



WAVES

Biomass and Nutrient Dynamics from household to field in Koutiala, Mali-Sud



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October, 2021

Challenges for soil fertility management

Poor Soil fertility

- ❖ pH
- ❖ OC
- ❖ Sandy



Increase of population

- ❖ Pressure on land
- ❖ Livestock grazing



Farming management

- ❖ Equipment
- ❖ Knowledge
- ❖ Biomass
- ❖ Manure





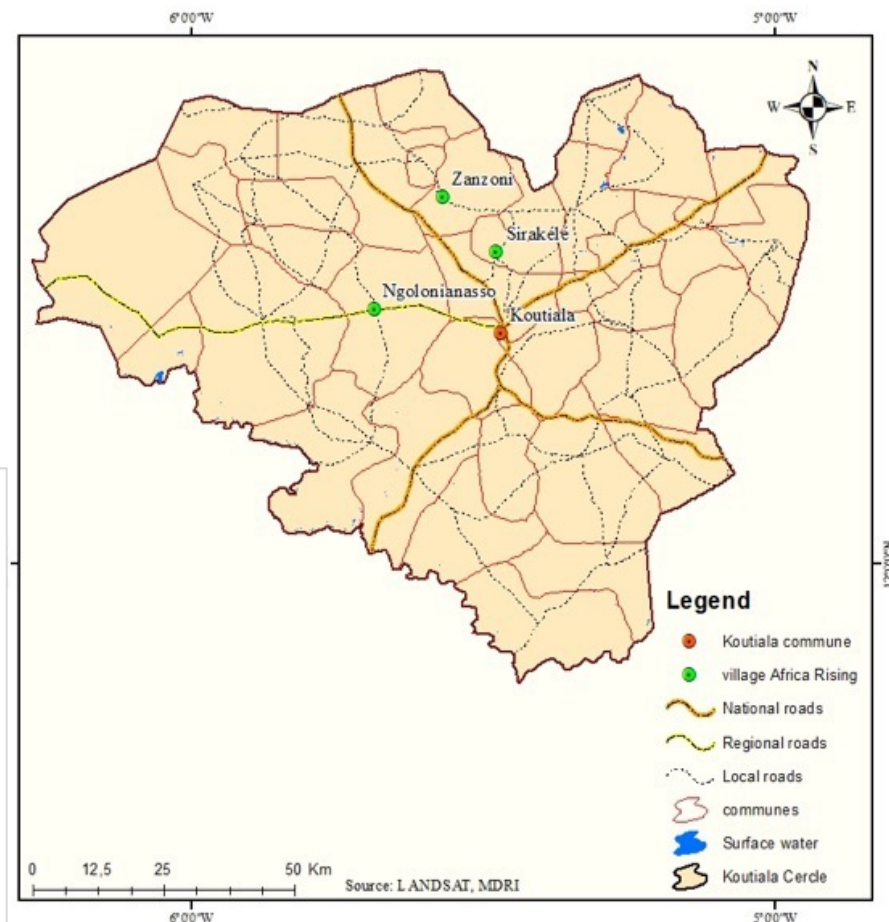
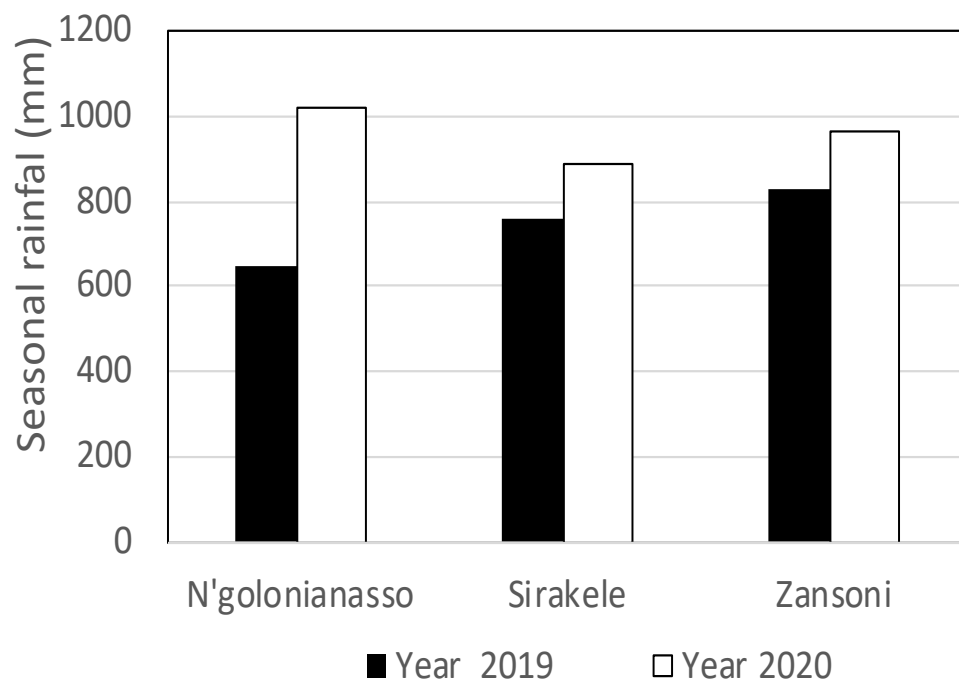
Research objective

**Quantifying Biomass and Nutrients per farm
typology**

**Evaluate Nutrient partial balance per farm
type**

Evaluate Nutrient partial balance per crop

Study site





**Farming systems extensive
agro-sylvo - pastoral
systems**

**Cattle, goats and
sheep livestock**

**Cropping system
millet, sorghum, maize and cotton**



**Systematic random
sampling method for
selecting 45 farmers**

	Plow	Land (ha)	labor	Animal
HRE	>2	>20	>20	>20
MRE	>2	>10-15	>10-20	>5-20
LRE	0	1-10	5-10	1-5



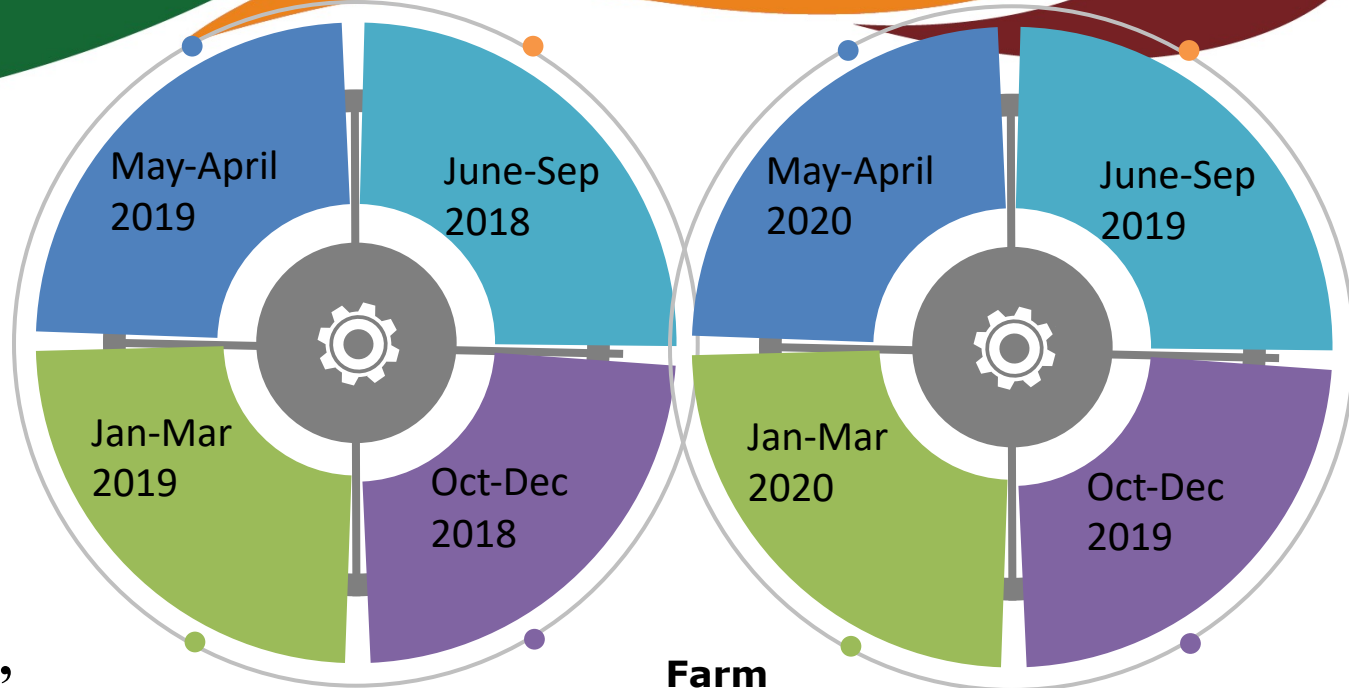
Data collection and monitoring

Farm Resource inv

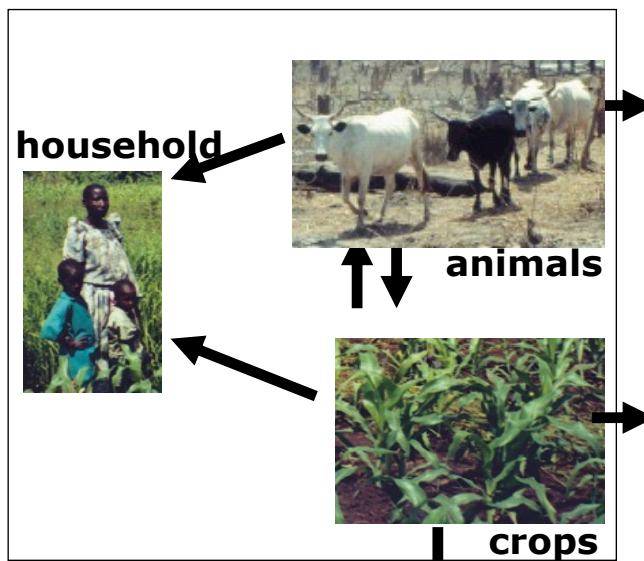
- ❖ Household
- ❖ Crop
- ❖ Animals
- ❖ Redistribution Units,
- ❖ Inputs
- ❖ Etc.

Continuous monitoring

- ❖ Individual survey
- ❖ Weight harvested products
- ❖ Weight FYM, Compost, CM
- ❖ Numbers of animals
- ❖ Etc.



Farm

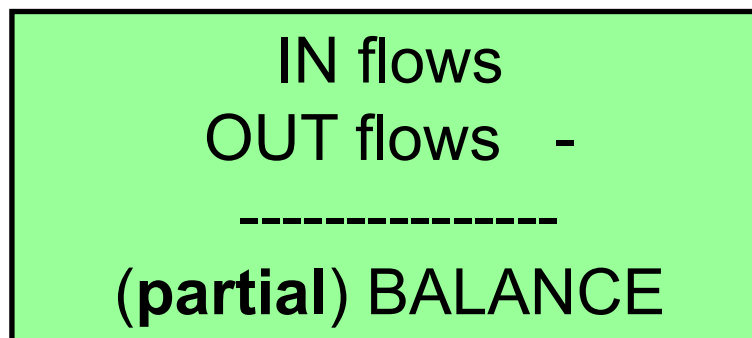




NUTrient MONItoring

- IN 1:** mineral fertilizers
- IN 2:** organic manure
- IN 3:** wet and dry deposition
- IN 4:** biological Nitrogen fixation
- IN 5:** sedimentation

In flows



Out flows

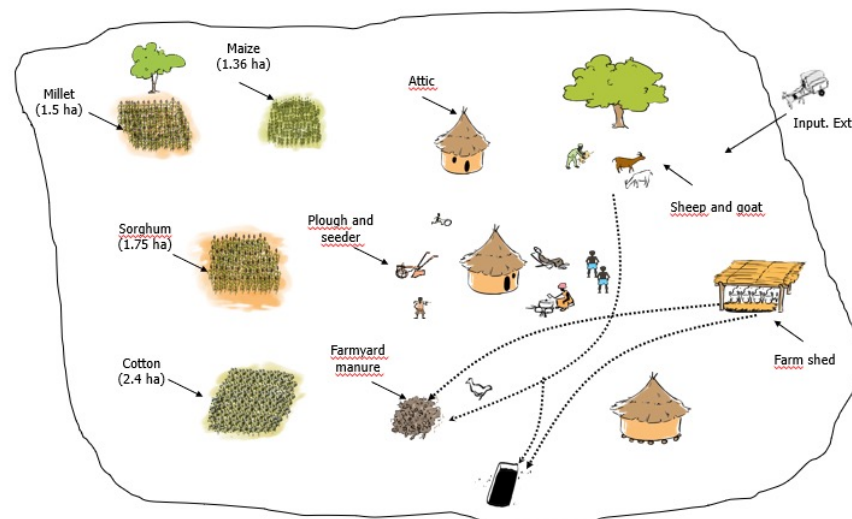
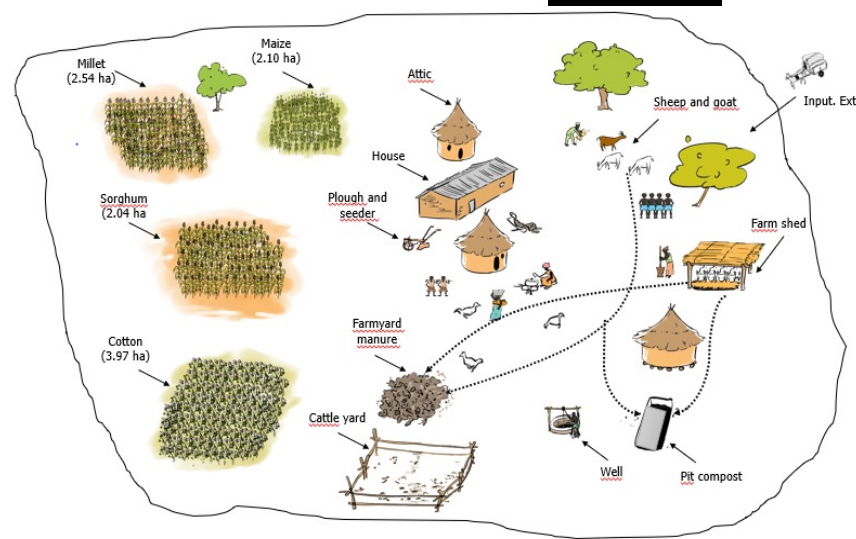
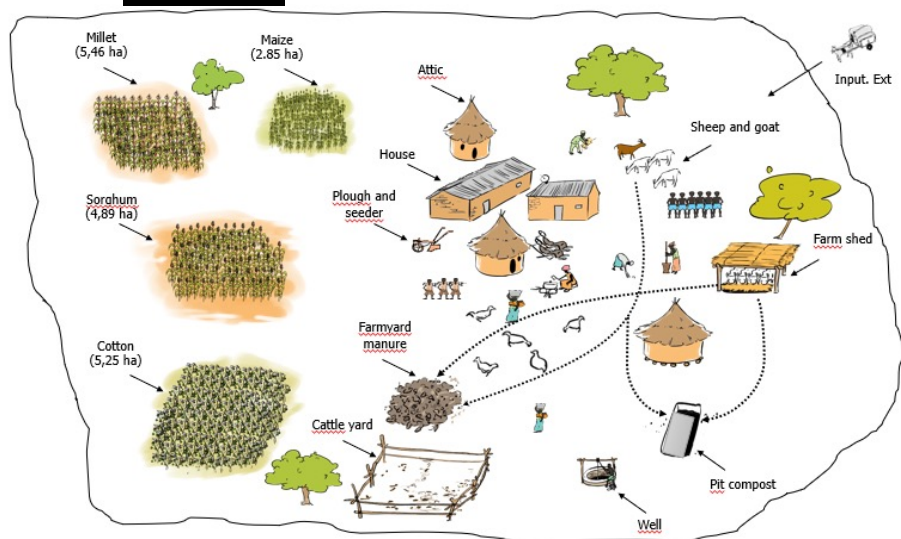


- OUT 1:** removal harvested crop products
- OUT 2:** removal crop residues
- OUT 3:** leaching
- OUT 4:** gaseous losses
- OUT 5:** erosion

HRE

July - September

MRE

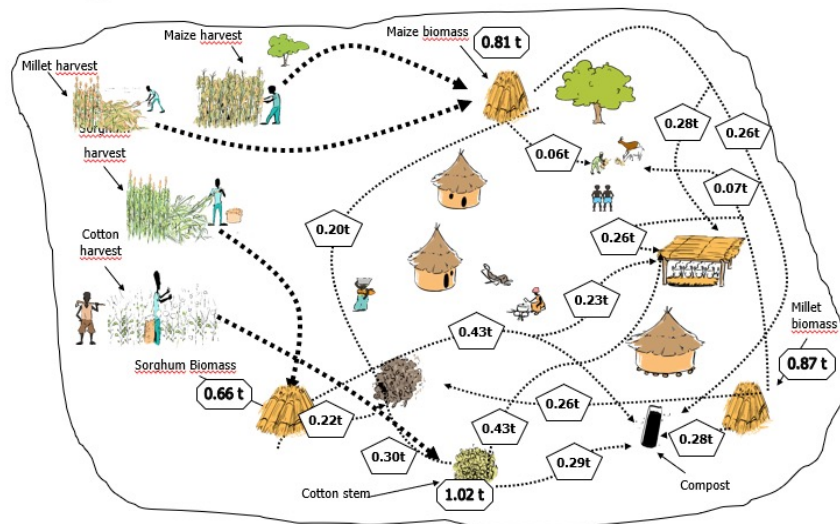
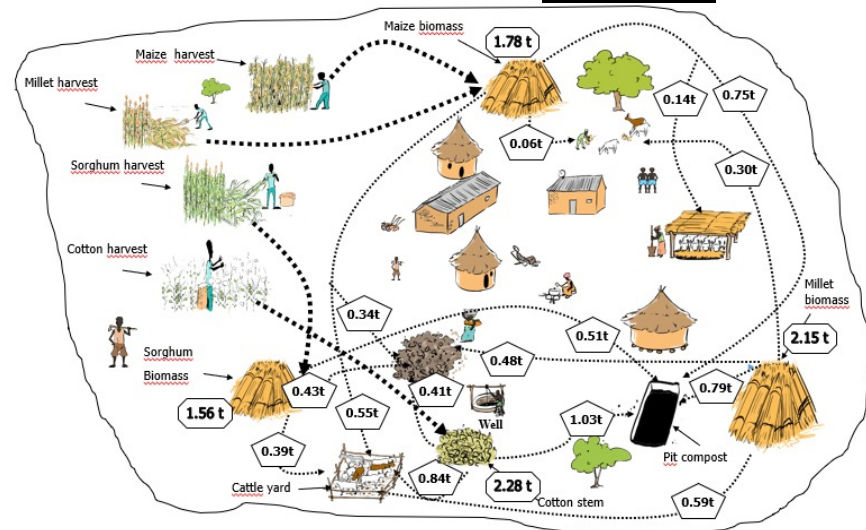
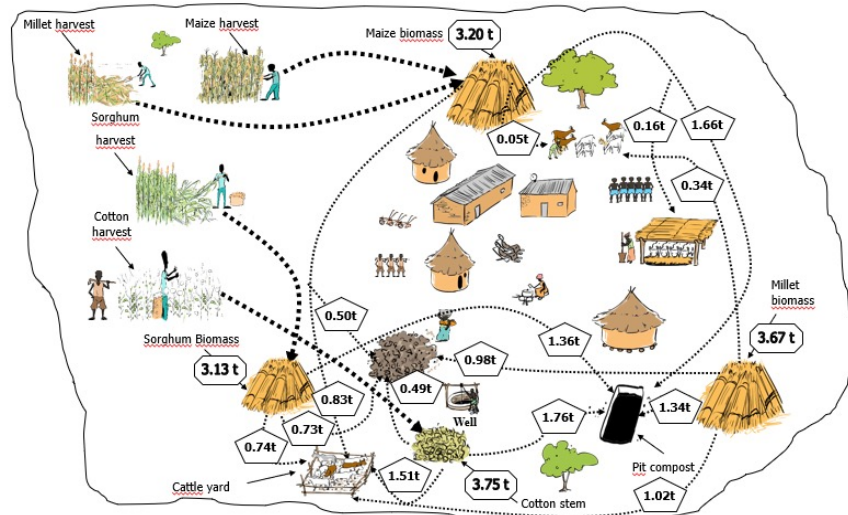


LRE

October to December

HRE

MRE



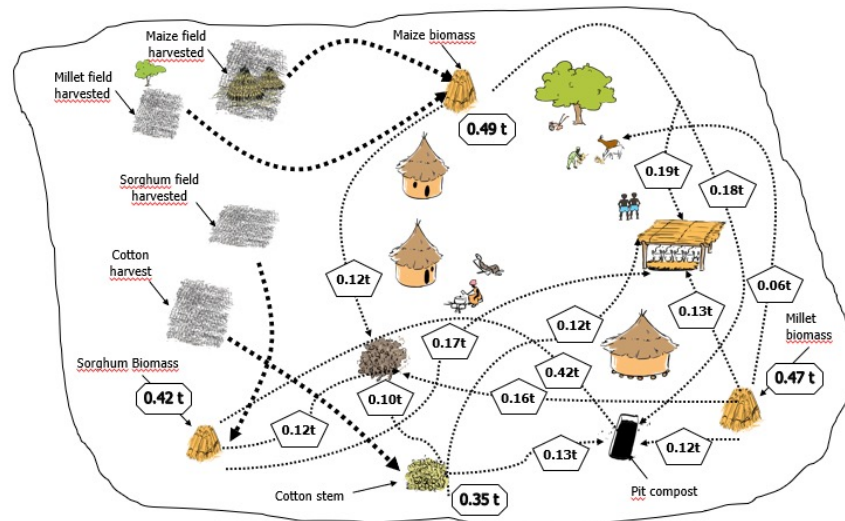
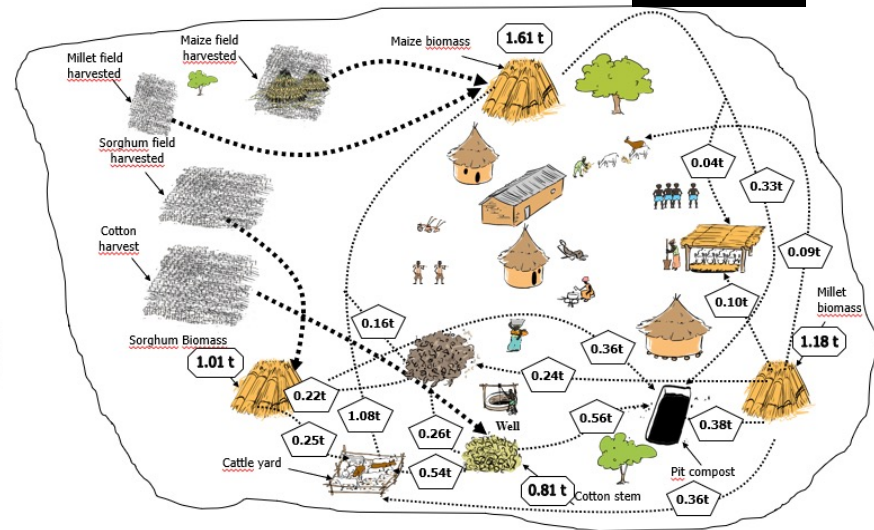
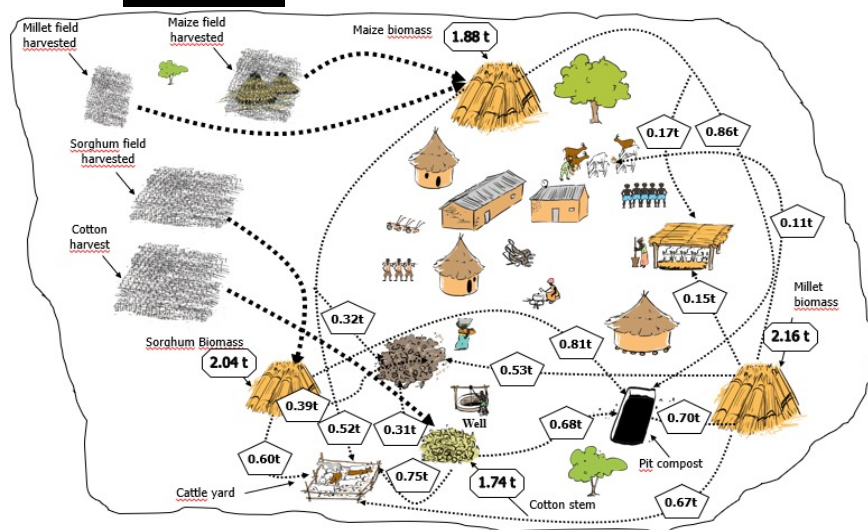
LRE



January to March

HRE

MRE

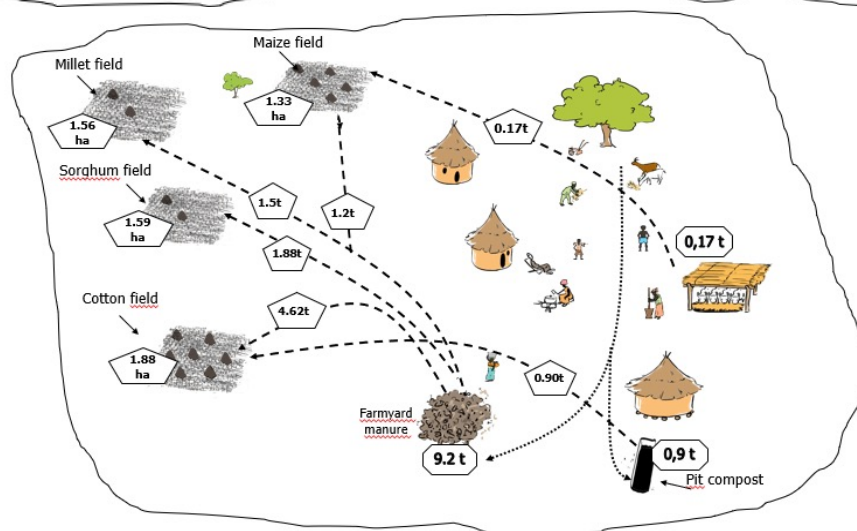
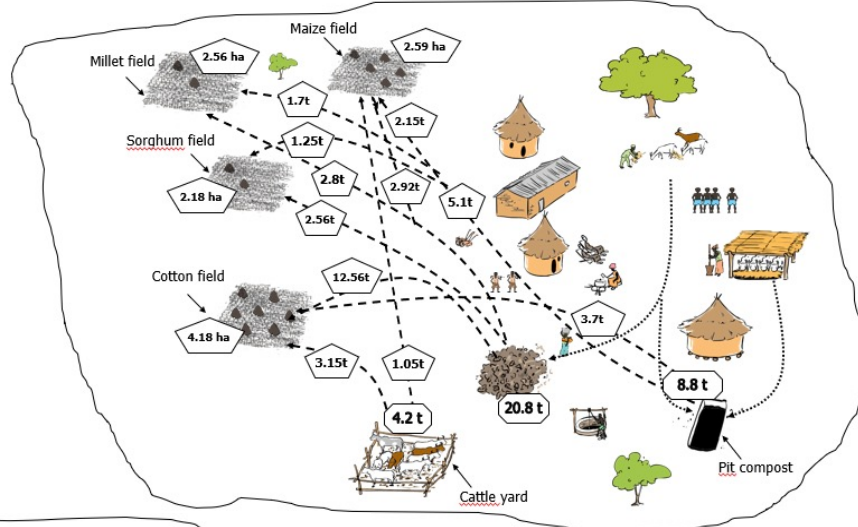
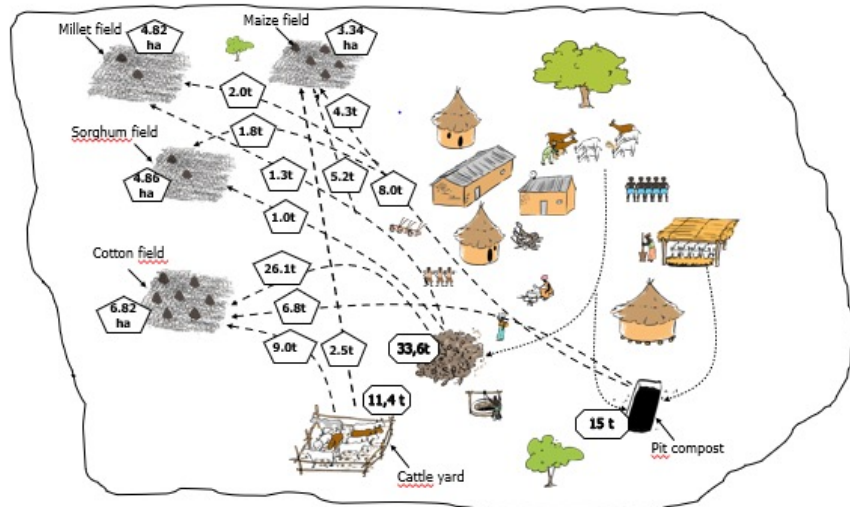


LRE

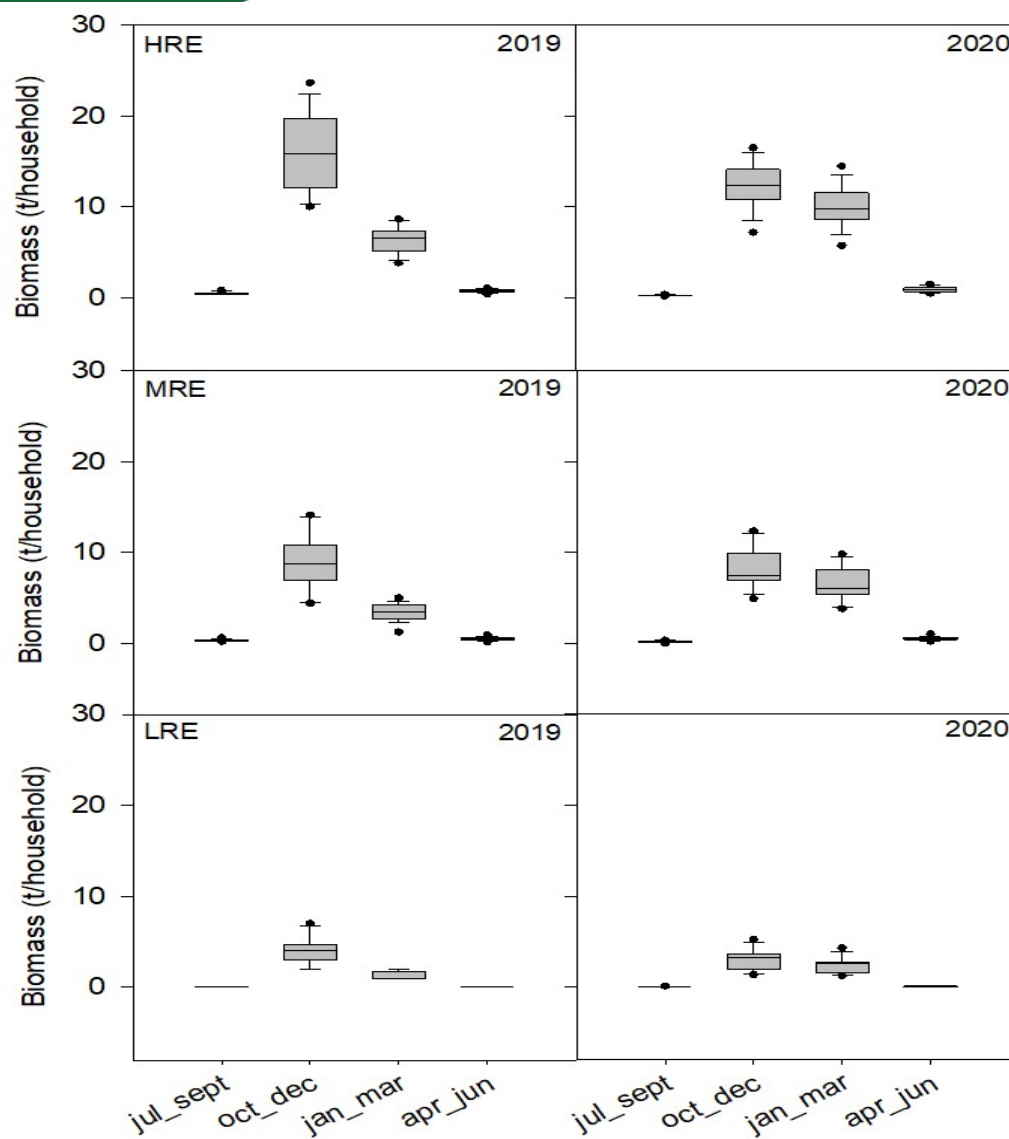
April to June

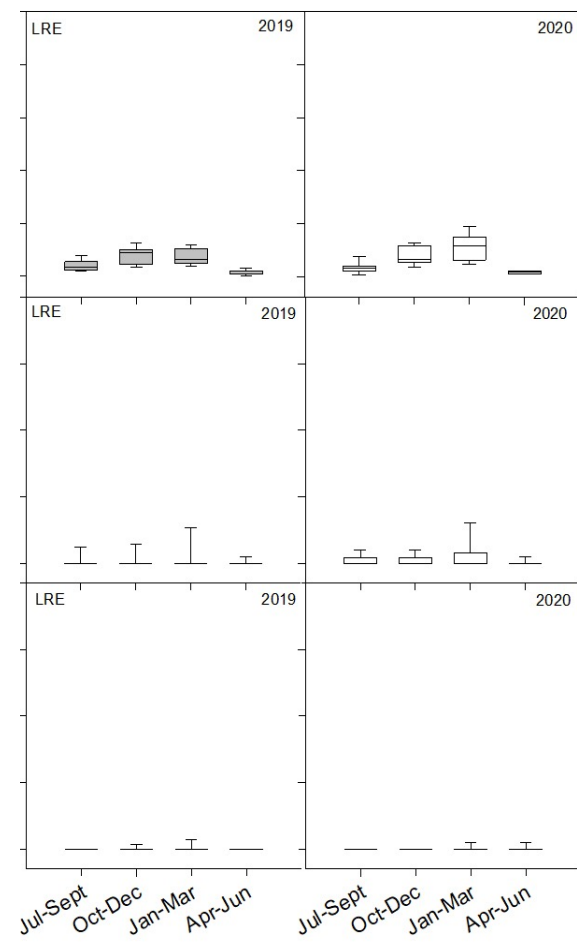
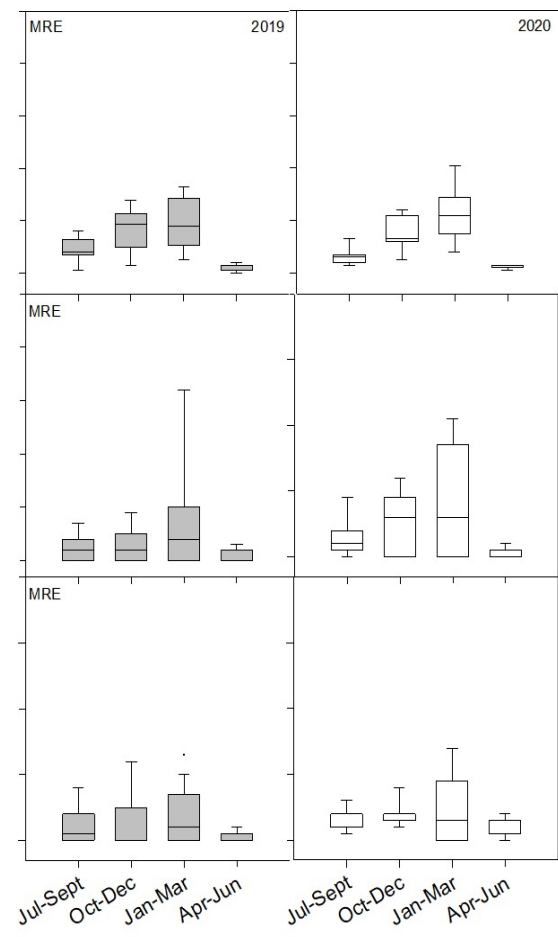
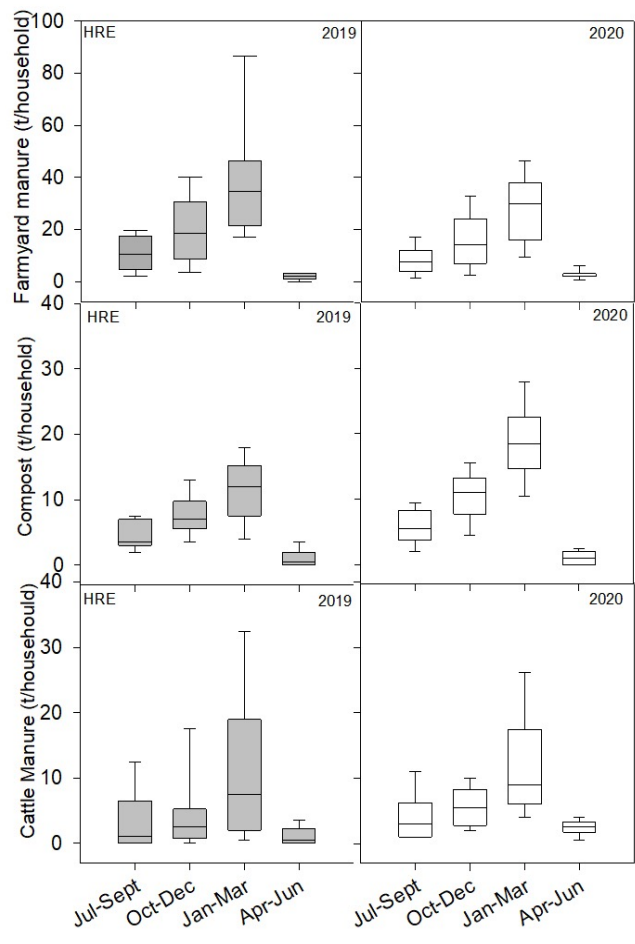
HRE

MRE



LRE





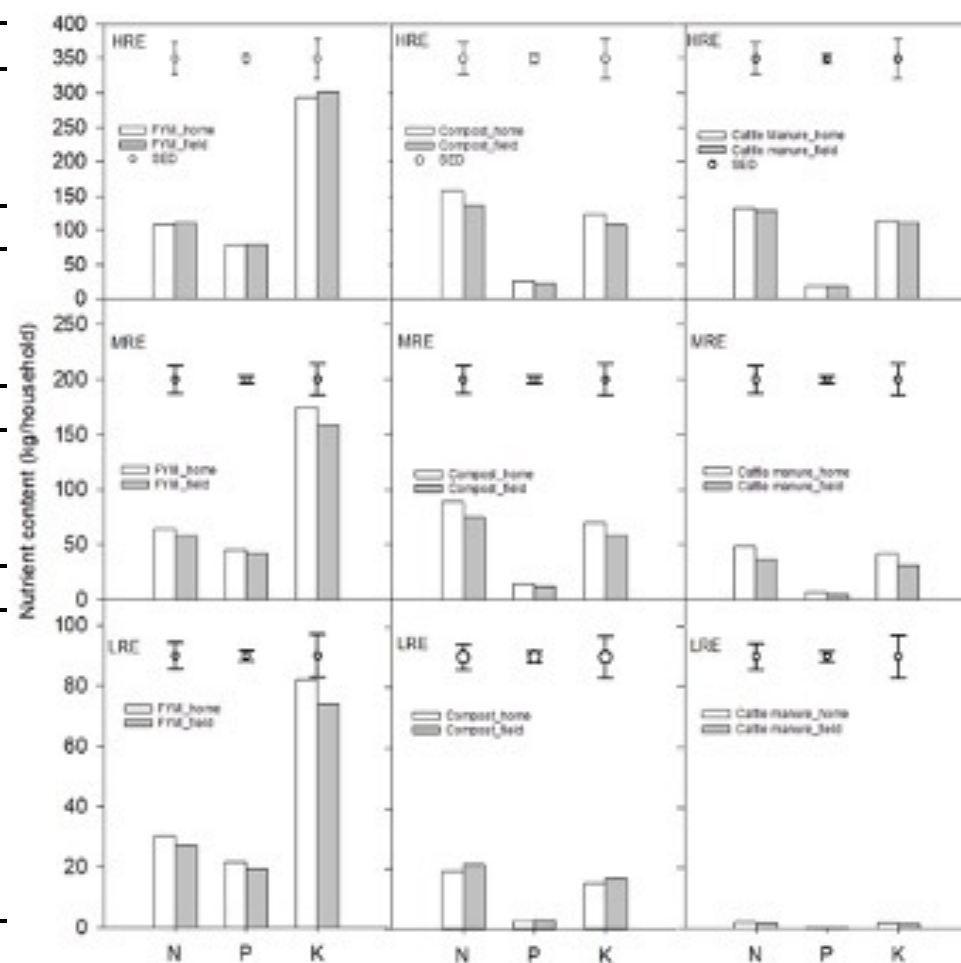


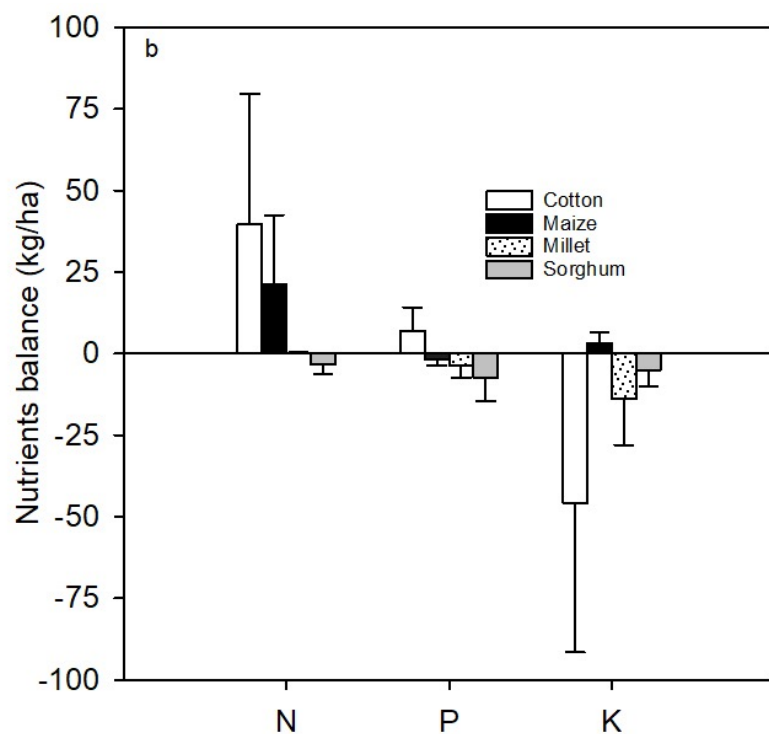
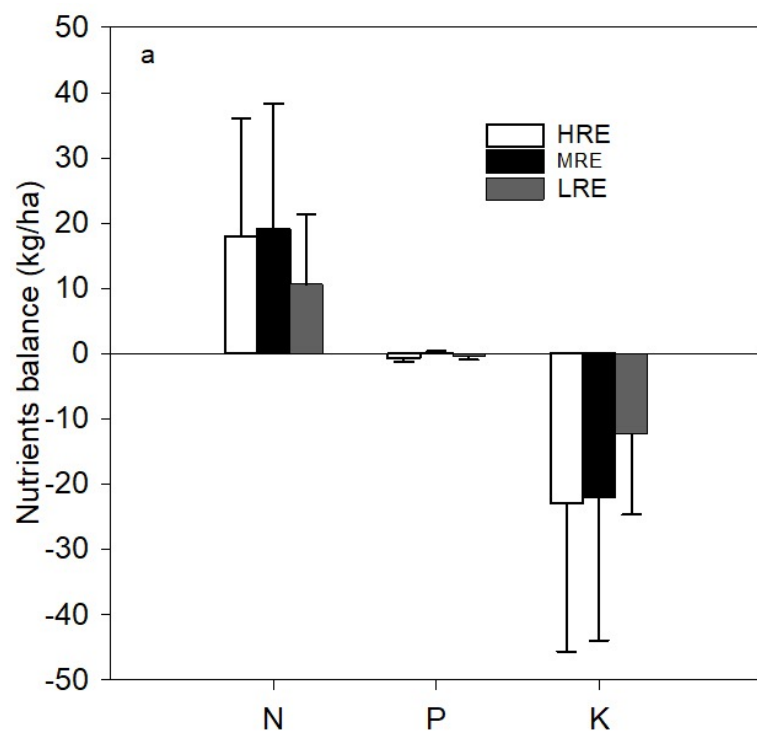
Farm type	Biomass (t)	Farmyard manure (t)	Compost (t)	Cattle manure (t)
<i>HRE</i>	22.26	33.53	14.08	11.48
<i>MRE</i>	13.42	20.86	8.80	4.20
<i>LRE</i>	5.35	9.19	0.90	0.17
<i>Mean</i>	3.67	21.22	8.23	5.26
<i>Ecart type</i>	8.45	12.24	7.05	5.70
<i>Prob</i>	< 0.001	< 0.001	< 0.001	< 0.001

		%	FYM	Compost	Cattle Manure
HRE	Cotton	70	26	6	9
	Maize	18	5.23	4.33	1.33
	Millet and sorghum	12	2.3	3.75	1.15
MRE	Cotton	57	12.56	3.70	3.15
	Maize	18	2.90	2.15	1.05
	Millet and sorghum	25	5.4	2.95	0
LRE	Cotton	54	0.9	4.62	
	Maize	13	1.2	0	0.17
	Millet and sorghum	33	3.38	0	



	Type of manure	N	P	K
HRE	Farmyard manure	107.9	77.5	293.3
	Compost	156.7	25.6	123
	Cattle manure	131.9	18	113.9
	Total	396.5	121.1	530.2
MRE	Farmyard manure	64.2	46.2	174.6
	Compost	89	14.2	69.9
	Cattle manure	48.4	6.6	41.8
	Total	201.6	67.0	286.3
LRE	Farmyard manure	30.2	21.7	82
	Compost	19.3	2.7	15.2
	Cattle manure	1.9	0.3	1.7
	Total	51.4	24.7	98.9
Prob. Value Year		<.001	0.266	0.084
Prob. Value Type of manure		0.002	<.001	<.001
Prob. Value Farm type		<.001	<.001	<.001
Prob. Value Year x type of manure		<.001	0.01	0.002
Prob. Value Year x farm type		0.678	0.189	0.291
Prob. Value Type of manure x farm type		0.049	<.001	0.002
Prob. Value Year x type of manure x farm type		0.097	0.004	0.009







Implications for Research

- ❖ Cotton fields are on top of priority for nutrients inputs
- ❖ More attention to food crop for the LRE
- ❖ Main source of N is Compost for HRE/MRE and FYM for LRE
- ❖ Collective production of compost
- ❖ N Balance is positive and K is negative for all farm type and especially for cotton
- ❖ Option for fertilising Millet and sorghum