Integrating Diverse Cover Crops for Fallow Replacement in a Subtropical Dryland: Implications on Subsequent Cash Crop Yield, Grain Quality, and Gross Margins

Supplementary materials

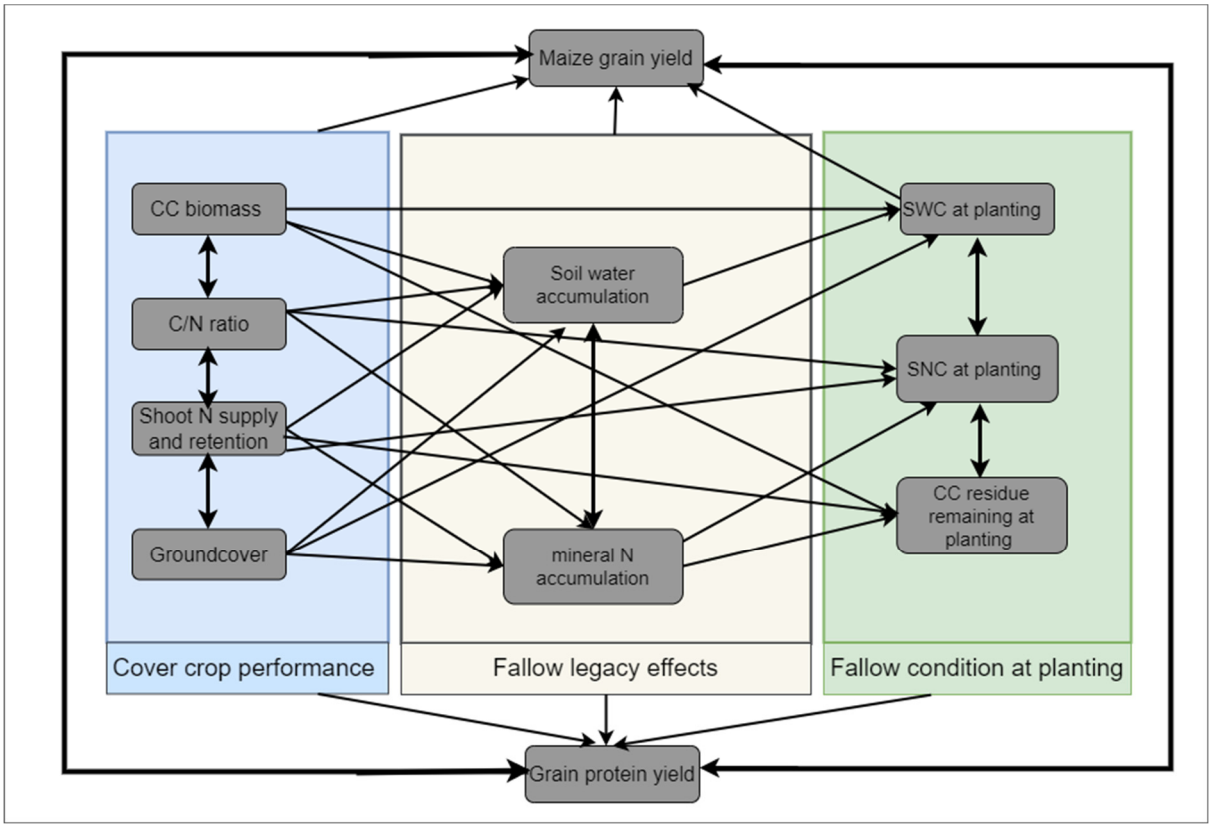

Figure S1: The *a priori* conceptual framework articulating the proposed causal influences of cover crops on subsequent cash crop grain and protein yield based on the hypothesis that cash crop productivity (grain yield and protein content) is influenced by cover crop performance, and fallow as well as through direct and indirect effects on fallow soil water (SWC) and mineral N dynamics (SNC).

Table S1. Price and costs of commodities, stubble, seeds, operations, and chemicals used for the calculation of farm gross margin

	Qty	Rate	Cost	unit	Fallow	Stubble	Oats	Fababean	Rape	Oats - Fababean	Oats - Rape	Fababean - Rape	33Oats - 33Fababean - 33Rape	70Oats - 15Fababean - 15Rape	15Oats - 70Fababean - 15Rape	15Oats - 15Fababean - 70Rape
A. Fallow management																
Stubble	1	10	15.8	$/kg		158										
Stubble transport	2	1	60.7	$/hr		121										
Stubble spread	2	1	60.7	$/hr		121										
CC seeds oats	1	40	1.4	$/kg			56									
CC seeds faba	1	200	2.1	$/kg				420		238	49	231	172	108	309	100
CC seeds rapa	1	4	10.1	$/kg					41							
basal fertilizer-Granulock Z	1	30	1.99	$/kg	60	60	60	60	60	60	60	60	60	60	60	60
CC sowing-operation	1	1	130	$/hr		130	130	130	130	130	130	130	130	130	130	130
Inoculant	1	0.2	95	/ha				20						3	14	3
Operation: sprayer FORM x operations	1	1	60.7	$/hr	120	61	182	182	182	182	182	182	182	182	182	182
Herbicide: Glyphosate pre-plant x 1 app	1	2	15	$/L	30	30	30	30	30	30	30	30	30	30	30	30
Herbicide: Hammer pre-plant x 1 app	1	0.2	150	$/L	30	30	30	30	30	30	30	30	30	30	30	30
Herbicide: Glyphosate termination x 2 app	2	2	15	$/L			60	60	60	60	60	60	60	60	60	60
Herbicide: Hammer termination x 2 app	2	0.2	150	$/L			60	60	60	60	60	60	60	60	60	60
A. total					**240**	**711**	**608**	**992**	**593**	**790**	**601**	**783**	**724**	**663**	**875**	**655**
Cash cro planting																
Maize (Year 1)																

Maize seed	1	14.5	13.5	$/kg	198	198	198	198	198	198	198	198	198	198	198	198
operation-sowing	2	1	60.7	$/hr	121	121	121	121	121	121	121	121	121	121	121	121
Inoculant	0	0.2	95	/ha	0	0	0	0	0	0	0	0	0	0	0	0
B1. total					**319**	**319**	**319**	**319**	**319**	**319**	**319**	**319**	**319**	**319**	**319**	**319**
Mungbean (Year 2)																
mungbean seed	1	29	10.9	$/kg	316	316	316	316	316	316	316	316	316	316	316	316
operation-sowing	2	1	60.7	$/hr	121	121	121	121	121	121	121	121	121	121	121	121
Inoculant	1	0.2	95	/ha	19	19	19	19	19	19	19	19	19	19	19	19
B2. total					456	456	456	456	456	456	456	456	456	456	456	456
C. Nutrition																
Spreader x 2 operations	2	1	60.7	$/hr	121	121	121	121	121	121	121	121	121	121	121	121
basal dose	1	120	1.5	$/kg	180	180	180	180	180	180	180	180	180	180	180	180
top dress	1	60	1.5	$/kg	90	90	90	90	90	90	90	90	90	90	90	90
C. total					391	391	391	391	391	391	391	391	391	391	391	391
D. Crop protection																
Herbicide: Glyphosate pre-plant x 1 app	1	2	15	$/L	30	30	30	30	30	30	30	30	30	30	30	30
Herbicide: Hammer pre-plant x 1 app	1	0.2	150	$/L	30	30	30	30	30	30	30	30	30	30	30	30
Fall armyworms-Dinotefuran Starkle	1	5	8.5	$/L	43	43	43	43	43	43	43	43	43	43	43	43
Spray operation	2	1	60.7	$/hr	120	120	120	120	120	120	120	120	120	120	120	120
C. total					**223**	**223**	**223**	**223**	**223**	**223**	**223**	**223**	**223**	**223**	**223**	**223**
D. Harvesting																
Operation:	1	1	130	$/hr	130	130	130	130	130	130	130	130	130	130	130	130

Harvester:	1	1	130	$/hr	130	130	130	130	130	130	130	130	130	130	130	130
D. total					**260**	**260**	**260**	**260**	**260**	**260**	**260**	**260**	**260**	**260**	**260**	**260**
Wheat (Year 3)																
wheat seed	1	70	7.5	$/kg	0	0	0	0	0	0	0	0	0	0	0	0
operation-sowing	2	1	60.7	$/hr	121	121	121	121	121	121	121	121	121	121	121	121
	3	15	$/L	30	30	30	30	30	30	30	30	30	30	30	30	
Inoculant	0	0.2	95	/ha	0	0	0	0	0	0	0	0	0	0	0	0
E. total					**151**	**151**	**151**	**151**	**151**	**151**	**151**	**151**	**151**	**151**	**151**	**121**
Total Cost																
Year 1: Maize					**1433**	**1904**	**1801**	**2185**	**1786**	**1983**	**1794**	**1976**	**1917**	**1856**	**2068**	**1848**
Year 2: Mungbean					**1570**	**2041**	**1938**	**2322**	**1923**	**2120**	**1931**	**2113**	**2054**	**1993**	**2205**	**1985**
Year 3: Winter wheat					**1025**	**1025**	**1025**	**1025**	**1025**	**1025**	**1025**	**1025**	**1025**	**1025**	**1025**	**995**

Table S2. Parameter estimates from the final SEM model.

Dep	Pred	Estimate	SE	β	z	p
MCGY	CCDM	1.0836	0.4229	1.0723	2.5625	0.01
MCGY	CCNC	0.3003	0.244	0.2972	1.2306	0.218
MCGY	CNRT	0.5496	0.1338	0.5439	4.1076	< .001
MCGY	NSNR	-0.6157	0.4165	-0.6093	-1.4783	0.139
MCGY	EPAW	0.3993	0.1097	0.3951	3.6386	< .001
MCGY	ESMN	0.0807	0.1885	0.0798	0.428	0.066
MCGY	SNAC	0.2367	0.1865	0.2342	1.2688	0.205
MCGY	SWAC	0.1127	0.1124	0.1115	1.0024	0.061
MCGY	DMRE	-0.5454	0.1153	-0.5397	-4.7297	< .001
EPAW	CCDM	-0.3227	0.507	-0.3227	-0.6365	0.524
EPAW	CCNC	-0.4057	0.3112	-0.4057	-1.3039	0.192
EPAW	CNRT	-0.1764	0.1793	-0.1764	-0.9835	0.325
EPAW	NSNR	0.2961	0.5157	0.2961	0.5741	0.566
EPAW	SWAC	0.4861	0.1295	0.4861	3.7547	< .001
EPAW	ESMN	0.013	0.1722	0.013	0.0753	0.94
ESMN	CCDM	-0.3686	0.2961	-0.0686	-0.3686	0.081
ESMN	CCNC	-0.0207	0.1813	-0.0207	-0.1144	0.909
ESMN	CNRT	-0.0866	0.101	-0.0866	-0.8572	0.391
ESMN	NSNR	0.153	0.3023	0.153	0.5059	0.613
ESMN	SNAC	0.8143	0.0815	0.8143	9.989	< .001
ESMN	SWAC	0.0255	0.0759	0.0255	0.3363	0.737
SWAC	CCDM	-0.337	0.5693	-0.337	-0.592	0.554
SWAC	CCNC	-0.0372	0.3514	-0.0372	-0.1059	0.916
SWAC	CNRT	-0.0723	0.187	-0.0723	-0.3863	0.699
SWAC	NSNR	0.2153	0.5845	0.2153	0.3683	0.713
SNAC	CCDM	0.8194	0.5302	0.8194	1.5455	0.122
SNAC	CCNC	0.4084	0.3273	0.4084	1.248	0.212
SNAC	CNRT	-0.402	0.1742	-0.402	-2.3077	0.021
SNAC	NSNR	-0.7415	0.5444	-0.7415	-1.3621	0.173
DMRE	CCDM	1.4948	0.4691	1.4948	3.1864	0.001
DMRE	CCNC	0.4058	0.2896	0.4058	1.4014	0.161
DMRE	CNRT	0.0172	0.1541	0.0172	0.1117	0.911
DMRE	NSNR	-1.1483	0.4817	-1.1483	-2.3839	0.017

MCGY = cash crop grain yield (kg ha^{-1}); MCBY = cash crop biomass yield (kg ha^{-1}); MCWE = cash crop water use efficiency (kg ha^{-1} m^{-1}); GRMN = farm gross margin ($ ha^{-1}); MCPR = cash crop grain protein (%); CCDM = cover crop biomass (kg DM ha^{-1}); CNCC = biomass N concentration (%); CNRT = biomass C/N ratio; NSNR = Biomass retention and supply (kg N ha^{-1}); EPAW = soil water at end of fallow (mm); SWAC = soil water accumulation between cover crop termination and cash crop sowing (mm); FAEF = fallow efficiency (%); ESMN = soil mineral N content at cash crop sowing (kg N ha^{-1}); SNAC = soil mineral N between cover crop termination and cash crop sowing (kg N ha^{-1}); and DMRE = cover crop residue remaining at cash crop sowing (%).