)	SSP1-2.6 (2081–2100)	SSP3-7.0 (2081–2100)	SSP1-2.6 (2081–2100)	SSP3-7.0 (2081–2100)
Mango	Unsuitable	2,280	1,470	878	+35.52	–61.4%
	Marginally suitable	12,188	12,924	13,261	+6.03%	+8.80%
	Moderately suitable	0	14	185	(Increase)	(Increase)
	Highly suitable	0	0	0	0	0
Longan	Unsuitable	5,970	4,332	2,403	–27.43%	–59.7%
	Marginally suitable	8,553	10,075	12,031	+17.79%	+40.66%
	Moderately suitable	0	0	0	0	0
	Highly suitable	0	0	0	0	0
Custard Apple	Unsuitable	653	612	669	–6.27%	+2.45%
	Marginally suitable	13,555	13,728	4,208	+1.27%	–68.95%
	Moderately suitable	291	103	9,529	–64.60%	+3,174.57%
	Highly suitable	0	0	0	0	0
Maize	Unsuitable	611	660.5	671	0%	+10.2%
	Marginally suitable	13,915	14,638.2	10,050	–1.3%	–27.7%
	Moderately suitable	0	0	3,691	0	(Increase)
	Highly suitable	0	0	0	0	0
Paddy Rice	Unsuitable	2,257	1,418	1,175	–37.17%	–47.93%
	Marginally suitable	12,207	13,037	13,189	+6.79%	+8.04%
	Moderately suitable	0	0	76	0	(Increase)
	Highly suitable	0	0	0	0	0