Socio-economic factors affecting the adoption of Ecological Sanitation approach in Benin

By Hector KPANGON, Msc
Agricultural Economist
Country Program officer
Email: hectorkpangon@wsafrica.org
1- Introduction

2- Methodology

3- Results and discussions

4- Conclusion and implications
The lack of sanitation is one of the major challenges in Benin: only 1/3 of households have an access to adequate sanitation facilities. Open defecation is the common practices in rural areas (more than 60%).

**Consequences:** Diarrhea of children under five Years is the 3rd cause of consultation and the 4th cause of hospitalization in Benin.

The 2nd most important challenge is the degradation of soil fertility which contributes to low yields and poor food security.
Introduction

• To tackle these problems in Benin WSA has introduced EcoSan in many communities since 2002

• Since 2002, several studies took place, but the factors that affect the adoption of this approach are not known.

  ▪ This study aims to highlight the socio-economic factors that affect the adoption of ECOSAN approach
Methodologies
(Choice of study areas)

Study areas

- Criteria of study areas choice: where WSA and his partners are promoting Ecosan

- Southern-west of Benin in two administratives regions (Oueme and Couffo)

- Data are collected between 2009 and 2010
• Fifteen (15) villages are randomly selected from a list where WSA intervenes.

• The household sampling is a stratified random type.

• The two stratification criteria are: adopting and not adopting of the ECOSAN approach.

• In total, 272 households are selected
Methodologies

(A model for analyzing adoption decision)

- The decision to adopt is modeled following Saha and al. (1994) and Dimara and Skuras (2003) who stated that farmers can only adopt a technology if they are aware of it.

- For empirical analyzing related to factors influencing the adoption of the ECOSAN approach, the Probit model is used.

- The probability that a farmer j adopts the approach is:

\[ P_j = P(Y=1) = F(I_j) = \int_{-\infty}^{\infty} \exp\left(-\frac{t^2}{2}\right) dt \]

\[ I_j = \sum_{n=1}^{N} \alpha_n X_{nj} \]

\( I_j \) is a linear combination of Independents variables \( X \) and \( \alpha \) is coefficients to be estimated and whose expression is:

\( X_{nj} \) represents the \( n^{th} \) explanatory variable and \( \alpha_n \) the parameter to be estimated which corresponds to the independent variable \( X_{nj} \).
Methodologies
(Steps in analysis)

Step 1
- Probit model was estimated to determine the factors that influence the probability of being aware of ECOSAN approach.

Step 2
- Using the sub-sample of farmers aware of ECOSAN approach, the determinants of adoption decision are identified by the method of Heckman (1979). To reduce selection bias, Heckman (1979) suggests a two-stage estimation.
- Based on the model of Castaño and al. (2005) that links the adoption of new technologies to institutional, social, economic and physical factors we have chosen the suspects variables which are included in the model.

Step 3
- Using the sub-sample of farmers aware of the ECOSAN approach, the effect of the source of information on the decision to adopt the ECOSAN approach is measured. The LR test allows measuring the difference between two subgroups (group informed by extension agents and the other informed by their colleagues or members of local health committees) of a sample.
### Results and discussions

(Perceptions of respondents about ECOSAN approach)

Table no.3: Perceptions of respondents about ECOSAN approach

<table>
<thead>
<tr>
<th>Perceptions about:</th>
<th>RESPONSES</th>
</tr>
</thead>
<tbody>
<tr>
<td>Approval of crops by consumers if they know that fertilization are made with safe excreta</td>
<td>YES 163 (68%)  NO 78 (32%) Without opinion 0%</td>
</tr>
</tbody>
</table>
Results and discussions
(Factors affecting the probability of awareness of ECOSAN approach)

Table n°4: Results of estimating of information model

<table>
<thead>
<tr>
<th>Variables</th>
<th>Coefficients</th>
<th>Std. Err.</th>
<th>P&gt; ızı</th>
</tr>
</thead>
<tbody>
<tr>
<td>Education level</td>
<td>0,147766²ns</td>
<td>0,281065</td>
<td>0,599</td>
</tr>
<tr>
<td>Contact with extension agents and/or local health committees</td>
<td>0,9602196**</td>
<td>0,4210436</td>
<td>0,023</td>
</tr>
<tr>
<td>Membership of a cooperative</td>
<td>0,3946458ns</td>
<td>0,2327371</td>
<td>0,090</td>
</tr>
<tr>
<td>Severity of soil depletion</td>
<td>0,1875323ns</td>
<td>0,2461868</td>
<td>0,446</td>
</tr>
<tr>
<td>constant</td>
<td>0,8526357***</td>
<td>0,2432933</td>
<td>0,000</td>
</tr>
</tbody>
</table>

Number of observations = 268

Wald chi²(4) = 10.22
Prob > chi² = 0.0369**

% of correct prediction = 89.93%

Source: Field inquiry, 2010 ns= no significance **P<0.05 ***P<0.01

Log pseudolikelihood = -82.239706
Pseudo R² = 0.0608
## Results and discussions

*(Factors affecting adoption decision of ECOSAN approach)*

Table n°5: Estimation results of adoption model of ECOSAN approach

| Variables                                      | Coefficients       | Std. Err.     | P>|z| |
|------------------------------------------------|--------------------|---------------|-----|
| Credit access                                 | 0.567782<sub>ns</sub> | 0.304201      | 0.062 |
| Membership of a cooperative                   | 0.2019257<sub>ns</sub> | 0.23653       | 0.393 |
| Perception of consumer reaction               | 0.0363033<sub>ns</sub> | 0.220313      | 0.869 |
| **Perception of initial investment cost**     | -1.011678<sub>***</sub> | 0.274116      | 0.000 |
| **Perception of ease of ECOSAN**              | 0.7875392<sub>***</sub> | 0.230135      | 0.001 |
| **Perception of ECOSAN effectiveness**        | 0.4281362<sub>**</sub> | 0.216388      | 0.048 |
| Age                                            | 0.8834762<sub>***</sub> | 0.337173      | 0.009 |
| Education level                               | 0.7952091<sub>***</sub> | 0.262171      | 0.002 |
| riskc                                          | 0.3535351<sub>ns</sub> | 0.266962      | 0.185 |
| Mills                                          | 2.219627<sub>ns</sub> | 1.26347       | 0.079 |
| Cons                                           | -4.038061<sub>***</sub> | 1.35776       | 0.003 |

Number of observations = 241

Wald chi2(10) = 61.50

Prob > chi2 = 0.0000<sub>***</sub>

Log pseudolikelihood = -104.21752

Pseudo R2 = 0.2909

% of correct prediction 79, 25%

Source: Field Inquiry, 2010  ns= no significant  **P<0,05  ***P<0,01
## Results and discussions

(Analysis of effect of different sources of information)

### ADOPTION EQUATION

| Variables     | Coefficients | Std. Err. | P > |z| | Coefficients | Std. Err. | P > |z| |
|---------------|--------------|-----------|-----|---|--------------|-----------|-----|---|---|
| Credit        | 0.178229 ns  | 0.380658  | 0.64|   | 1.970481**   | 0.77965  | 0.011|   |
| Associa       | 2.187073**   | 0.72195   | 0.002|   | -2.33354 ns  | 1.45738  | 0.109|   |
| achapc        | 0.20802 ns   | 0.27743   | 0.453|   | 0.253636 ns  | 0.59806  | 0.671|   |
| Pcostc        | -1.289869*** | 0.327319  | 0.000|   | -0.721618 ns | 0.68019  | 0.289|   |
| teasytc       | 0.641878***  | 0.248573  | 0.010|   | 1.975828**   | 0.85372  | 0.021|   |
| Peffc         | 0.593366**   | 0.287871  | 0.039|   | -0.446249 ns | 0.65417  | 0.495|   |
| lage          | 0.905817 ns  | 0.488198  | 0.064|   | 0.704652 ns  | 0.63909  | 0.270|   |
| neduc         | 1.114174**   | 0.364291  | 0.002|   | 0.234078 ns  | 0.83763  | 0.780|   |
| riskc         | 0.809969 ns  | 0.443549  | 0.068|   | -0.491985 ns | 0.57265  | 0.390|   |
| Mills         | 16.43772**   | 5.272782  | 0.002|   | -47.55004 ns | 33.5715  | 0.157|   |
| Cons          | -8.387833*** | 2.411544  | 0.001|   | -0.408748 ns | 3.33745  | 0.903|   |

Number of observations = 188  
LR chi2(10) = 80.26  
Prob > chi2 = 0.0000  
Log likelihood = -72.603861  
R2 = 0.3560  
Pseudo

Number of observations = 53  
LR chi2(10) = 24.71  
Prob > chi2 = 0.0059  
Log likelihood = -20.509215  
Pseudo R2 = 0.3759

LR chi2(11) = 22.21  
Prob > chi2 = 0.0228

Source: Inquiries, 2010 ns= no significant  **P<0.05  ***P<0.01
Conclusion

• Estimation of Probit models shows that five (5) variables affect the probability of ECOSAN adoption. Also, it shows that it is necessary to model awareness before modelling adoption.

• These variables are: perception of the initial investment cost, perception of ease of utilization of ECOSAN principles and of reuse of safe excreta in agriculture, age, education level and perception of the competitiveness of ECOSAN fertilizers compared to mineral fertilizer.

• The source of information influences the adoption of ECOSAN approach. Households are more convinced by extension agents of WSA and his partners engaged in the extension of the approach.
Implications

- Exposition of farmers to information about Ecosan by contact with extension agents or local health committees is necessary to improve the rate of Ecosan adoption;

- To improve the rate of adoption and sustainable the impact of actions, it is important to make strong the capacities of members of local health committees to convince communities about ECOSAN approach

- Ecosan adoption depends greatly on many perceptions. Therefore, demonstration pilot project must be done to improve the chance of integrating safe excreta in farming fertilization practices
Thank you

La santé, l’égalité et la dignité commencent ici...

wsafrica@wsafrica.org

wsabenin@wsafrica.org

www.wsafrica.org