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Technical efficiency of the riparian beekeepers of the complex of protected areas Pô-Nazinga-Sissili, BURKINA FASO

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OUTLINE

1. INTRODUCTION
2. METHODOLOGY
3. RESULTS AND DISCUSSION
4. CONCLUSION

1. INTRODUCTION (1/4)

- Burkina Faso has an important network of ecological and protected areas, including Pô-Nazinga-Sissili (PONASI) complex.
- Some components of these protected forests do not have a valid legal status in terms of the regulations on protected areas. Then, they are subject to various forms of pressure from local populations.
- It is the case of *Elephant corridor* called *Corridor No. 1* of the PONASI complex.

1. INTRODUCTION (2/4)

- To ensure real protection of this corridor, it is necessary to boost the sources of income of the local populations.
- Beekeeping is one of the main activities practiced by these populations. However, beekeepers have disparate yields ranging from 6 to 12 L/hive (NATUDEV, 2017).
- These yields are much lower to what are observed in other countries such as Madagascar with 50L/hive (Lagarde and Rakotovelo, 2004).

yield problem for these beekeepers.

1. INTRODUCTION (3/4)

- **Research question**: How to increase the production of honey in these villages, without the beekeepers bearing additional production costs?

  ➢What is the level of technical efficiency of these beekeepers?

  ➢What are the main determinants of this technical efficiency?

- **Main objective**: to analyse the technical efficiency of the beekeepers in the periphery of corridor n°1 of the PONASI complex.

1. INTRODUCTION (4/4)

Objectives

SO 1: to determine the level of technical efficiency of beekeepers

SO 2:to identify the main determinants of this efficiency

Hypotheses

H1: beekeepers are not technically efficient

H2: proximity of the hives to protected forests explains significantly the efficiency of beekeepers

2. METHODOLOGY (1/3)

- **The theoretical model :** Stochastic frontier analysis model developed by Aigner et al. (1977) and, Meeusen and Broeck (1977).

➢Production fonction **:**

$$y_i = f(x_i, \beta) e^{v_i - u_i} \quad (1)$$

➢Technical inefficiency model **:**

$$u_i = z_i \alpha + w_i \quad (2)$$

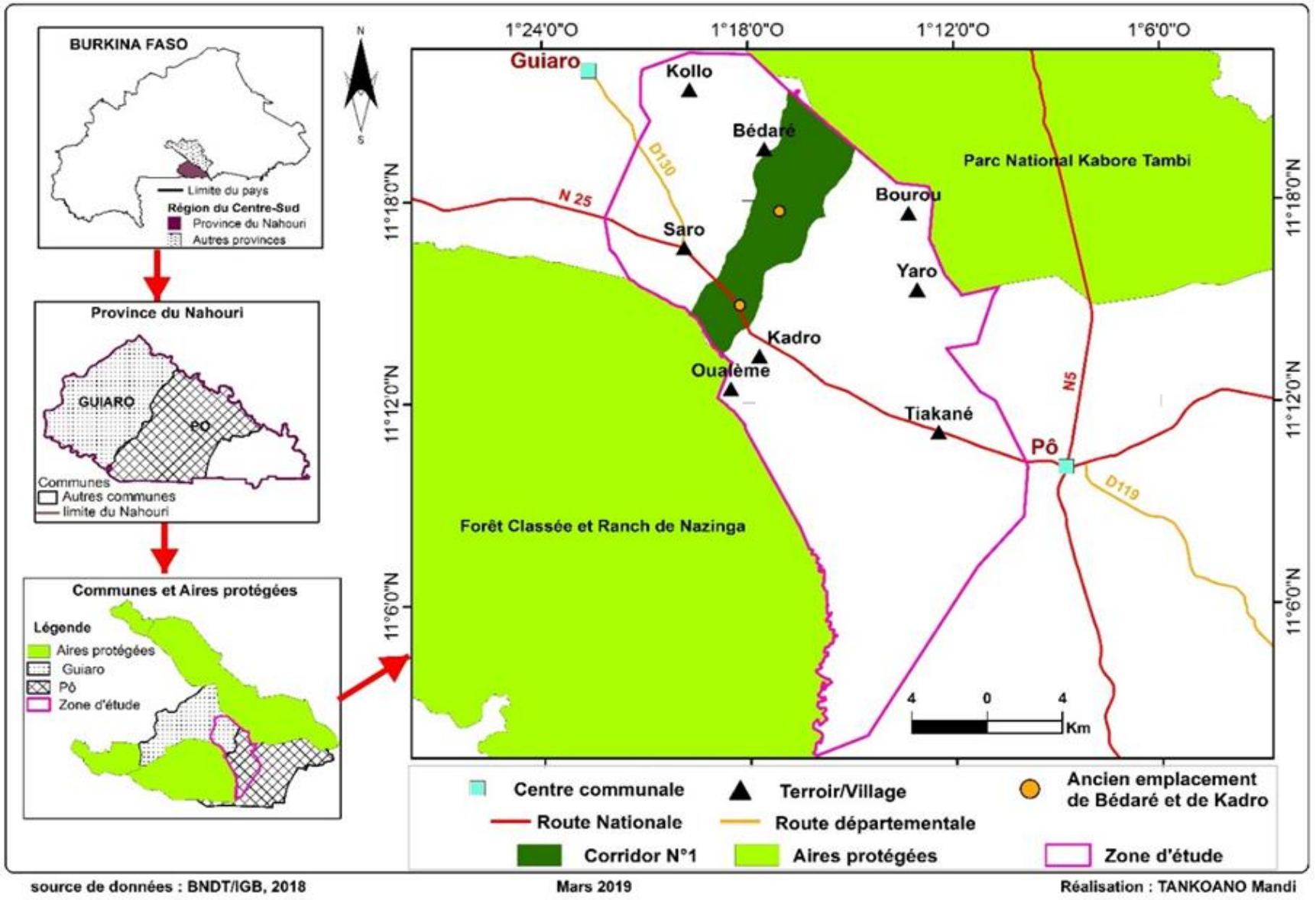
- **Source of data**

➢After a census : 52 beekeepers in the villages;

➢Survey period : July and August 2018;

➢Structured questionnaire.

2. METHODOLOGY (2/3)



2. METHODOLOGY (3/3)

- **The empirical model :** two components

➢The empirical production function: a Cobb-Douglas function after some preliminary tests.

$$\boldsymbol{ln\,(Honey)_i = \beta_0 + \beta_1\, ln(Hives)_i + \beta_2\, ln\,(Labour)_i + v_i - u_i} \quad (3)$$

➢The empirical model of technical inefficiency:

$$\boldsymbol{u_i = \alpha_0 + \alpha_1(Education)_i + \alpha_2(Training)_i + \alpha_3(Group)_i + \alpha_4(Suit)_i + \alpha_5\,(Forest) + w_i} \quad (4)$$

Where **ln** represents the Napierian logarithm.

- **Estimation:** Maximum likelihood method (Battese and Coelli, 1995).

3. RESULTS AND DISCUSSION (1/2)

- **Statistical findings on quantitative variables**

Variable	Obs.	Mean	Standard errors	Minimum	Maximum
Honey	52	36.45	37.58	5.00	270.00
Hives	52	4.69	2.70	1.00	14.00
Labour	52	50.93	45.91	5.92	261.75
Training	52	2.83	2.51	0.00	10.00

- **Statistical findings on qualitative variables**

Statistics	Education=1	Group=1	Suit=1	Forest=1
Frequency	40	40	31	20
Percentage	76.92	76.92	59.62	38.46

3. RESULTS AND DISCUSSION (2/2)

- **Econometric estimation of the stochastic Cobb-Douglas production**

Notice that (i) standard errors are in parentheses and; (ii) *** p<0.01, ** p<0.05, * p<0.1

VARIABLES	frontier	usigmas	vsigmas
Education		1.945	
		(1.195)	
Training		-1.281***	
		(0.480)	
Group		2.098*	
		(1.186)	
Suit		-1.975**	
		(0.914)	
Forest		-1.907**	
		(0.958)	
ln (Hives)	1.238***		
	(0.221)		
ln (Labour)	-0.752***		
	(0.173)		
Constant	0.051	-1.004	-2.106***
	(0.083)	(1.249)	(0.261)
Number of observations	52	Wald chi2(2)	33.08***
Log likelihood	-29.426	Gamma (γ)	0.751***
Average efficiency score	0.78		

4. CONCLUSION (1/1)

- **Main findings :**

➢ Beekeepers can increase their production levels by 22%;

➢ Proximity of the hives to protected forests increases technical efficiency and honey produced.

H1 and H2 cannot be rejected.

- **Some economic policy implications :**

➢ Encourage beekeepers to:

❖ place their hives near protected forests;

❖ use one's own beekeeping suit;

❖ be trained annually in good beekeeping practices;

➢ **Policy makers have to find a valid legal status for the real protection of corridor n°1 of the PONASI complex.**

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REFERENCES

- Aigner, D., Lovell, C. A. K., & Schmidt, P. (1977). Formulation and estimation of stochastic frontier production function models. *Journal of Econometrics*, *6*(1), 21-37.
- Battese, G. E., & Coelli, T. J. (1995). A model for technical inefficiency effects in a stochastic frontier production function for panel data. *Empirical Economics*, *20*(2), 325-332.
- Lagarde, K., Rakotovelo, N., Andrianarivony, R., & Razafiarison, T. (2004). *Etude de la filière apiculture en vue du développement de l'exportation (Study of the beekeeping sector for export development)*. Programme de développement rural Suisse - Madagascar.
- Meeusen, W., & van den Broeck, J. (1977). Efficiency Estimation from Cobb-Douglas Production Functions with Composed Error. *International Economic Review*, *18*(2), 435-444.
- NATUDEV. (2017). *Diagnostic sur les productions, transformations et commercialisations du beurre de Karité et du Miel dans dix-neuf (19) villages administratifs de la commune de Guiaro (Diagnosis on the production, processing and marketing of shea butter and honey in 19 administrative villages of the Guiaro commune)*. NATUDEV, Burkina Faso.
- Tankoano, M. (2019). *Caractérisation biophysique des terroirs autour du corridor n°1 de PONASI*. Université Joseph Ki-Zerbo.

THANK

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