



# Analysis of determinants of adoption of service-based business of digital agricultural extension technologies: an ex-ante evidence

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## Introduction & Goals

- The rise of digital farming technologies is an opportunity to increase agricultural production and contribute to food security [1].
- Adoption by smallholders' farmers still a subject of discussion considering the constraints link to the access of IT infrastructure, the low e-literacy and the use of IT tools.
- Study proposes a new approach: an indirect adoption framework through a Service Based (SB) business model and its ex-ante evaluation.
- Using a case study of RiceAdvice Application, this study aims to analyse the factors that drive the SB adoption and the most preferred SB.

## Methodology

### Experimental design

Table 1. Experimental design Block1

Attributes	BP1	BP2	BP3	BP4	BP5	No BP
Payment Method	Cash at delivery	Cash at delivery	Cash payment after harvest	Cash payment after harvest	Cash payment after harvest	No personalized advice
Cost of service per hectare (USD)	14.50	19.40	9.70	14.50	19.40	0
Length of partnership	1 season	1 season	More than 2 seasons	More than 2 seasons	More than 2 seasons	Not interested
Credit	No	Yes	No	Yes	No	No
Additional paid services (land preparation, threshing, etc.)	Yes	No	Yes	No	Yes	No
Contract farming	Yes	Yes	Yes	Yes	Yes	No
Agreement on quantity	No	Yes	Yes	Yes	No	No
Agreement on quality	Yes	No	Yes	Yes	No	No

Do not like neither option (Option-out)

Table 2. Experimental design Block2

Attributes	BP6	BP7	BP8	BP9	BP10	No BP
Payment Method	Cash payment after harvest	Cash payment after harvest	Cash payment after harvest	Payment cash after harvest incorporate into rice price	Payment cash after harvest incorporate into rice price	No personalized advice
Cost of service per hectare (USD)	14.50	9.70	9.70	9.70	9.70	0
Length of partnership	1 season	More than 2 seasons	1 season	1 season	1 season	Not interested
Credit	Yes	Yes	No	No	Yes	No
Additional paid services (land preparation, threshing, etc.)	Yes	No	No	Yes	No	No
Contract farming	No	Yes	No	Yes	Yes	No
Agreement on quantity	No	No	No	Yes	No	No
Agreement on quality	No	No	No	No	Yes	No

Do not like neither option (Option-out)

### Data Analysis

The alternative-specific mixed logit estimates the parameter of the mixed logit model by maximum simulated likelihood (MSL) [2];

- Predictor factors (socio-economics variables);
- Prediction probability of the business models

Chi-square automatic interaction detection algorithm (CHAID): determine interaction between attributes of business profiles and the most preferred business profiles.

## References

[1] J.P. Rodríguez, A.I. Montoya-Munoz, C. Rodríguez-Pabon, J. Hoyos, J.C. Corrales, IoT-Agro: A smart farming system to Colombian coffee farms, Comput. Electron. Agric. 190 (2021). <https://doi.org/10.1016/j.compag.2021.106442>.

[2] C.A. Cameron, P.K. Trivedi, Microeconometrics: Methods and Applications, Cambridge, Cambridge University Press, New York, 2005

## Results and discussion

Table 3. Summary statistic of the predicted probability of adoption

Business Models Block 1			Business Models Block 2		
BP	Predicted probability (%)	Standard Deviation	BP	Predicted probability (%)	Standard Deviation
1	26.8	0.131	6	44.7	0.144
2	5.1	0.046	7	16.9	0.082
3	49.4	0.143	8	14.0	0.052
4	4.4	0.046	9	5.3	0.078
5	1.1	0.009	10	1.3	0.019

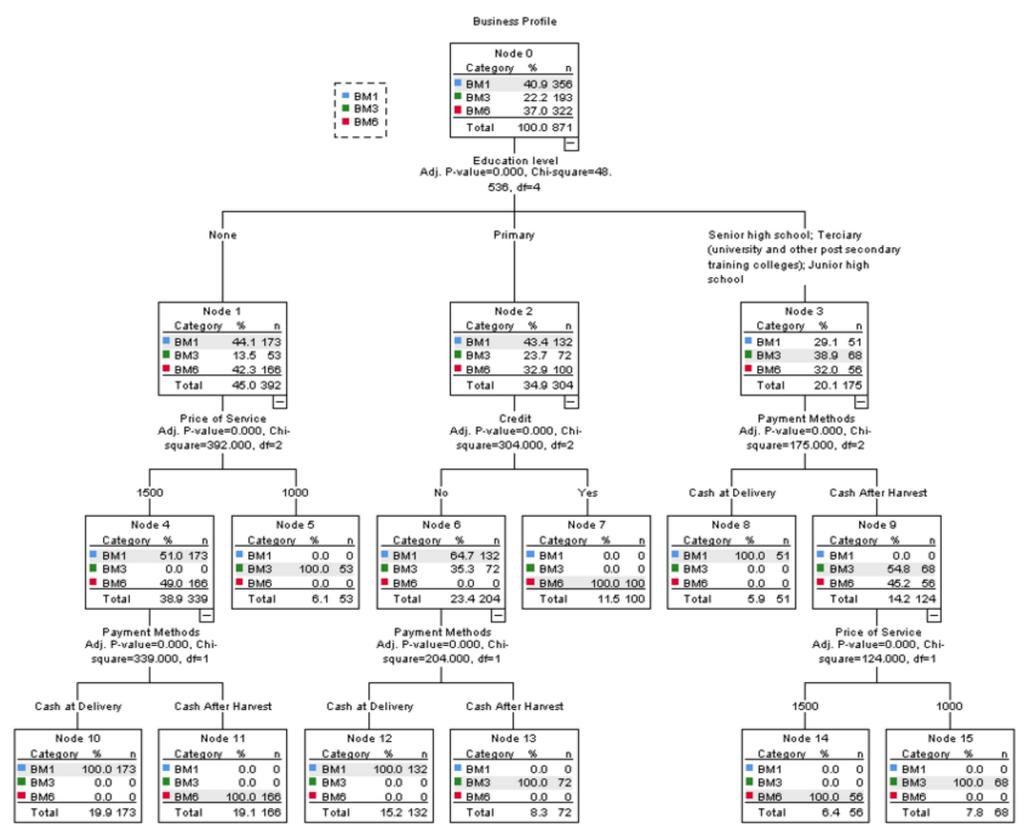


Figure 1. CHAID Diagram tree of the most preferred Business profiles

## Conclusion

- Age, education level, experience in rice production, knowledge of RiceAdvice, contact with the extension agent, membership of the association, size of the rice production, and household income are the socio-economic and institutional parameters that determine rice farmers' choice of a service-based business;
- The service-based businesses with the following characteristics: cash payment after harvest at 9.70 USD/hectare for more than two seasons contract, cash payment after harvest at 14.50 USD/hectare for 1 season contract, and cash payment at delivery for 14.50 USD/hectare for the one-season contract are the most preferred profiles and therefore susceptible to be adopted by rice farmers,
- The optimum business profile should consider education level as the first most important predictor, followed by the price of service, access to credit, and payment options that would interest rice farmers.

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