

Forage technology adoption studies in bovine livestock production systems: a field open to innovation

Karen Enciso, Manuel Díaz, Natalia Triana-Angel, Stefan Burkart
 1 International Center for Tropical Agriculture (CIAT), Tropical Forages Program, Cali, Colombia. CONTACT: s.burkart@cgiar.org

Introduction

- » The forage-based cattle sector requires profound transformations aiming at reducing GHG emissions, mitigating the effects of climate change, supplying the growing demand for animal-source foods and improving the efficient use of resources.
- » Sustainable intensification through improved forages is one of the most promising strategies for increasing productivity and mitigating environmental impacts. However, adoption rates remain low.
- » Different studies have been commissioned to analyze factors affecting adoption through various methodological approaches.
- » Identifying factors influencing adoption, existing technologies and research on the subject is fundamental for designing strategies to effectively boost adoption rates of improved forages.

Objective

Identify the dimensions and methodologies applied in forage adoption studies to assess their possible impact on adoption decision-making processes.

Methodology

- » Exhaustive literature research: 27 studies published between 2000 and 2019 in Scopus and Science Direct databases.
- » Information analysis: frequency count and percentages.

Results

- » Case study regions: East Africa (34%), Latin America (34%), Asia (14%), Europe (17%)
- » Evaluated technologies: improved pastures (56%), crop-livestock-systems (8.6%), pasture management practices (22%), silage (8.6%), and fodder banks (4.3%).
- » Perspective of analysis: primary producer (micro) (96%) and innovation systems (macro) (4%).
- » Quantitative studies (73%) and qualitative studies (27%).

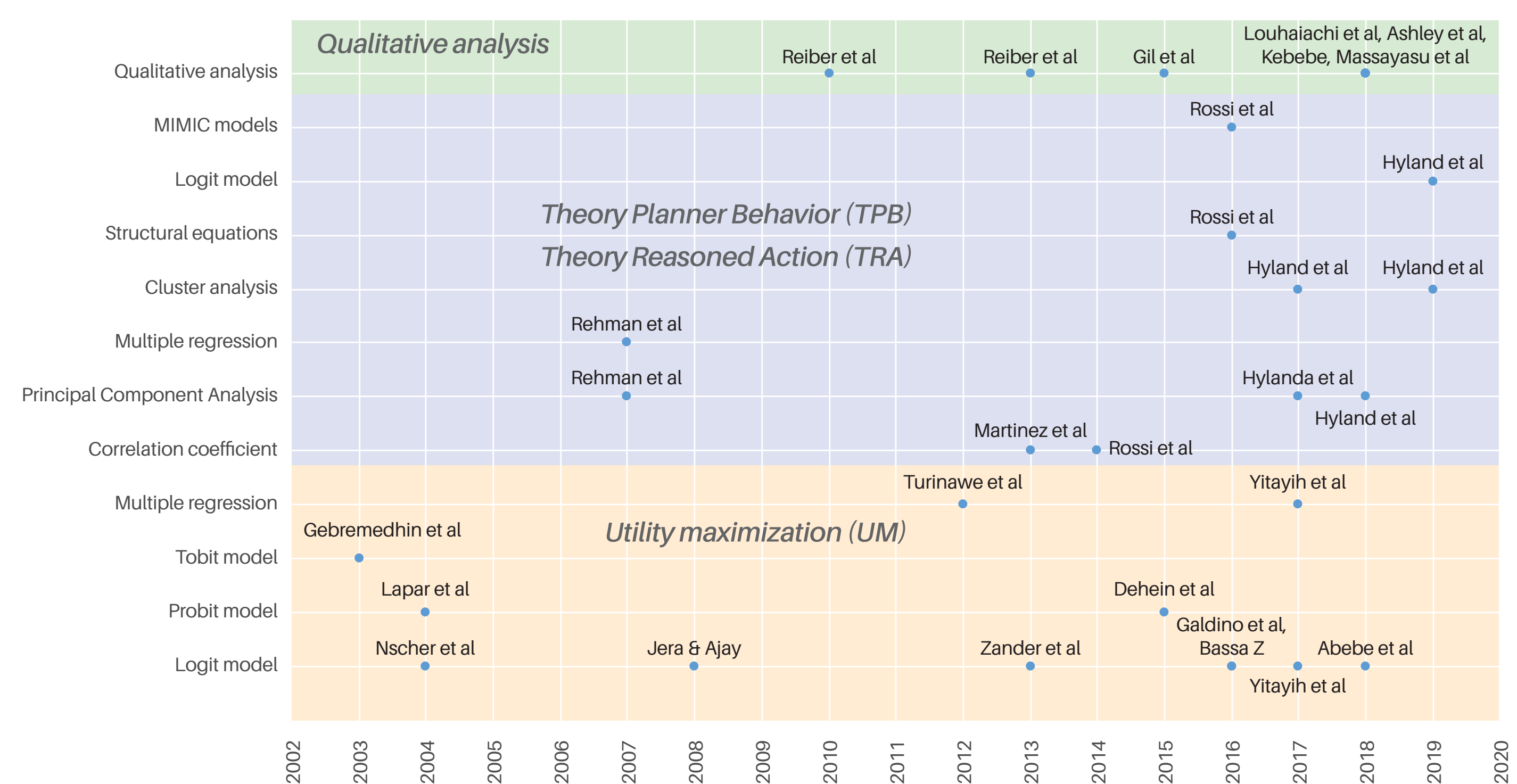


Figure 1. Empirical methods and theories used in adoption studies.

Qualitative studies



Figure 2. Factors that promote (left) and hinder (right) adoption

- » Factors promoting adoption were related to benefits obtained from specific technologies contributing to productive indicators and favorable market conditions.
- » Factors constraining adoption were associated to resource limitations and market uncertainties.

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Table 1. Frequency analysis from 12 UM studies show the results for significance and sign on estimated coefficients

Variable	Sig (+)	Sig (-)	Insig	N° M	N° S	Effect
Education level	6	2	3	11	10	*
Livestock herd size	6	3	2	11	9	*
Age	2	1	5	8	8	*
Farm size	3	2	2	7	7	
Market distance	1	4	2	7	7	*
Extension/training	5	0	2	7	6	**
Membership in farmers' associations or other groups	7	0	0	7	6	***
Gender (Male)	1	0	3	3	4	*
Household income	3	0	1	4	4	**
Family labour	2	0	2	4	4	**
Geographic location	1	3	2	6	4	
Credit	2	1	1	4	4	
Experience	1	0	2	3	3	**
Household size	0	0	3	3	3	***
Non-farm income	0	1	2	3	3	
Distance to the training center	0	3	0	3	3	***

NOTE: only those variables with a frequency ≥ 3 are presented. * Indicates that a variable is a mix between sig (+) and sig (-), but tends to show convergence towards a sign. ** Indicates that a variable is a mix between sig/insig, but always presents the same sign when it is sign. *** Indicates that a variable always presents the same sign

Theories of planned behavior and reasoned action models

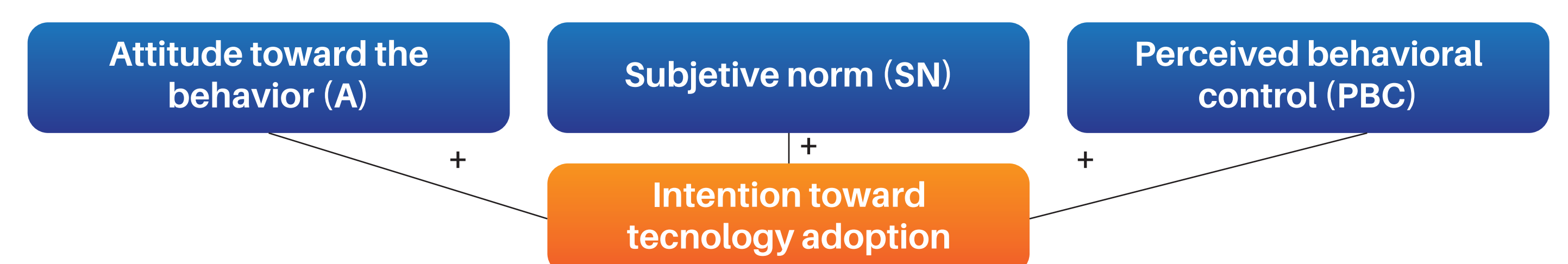


Figure 3. The TBT model. Adapted from Ajzen (2005)

- » The analysis of attitudes as an explanatory factor of adoption behavior is the most popular approach when studying psychological factors.
- » Subjective norms present a significant effect on the adoption of technologies, yet, social pressure could promote or hinder adoption behavior.
- » In non-adopting producers, PBC (specifically oriented towards resource restrictions) was the most influential variable.

Utility Maximization studies

- » Independent variables were mostly composed by: farm characteristics and producers' sociodemographic factors, evaluated through logit/probit models.
- » In most cases, variables were inconsistent: with studies reporting significant and positive effects or vice versa (Table 1).
- » This can be explained by the particularities of each region, sociodemographic differences among the populations and the technology being evaluated.
- » The variable "membership in farmers' association" presented a positive behavior in all analyzed studies.
- » Contradictory effects amongst variables could be associated to the notable variation in terms of quality of the studies analyzed.

Conclusions

- » Even though sociodemographic characteristics result vital in the identification of adopting producers, studies tend to treat them differently and produce inconsistent results. External conditions such as market dynamics can greatly affect the promotion or limitation of adoption.
- » Recommendations indicate to consider the use of a mixed-methodological approach that allows a deeper understanding of adoption and dissemination processes in-situ. We propose to work with two aggregated approaches (micro and macro) in a complex and dynamic system, which includes not only the perception of the adopter but also the surrounding social structure.