Food Self-sustainability Drive and Malaria Incidence in Nigeria: A Need for Policy Coherence?

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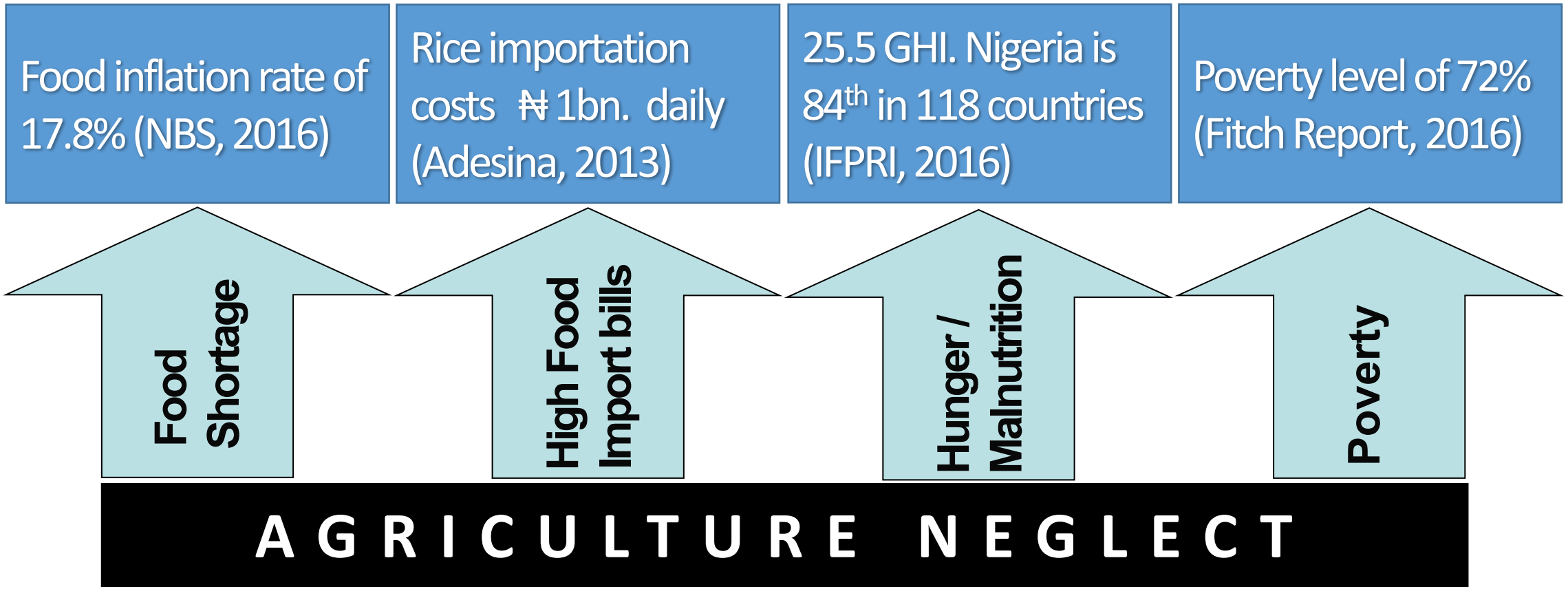
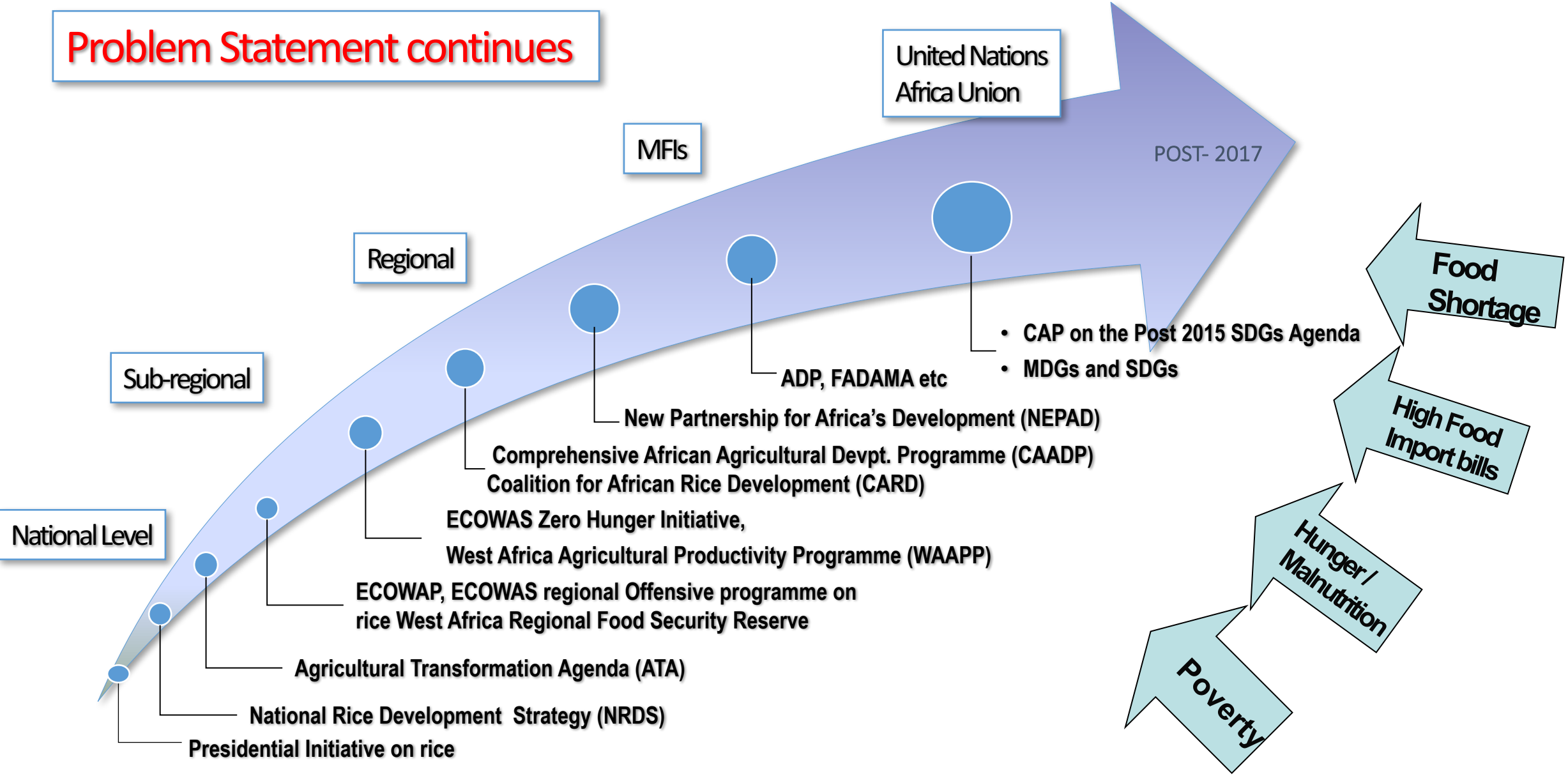
Problem Statement

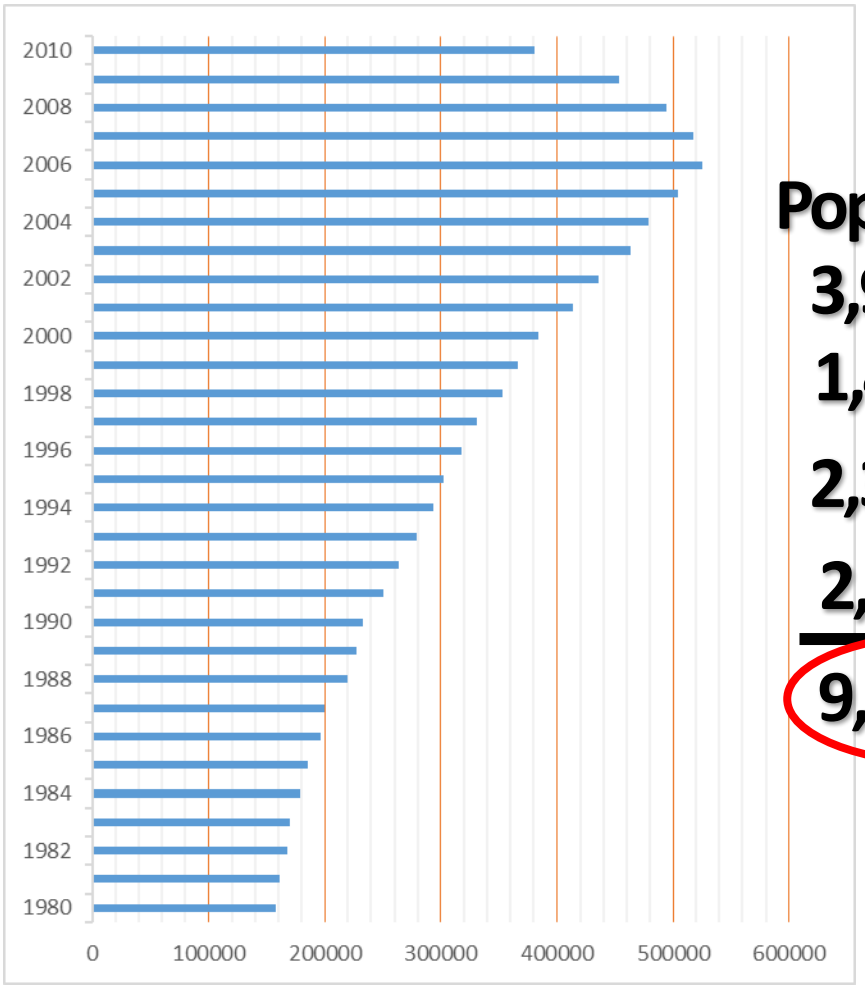


Problem Statement continues



Source: ECOWAS Commission, 2012; 2013; 2015; ECDPM, 2014; UNECA, 2014.

Problem Statement continues



Population figure

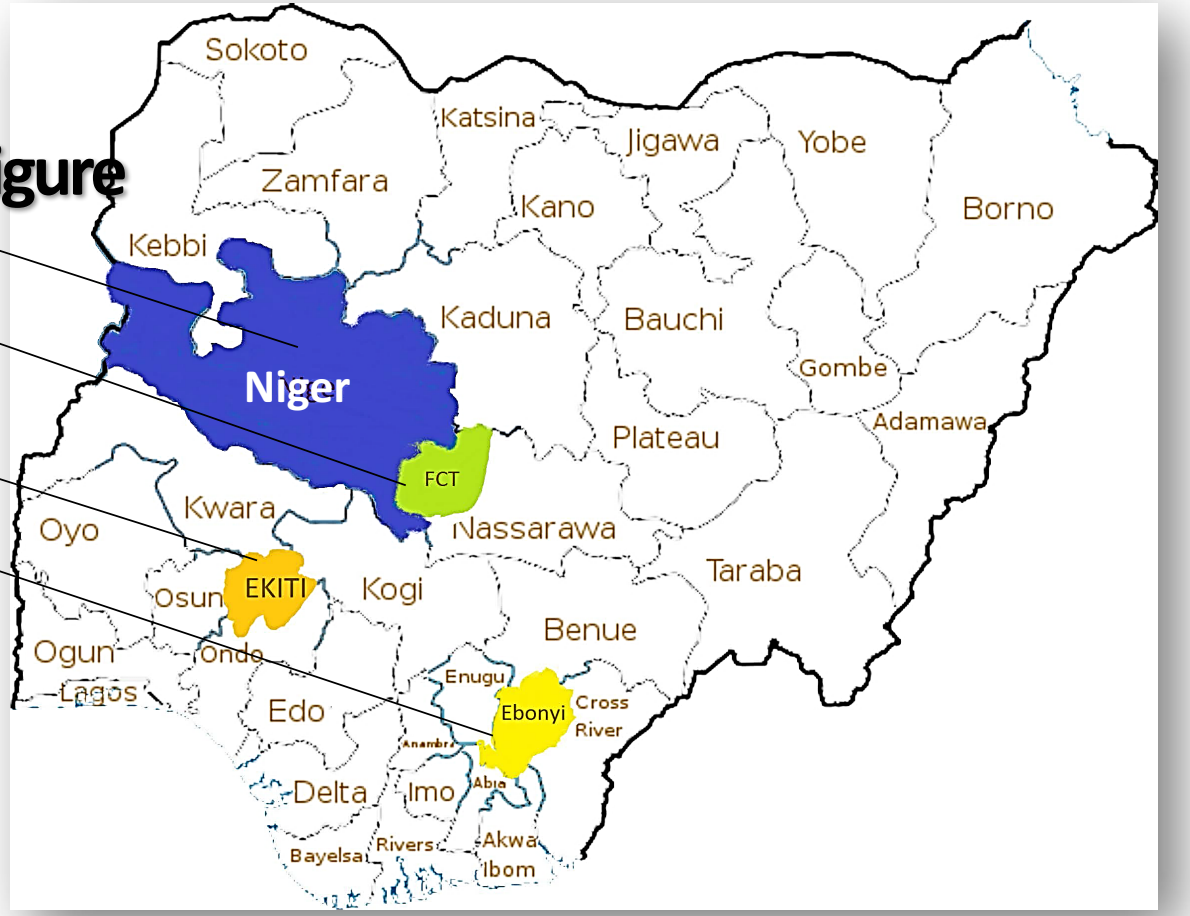
3,950,294

1,405,201

2,384,212

2,173,501

9,913,208



Deaths from malaria from 1980 – 2010. (9,905,724)

Source: Institute for Health Metrics and Evaluation, (2013)

- Economic Burden
- Productivity Loss

Research Questions

1. What socio-economic characteristics enhance malaria spread?

2. What economic burden is placed by malaria?

3. What no of hours/ days lost to malaria treatment?

4. What choices do they make in malaria care?

5. What is the level of efficiency of rice farmers?

6. What efficiency differential exist?

Specific Objectives

(a) socio-economic characteristics of respondents that influence malaria;

(c) economic burden of malaria on rice farmers;

(b) awareness level of malaria and current practices employed to address malaria;

(d) effect of malaria on rice farmers' technical efficiency;

(e) differentials in technical efficiency between malarious and non-malarious households

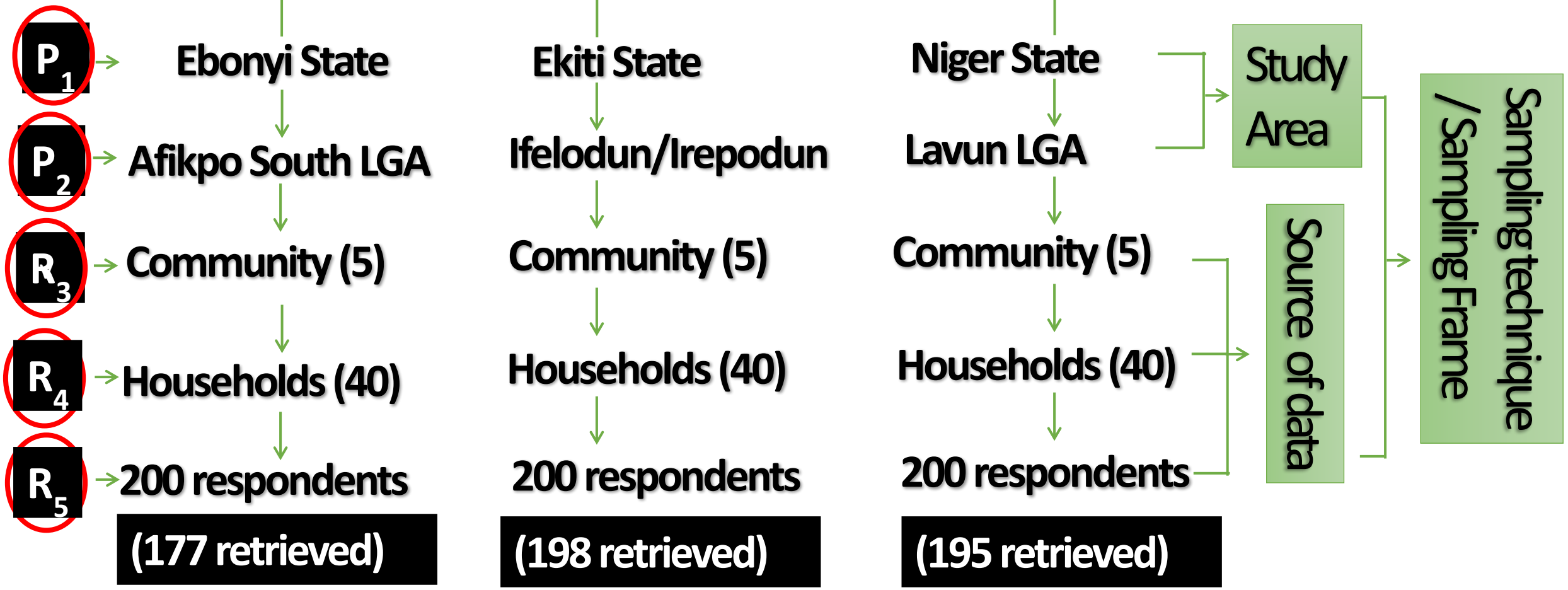
Hypotheses

$H0_1$: There is no significant difference in the socio-economic characteristics of farming households with malaria and households without malaria.

$H0_2$: There is no significant difference in the level of input use between farmers households with Malaria and those without malaria.

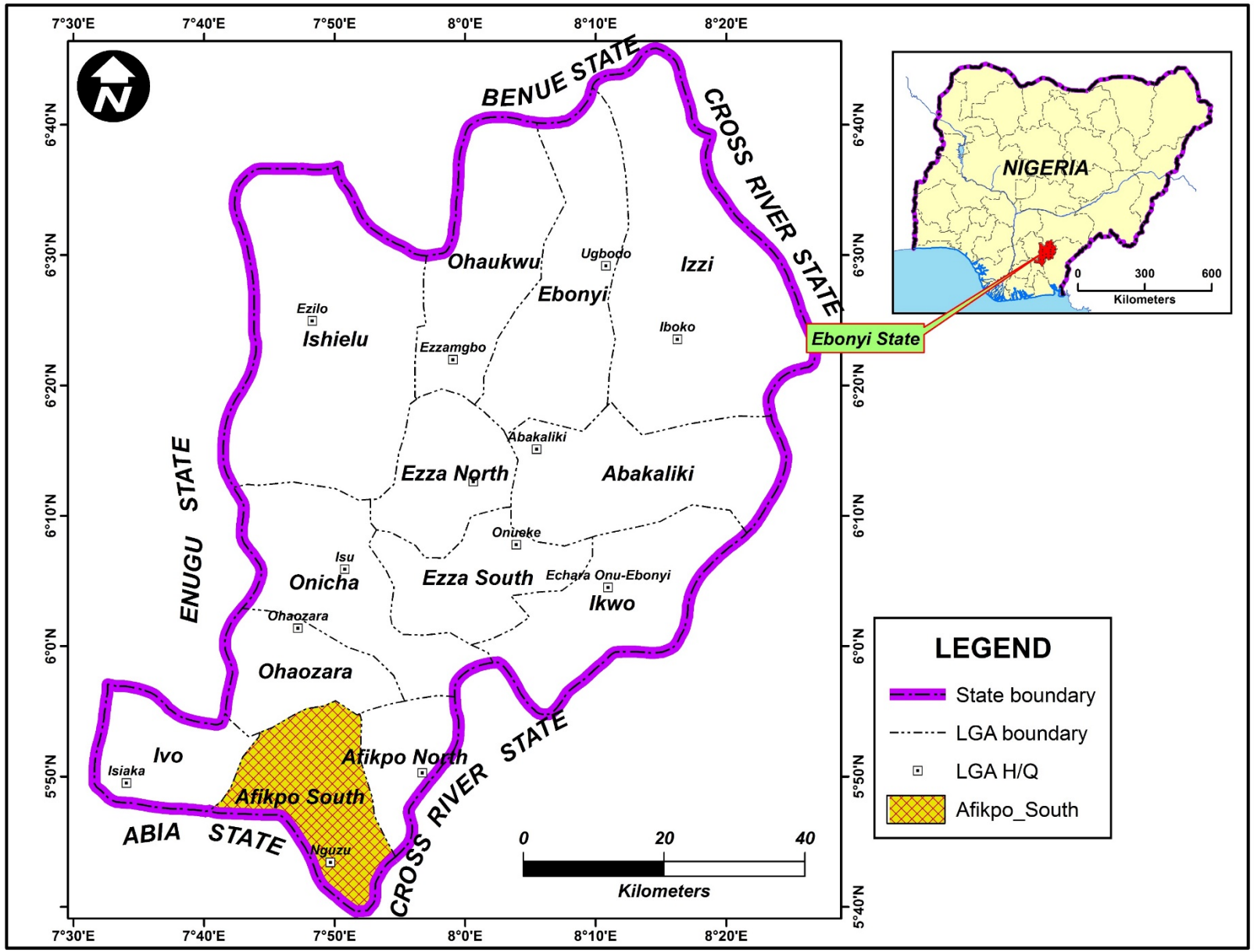
$H0_3$: There is no significant difference in the technical efficiency of farmers in households with malaria and without malaria.

Methodology

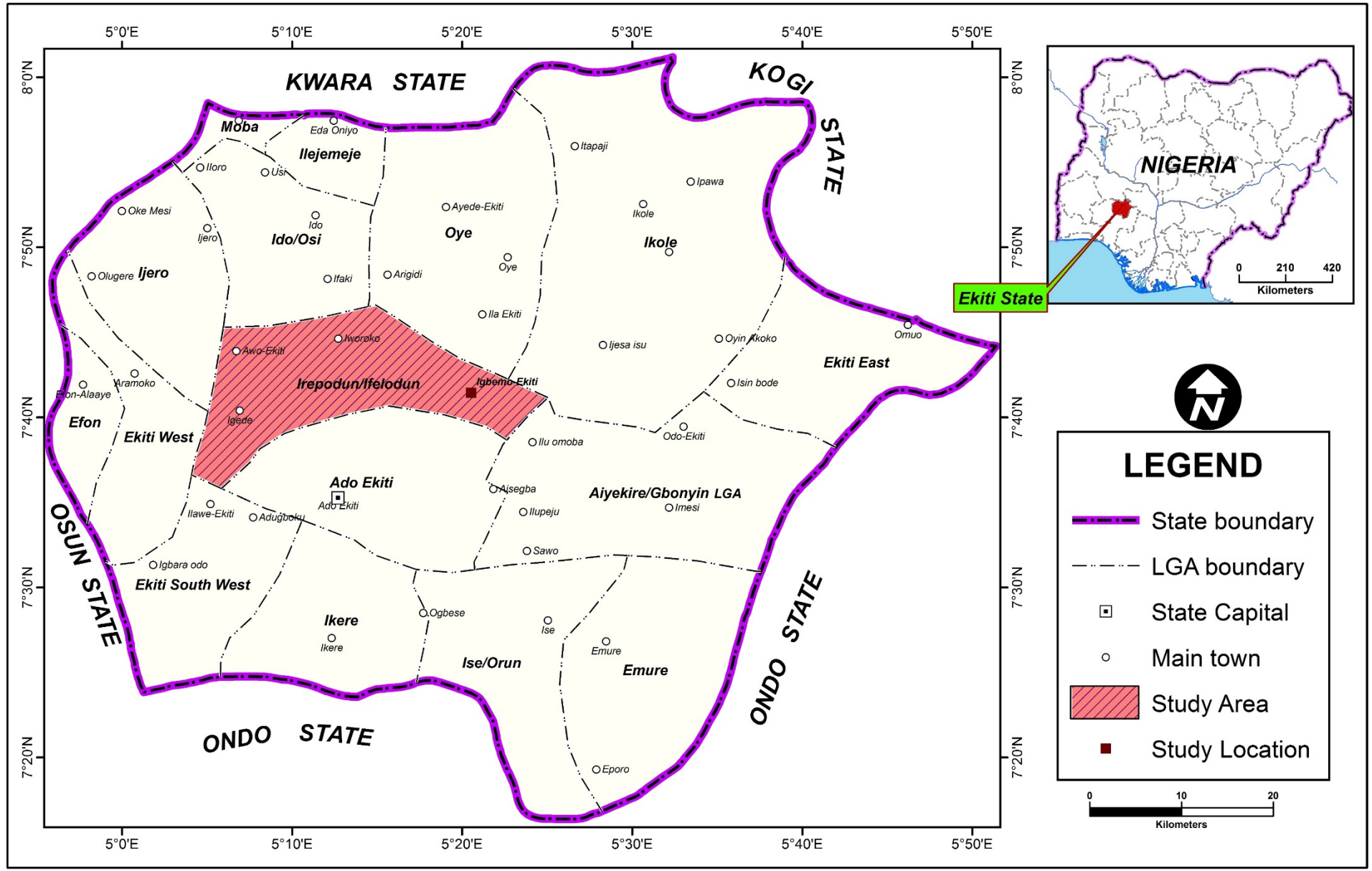


Note: P = Purposive R = Random Subscript = stage

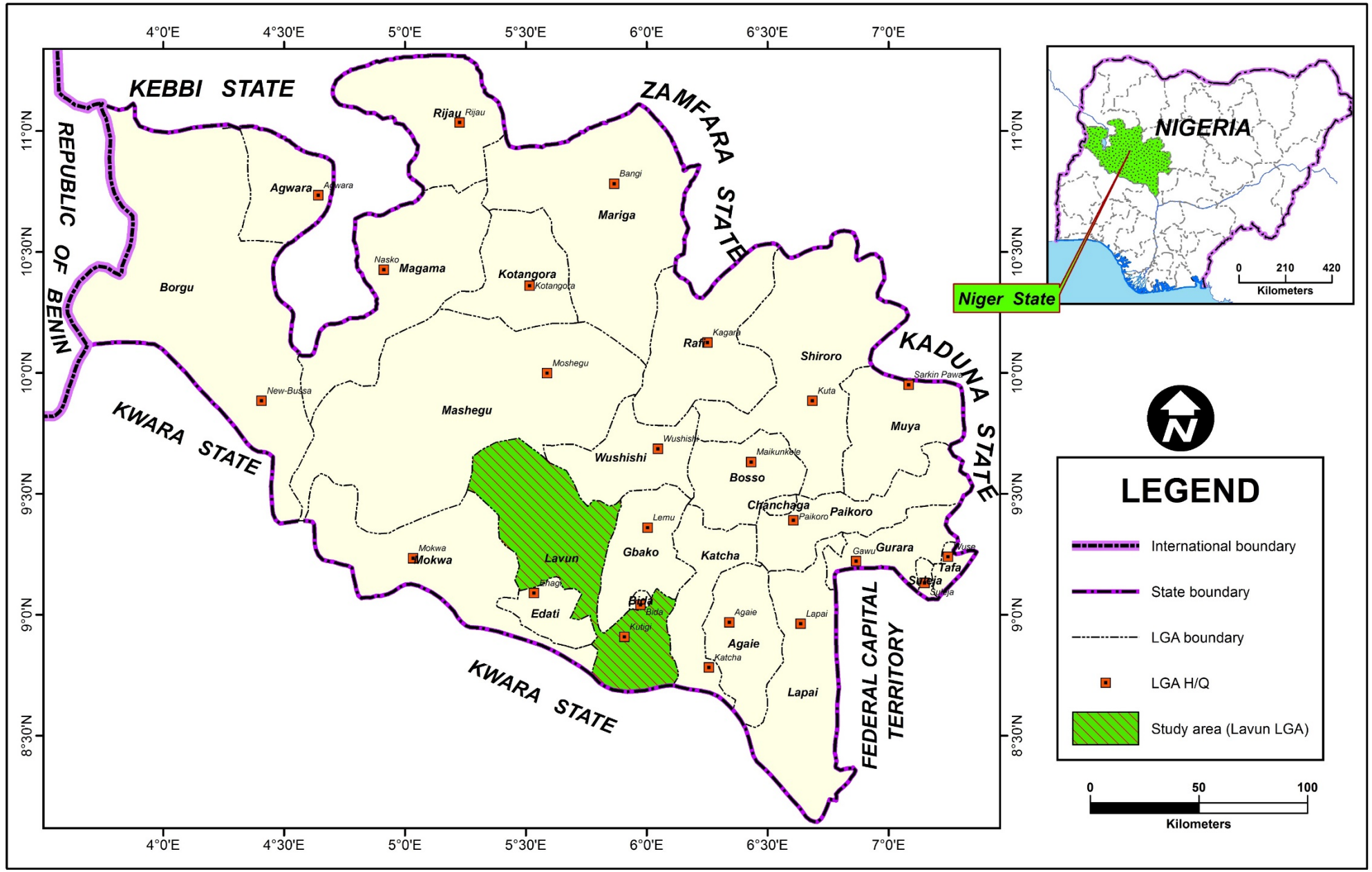
Map of Nigeria showing the three states



Map of Ebonyi State showing Afikpo South LGA



Map of Ekiti State showing Ifelodun/Irepodun LGA



Map of Niger State showing Lavun LGA

Analytical Tools Used

Socio-economic variables description: frequency counts, percentages, histogram, mean, standard deviation, and variance were employed

Objective 1: Tobit model

Objective 2: Multinomial Logit Model

Objective 3: Cost of illness method

Objective 4: Stochastic Frontier Production Function

Objective 5: Stochastic Frontier Production Function

RESULTS

Table 1: Result of Tobit regression About Malaria Incidence in the Study Area

Index		Pooled			
		Coeff.	Stand. Error	P> | Z |	Marginal Effect
Constant		0.1292	0.108	0.234	
Household size	(X_1)	-0.0277	0.005	0.000***	-0.028
Age	(X_2)	-0.0012	0.001	0.389	-0.001
Gender	(X_3)	-0.0592	0.459	0.198	-0.060
Education	(X_4)	-0.0151	0.006	0.012**	-0.015
Annual income	(X_5)	-8.7E-07	3.8E-07	0.022**	-8.75E-07
Clinic distance	(X_6)	-0.0057	0.004	0.116	-.0.006
Treatment cost	(X_7)	0.0002	0.000	0.000***	0.0003
Farm distance	(X_8)	-0.0291	0.009	0.003***	-0.029
Malaria perception	(X_9)	0.0514	0.039	0.192	0.051
Marital status	(X_{10})	0.1411	0.062	0.024**	0.141
Sigma		0.3227	0.0182		

Number of observn.	= 570	LR chi2 (10)	= 300.15
Prob > chi2	= 0.0000	Log likelihood	= -201.08673
Pseudo R2	= 0.4274		

Source: Computed Survey data, 2015.

Significance level: *** p<0.01; ** p<0.05

Table 2:Result of Tobit regression About Malaria Incidence in the Study Area

Index		Ebonyi State Coeff.	Stand. Error	P> | Z |	Marginal Effect	Ekiti State Coeff.	Stand. Error	P> | Z |	Marginal Effect	Niger State Coeff.	Stand. Error	P> | Z |	Marginal Effect
Constant		-0.4092	0.169	0.001		0.5458	0.156	0.001		0.5891	0.2819	0.008	
Household size	(X_1)	-0.0050	0.010	0.622	-0.005	-0.0328	0.013	0.014**	-0.033	0.0281	0.0101	0.006***	0.028
Age	(X_2)	0.0036	0.003	0.170	0.004	0.0002	0.002	0.890	0.0002	-0.0082	0.0031	0.925	-0.008
Gender	(X_3)	-0.2787	0.055	0.615	-0.028	-0.0635	0.056	0.257	-0.064	-0.018	0.1944	0.520	-0.018
Education	(X_4)	0.1496	0.104	0.155	0.015	-0.0538	0.008	0.000***	-0.054	-0.009	0.0144	0.309	-0.009
Annual income	X_5)	-6.5E-1	5.3E-07	0.223	-6..5E-07	-1.13E-06	6.E-07	0.065*	-1.13E-06	-8.33E-07	8.17E-07	0.794	-8.33E-07
Clinic distance	(X_6)	-0.0304	0.009	0.001***	-.0.030	0.0008	0.005	0.868	0.0008	0.0016	0.0061	0.000***	0.001
Treatment cost	(X_7)	0.0003	0.000	0.000***	0.0003	0.0001	0.000	0.000***	0.0001	0.0003	0.0003	0.058**	0.0002
Farm distance	(X_8)	-0.0394	0.017	0.023**	-0.039	-0.0141	0.009	0.116	-0.0141	-0.0688	0.0360	0.034**	-0.069
Malaria perception	(X_9)	0.0119	0.053	0.823	0.012	0.1997	0.045	0.000***	0.1996	-0.1992	0.0932	0.418	-0.1992
Number of observ.	=	177				Number of observ.	=	198		Number of observ.	=	195	
LR chi2 (10)	=	145.07				LR chi2 (10)	=	192.99		LR chi2 (10)	=	104.04	
Prob > chi2	=	0.0000				Prob > chi2	=	0.0000		Prob > chi2	=	0.0000	
Log likelihood	=	-24.8669				Log likelihood	=	-19.870616		Log likelihood	=	-81.997239	
Pseudo R2	=	0.7447				Pseudo R2	=	0.8292		Pseudo R2	=	0.3882	

Table 3: Paired Samples t-Test of Non-malarious and Malarious Households Educational Level

		Paired Differences								
					95% Confidence Interval of the Difference					
		Mean	Std. Deviatn.	Std. Error Mean	Lower	Upper	t	df	Sig. (2-tailed)	Decision
Pair 1	nonma - malar	1.5411	4.8818	0.3393	0.8721	2.2100	4.542	206	0.000	Reject
	Non-malarious	5.6710	3.9214							
	Malarious	4.1300	3.5700							

Source: Computed from survey data, 2015.

Table 4: Result of MNL Regression About Choice of Malaria Treatment Provider (Pooled Data)

1	Coeff.	P> |Z|	Marginal Effect	2.	Coeff.	P> |Z|	Marginal Effect	3.	Coeff.	P> |Z|	Marginal Effect
Cons	-5.12533	0.000			-6.68738	0.000			-0.84176	0.322	
(X_1)	-0.18882	0.037**	-0.0192		-0.10174	0.447	-0.0068		-0.07363	0.243	-0.0092
(X_3)	0.738493	0.220	0.0029		-0.24791	0.750	0.0551		1.112328	0.020**	-0.0141
(X_4)	0.282202	0.000***	0.0031		0.284535	0.002***	-2.6E-05		0.275422	0.000***	0.0022
(X_5)	6.39E-06	0.153	4.32E-08		1.27E-05	0.007***	-3.55E-07		4.25E-06	0.238	1.45E-07
(X_6)	-0.15822	0.001***	-0.0072		-0.15066	0.019**	-0.0011		-0.11213	0.000***	-0.0041
(X_7)	0.014277	0.000***	0.0003		0.0179	0.000***	-0.0002		0.011505	0.000***	0.0003
(X_8)	2.710677	0.000***	0.1509		3.734904	0.000***	-0.0433		1.285909	0.000***	0.0519
(X_{11})	0.006846	0.881	0.0366		-0.21342	0.007***	0.0163		-0.21813	0.000***	0.0159
(X_{12})	0.682405	0.031**	0.1441		-0.85763	0.099*	0.1015		0.03237	0.007***	0.0523

Number of observation	= 570	Log likelihood	= -329.33
Pseudo R2	= 0.5584	Prob > chi2	= 0.0000
LR chi2 (27)	= 832.81		

Source: Computed Survey data, 2015.

Significance level: ***; p <0.01; ** p <0.05; * p <0.10

Table 5: Elements of Cost

Cost items	Ebonyi State		Ekiti State		Niger State		Pooled	
	Total (₦)	Mean	Total (₦)	Mean	Total (₦)	Mean	Total (₦)	Mean
Drugs (f_{dh})	70,416	572.50	89,090	690.62	101,020	748.30	260,526	673.20
Consultation (f_{mc})	42,250	343.50	39,950	309.69	32,106	237.82	114,306	295.36
Travelling (f_{tc})	13,260	107.80	20,760	160.93	53,150	393.70	87,170	225.25
Subsistence (f_{sc})	55,430	450.65	62,190	482.09	47,038	348.43	164,658	425.47
Financial cost of malaria	**181,356**	**1474.44**	**211,990**	**1,643.33**	**233,314**	**1,728.25**	**626,660**	**1,619.28**
Days of sickness	137	1.11	207.3	1.61	261.3	1.94	605.6	1.56
Days of care	109	0.89	145.1	1.12	190.8	1.41	444.9	
Sick person's wage rate	82,241	668.63	124,370	964.11	156,790	1161.41	363,40	
Caretaker's wage rate	65,792	534.89	87,059	674.88	114,457	847.83	267,30	
Time cost of malaria	**148,034**	**1,203.53**	**211,430**	**1,638.99**	**271,247**	**2,009.24**	**630,71**	
Financial cost of malaria	181,356	737.22	211,990	821.67	233,314	864.13	626,66	
Time cost of malaria	148,034	1,203.53	211,430	1,638.99	271,247	2,009.24	630,71	
Economic cost of malaria	**386,746**	**1,940.75**	**423,420**	**2,460.66**	**504,561**	**2,873.50**	**1,257,**	
% of Annual Income	9.31		7.80		11.01		8.93	

Source: Computed Survey data, 2015.

About 3.5 tonnes of rice was lost by the farmers

Table 6: MLE for Stochastic Frontier and Inefficiency Model Result For Malarious and Non-Malarious Households

	Ebonyi State				Ekiti State				Niger State				Pooled			
	Mal. House		Non-mal. House.		Mal. House.		Non-mal. house		Mal. House.		Non-mal. House.		Mal. House.		Non-mal. House.	
	βs	t-ratio	βs	t-ratio	βs	t-ratio	βs	t-ratio	βs	t-ratio	βs	t-ratio	βs	t-ratio	βs	t-ratio
Constant	0.648***	6.205	3.044***	19.298	3.083**	2.045	6.611***	370.99	6.098***	5.439	3.899***	11.963	2.891***	6.085	4.819***	18.453
Farm size (ha)	0.085***	4.754	0.120**	2.552	-0.118	-0.548	0.504***	6.669	0.404	1.797	0.127*	1.303	0.038	0.377	0.259***	3.715
Family Labour (Manday)	-0.003	-0.005	-0.011	-0.291	0.658*	1.587	-0.100***	-2.682	-0.061	-0.827	0.025	0.726	0.031	0.533	-0.033	-0.657
Hired Labour (Mandays)	-0.097	-0.775	0.009	0.204	-0.682	-1.347	0.002	0.024	-0.153*	-1.899	0.013	0.471	-0.052	-0.624	0.073	1.497
Seed (Kg)	1.011***	40.656	0.909***	33.596	0.640**	5.568	0.497***	7.454	0.433**	2.138	0.859***	10.975	0.846***	14.65	0.768***	15.742
Herbicide (Ltr)	-0.037	-1.581	0.007	0.287	0.024	0.222	-0.041	-0.187	0.362***	2.699	0.142***	2.482	0.100*	1.520	0.006	0.141
Fertiliser (Kg)	0.019**	2.468	0.039***	2.871	-0.027	-0.378	-0.037	-0.416	0.044**	2.375	0.023*	1.905	0.039*	1.683	0.018	1.029
Returns to Scale	0.981		0.832		0.495		0.182		1.029		0.908		1.002		0.429	
Constant	-2.268	-0.594	0.374	0.706	-0.399	-0.299	-2.745***	-5.197	1.210***	3.609	0.266	0.749	1.165*	1.237	-0.118	-0.155
Household size (No)	-0.092*	-1.562	0.045*	1.693	-0.020	-0.231	-0.105***	-4.011	0.008	0.722	0.014	0.777	-0.061*	-1.158	-0.162*	-1.750
Age (Years)	-0.013*	-1.635	-0.002	-0.294	-0.019	-0.744	0.013*	1.867	-0.001	-0.062	-0.003	-0.368	0.015*	1.074	0.031**	2.048
Education (Years)	0.136	1.162	-0.153***	-3.110	-0.064	0.596	-0.132*	-1.521	-0.004	-0.184	-0.049	-2.008	0.092*	1.451	-0.048*	-1.695
Annual Income (₦)	0.000*	-1.807	0.001***	-2.965	0.001	-0.243	0.000	0.528	0.000*	-1.086	0.000*	1.916	0.000	-0.420	0.000***	-2.756
Treatment cost (₦)	0.001**	2.419	-0.232	-1.399	0.007*	1.471	-0.001	-0.470	0.001*	-1.865	-0.272**	-2.439	0.001**	1.951	0.000	0.282
Sigma squared (δ^2)	0.525***	2.812	0.081***	2.731	0.426*	1.781	0.223	1.399	0.085***	5.505	0.032	3.203	1.028***	2.923	0.433***	5.375
gamma (γ)	0.999***	752834	0.753***	5.969	0.273	0.604	0.209*	1.648	0.999***	8766	0.185	0.539	0.925***	26.179	0.364***	2.849
Log Likelihood		-11.8033		43.374		-65.087		-70.599		-13.201		-40.927		-188.23		-297.93
Likelihood Ratio test		58.5002		48.675		8.1001		38.936		11.974		19.534		47.291		16.94

Source: Computed Survey data, 2015.

Significance level: ***; p <0.01; ** p <0.05; * p <0.10

Table 7: Efficiency score For Malarious and Non-Malarious Households

Efficiency Score	Ebonyi State Households				Ekiti State Households				Niger State Households				Pooled			
	Non malrious		Malarious		Nonmalarious		Malarious		Nonmalarious		Malarious		Nonmalarious		Malarious 49	
	Freq.	(%)	Freq.	(%)	Freq.	(%)	Freq.	(%)	Freq.	(%)	Freq.	(%)	Freq.	(%)	Freq.	(%)
0.0001-0.2999	-	-	3	5.1	2	1.6	1	1.4	-	-	20	27.0	1	0.3	44	21.3
0.3000-0.4999	1	0.8	13	22.5	2	1.6	-	–	-	-	41	55.4	2	0.6	41	19.8
0.5000-0.6999	6	5.1	10	16.9	2	1.6	3	4.1	2	1.7	9	12.2	26	7.2	50	24.2
0.7000-0.8999	20	16.9	17	28.8	25	20.2	37	50.0	21	17.4	3	4.1	226	62.3	70	33.8
0.9000-1.0000	91	77.1	16	27.1	93	75.0	33	44.6	98	81.0	1	1.4	108	29.8	2	1.0
Total	118	100	59	100	124	100	74	100	121	100	74	100	363	100	207	100
Mean	0.9049		0.8616		0.8692		0.8616		0.9446		0.4014		0.8402		0.5413	
Std. Dev.	0.0958		0.1101		0.1297		0.1101		0.0620		0.1431		0.0950		0.2333	
Minimum	0.3182		0.1526		0.1307		0.2373		0.6236		0.1907		0.2385		0.1306	
Maximum	0.9775		0.9965		0.9995		0.9893		0.9914		0.9888		0.9540		0.9195	

Source: Computed Survey data, 2015.

Table 8: Paired Samples t-Test of Non-malarious and Malarious Households Seed Quantity Used

		Paired Differences								
					95% Confidence Interval of the Difference					
		Mean	Std. Deviatn.	Std. Error Mean	Lower	Upper	t	df	Sig. (2-tailed)	Decision
Pair 1	nonma - malar	57.5032	0.2446	0.0169	0.2326	0.2996	15.650	206	0.000	Reject
	Seed used by nonmalarious	145.450	93.452							
	Seed used by malarious	87.9469	67.470							

Source: Computed from survey data, 2015.

Table 9: Paired Samples t-Test of Non-malarious and Malarious Households Technical Efficiency

		Paired Differences								
					95% Confidence Interval of the Difference					
		Mean	Std. Deviatn.	Std. Error Mean	Lower	Upper	t	df	Sig. (2-tailed)	Decision
Pair 1	nonma - malar	0.26604	0.24457	0.0169	0.2325	0.2996	15.650	206	0.000	Reject
	Non-malarious	0.8073	0.0926							
	Malarious	0.5413	0.2332							

Source: Computed from survey data, 2015.

Conclusion

- Variables such as years of education; household size, marital status, income (Socio-economic variable), treatment cost, treatment time, malaria perception (Health variable) and farm distance, farm size (Agriculture variable) were the prominent significant variables in the study that influenced malaria incidence and choice of malaria caregiver.
- Averagely, about 9% of their annual income was spent on malaria and each lost about 6.1kg of paddy rice.
- Malarious households were found to be lower in technical efficiency than the non-malarious households.
- The study evidently linked malaria to poor technical efficiency of rice farmers in the study area, thereby establishing the need for policy coherence in agriculture and health sectors of the economy.

Recommendation

Efforts should be made by the government and Non-Governmental Organisations (NGOs) to ensure that malaria drugs are available and at affordable prices due to high treatment cost.

Rice farmers should be enlightened by the Extension Workers on the need to live further away from their irrigated farm plots to avoid frequent attacks by malaria since irrigation contributed to incidence of malaria in the study area.

Policies to address rice output increase should incorporate health policies in rural Nigeria because malarious households were found to be lower in technical efficiency than the non-malarious households

Thank you