



# Applying the food technology neophobia scale in a developing country context. A case-study on processed *matooke* (cooking banana) flour in Central Uganda



Hans De Steur<sup>a,\*</sup>, Walter Odongo<sup>a,b</sup>, Xavier Gellynck<sup>a</sup>

<sup>a</sup> Department of Agricultural Economics, Faculty of Bioscience Engineering, Ghent University, Coupure Links 653, 9000, Gent, Belgium

<sup>b</sup> Department of Rural Development and Agribusiness, Faculty of Agriculture and Environment, Gulu University, P.O Box 166, Gulu, Uganda

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## ABSTRACT

The success of new food technologies largely depends on consumers' behavioral responses to the innovation. In Eastern Africa, and Uganda in particular, a technology to process *matooke* into flour has been introduced with limited success. We measure and apply the Food technology Neophobia Scale (FTNS) to this specific case. This technique has been increasingly used in consumer research to determine consumers' fear for foods produced by novel technologies. Although it has been successful in developed countries, the low number and limited scope of past studies underlines the need for testing its applicability in a developing country context. Data was collected from 209 *matooke* consumers from Central Uganda. In general, respondents are relatively neophobic towards the new technology, with an average FTNS score of 58.7%, which hampers the success of processed *matooke* flour. Besides socio-demographic indicators, 'risk perception', 'healthiness' and the 'necessity of technologies' were key factors that influenced consumer's preference of processed *matooke* flour. Benchmarking the findings against previous FTNS surveys allows to evaluate factor solutions, compare standardized FTNS scores and further lends support for the multidimensionality of the FTNS. Being the first application in a developing country context, this study provides a case for examining food technology neophobia for processed staple crops in various regions and cultures. Nevertheless, research is needed to replicate this method and evaluate the external validity of our findings.

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## 1. Introduction

Despite the high rate of market failures, new food technologies are still increasingly introduced, due to the anticipated range of benefits they can bring to the consumer and the food sector, particularly in developing regions (Rollin, Kennedy, & Wills, 2011). Nevertheless, consumers are traditionally concerned about the risks associated with such food applications, especially when there is a perceived lack of tangible benefits (Frewer et al., 2011; Rollin et al., 2011; Siegrist, 2008). This has led to a growing body of literature in consumer food research dealing with consumers' fear of novel foods, also known as food neophobia (e.g. Caracciolo, Coppola, & Verneau, 2011; Chen, Anders, & An, 2013; Coppola,

Verneau, & Caracciolo, 2014; Cox & Evans, 2008; Frewer et al., 2011; Marin et al., 2012; Pliner & Hobden, 1992; Siegrist, 2008; Verneau, Caracciolo, Coppola, & Lombardi, 2014). While it is generally characterized as a personality trait, i.e. a continuum along which people can be placed in terms of their tendency to be in favor of new foods or to be reluctant (Pliner & Salvy, 2006), food neophobia has also been treated as a form of behavior, involving the avoidance of novel foods in particular situations (Pliner & Salvy, 2006; Ritchey, Frank, Hursti, & Tuorila, 2003). As the success of new food technologies largely hinge on consumers' behavioral responses in the market place (Chen et al., 2013), negative attitudes towards food technologies may prevent widespread adoption and result into product failures. Therefore, identifying population segments that are more or less food technology neophobic as well as segments of early adopters of innovative food technology is deemed useful from a marketing point of view (Evans, Kermarrec, Sable, & Cox, 2010).

Food neophobia does not only relate to consumers' reluctance to

\* Corresponding author.

E-mail addresses: [Hans.DeSteur@UGent.be](mailto:Hans.DeSteur@UGent.be), [hansdesteur@hotmail.com](mailto:hansdesteur@hotmail.com) (H. De Steur).

try new food products, but also to the acceptance of new technologies used in food production and processing, known as food technology neophobia (e.g. Bäckström, Pirttilä-Backman, & Tuorila, 2004; Choe & Cho, 2011; Cox & Evans, 2008; Grunert, Bredahl, & Scholderer, 2003; Lähteenmäki et al., 2002). Therefore it is deemed useful to make a distinction between the acceptance of new foods and the new technologies that are applied to develop those foods (Evans et al., 2010; Frewer et al., 2011; Grunert et al., 2003; Siegrist, 2008). The key factors that contribute to consumers' resistance to try foods produced by new food technologies generally include functional barriers related to ease of use and usefulness, benefits and risk perceptions, knowledge and attitudes, socio-demographic indicators and lifestyle factors, as well as psychological barriers (Chen et al., 2013; Frewer et al., 2013; Ronteltap, Van Trijp, Renes, & Frewer, 2007).

When looking at consumer research on food and food technology neophobia, the development of the Food Neophobia Scale (FNS) (Pliner & Hobden, 1992), which provides a standardized, validated measurement, is considered as the starting point for the increased attention on both phenomena, by which scientists particularly focused on evaluating the relationship between appetite and food aversion (Choe & Cho, 2011; Olabi, Najm, Baghdadi, & Morton, 2009). The FNS has been found to be associated with general neophobia, trait anxiety and sensation seeking (Pliner & Hobden, 1992). Consequently, studies have shown that the FNS accurately predicts responses to novel or unfamiliar food (e.g. Lähteenmäki et al., 2002; Ritchey et al., 2003).

However, while the FNS has been proven to be suitable for assessing consumer reactions towards ethnic or other culture foods (Pliner & Hobden, 1992), it seems not appropriate for examining acceptance of foods produced by novel technologies (Cox & Evans, 2008; Frewer et al., 2011; Siegrist, 2008). Even though food technology neophobia is still poorly addressed in consumer research (Choe & Cho, 2011; Cox & Evans, 2008; Olabi et al., 2009), the Food Technology Neophobia Scale (FTNS) (Cox & Evans, 2008; Evans et al., 2010), is considered a more suitable tool than the food neophobia scale (FNS) (Pliner & Hobden, 1992) to map consumer perceptions of food technologies. The original FTNS consists of 13 seven-point bi-polar scales, anchored from 'totally disagree' to 'totally agree' with a neutral mid-point, which focus on food technology itself, rather than the (attributes of the) food product.

Since its introduction in 2008, seven consumer studies have measured the FTNS (for a review, see Table 1). Building upon the first application of Cox and Evans (2008), Evans et al. (2010) have retested the FTNS constructs by looking at the same processing technologies, products and research location as in their original work. Out of the remaining studies, two focused on food packaging in Canada (Chen et al., 2013; Matin et al., 2012), while three other studies applied FTNS to food processing in Italy (Caracciolo et al., 2011; Coppola et al., 2014; Verneau et al., 2014). In general, the FTNS has been shown to be a valid and reliable measure of food technology neophobia. Although it has been tested and lauded for its consistency and stability (e.g. Chen et al., 2013; Evans et al., 2010; Matin et al., 2012; Verneau et al., 2014), the low number and limited scope of FTNS applications do not allow validation of its use in different contexts. Firstly, the existing FTNS studies have only been conducted in developed countries, such as Australia (Cox & Evans, 2008; Evans et al., 2010), Canada (Chen et al., 2013; Matin et al., 2012) and Italy (Caracciolo et al., 2011; Coppola et al., 2014; Verneau et al., 2014). Secondly, besides the work of Cox and Evans, two other studies (Chen et al., 2013; Matin et al., 2012) also dealt with food-related packaging technology, rather than focusing on food technology. Consequently, there is a need to conduct more studies on the applicability of the FTNS in other sectors and contexts, especially in relation to food technology in developing

regions.

Indeed, consumers have heterogeneous attitudes and preferences toward different, novel food technologies (Frewer et al., 2013; Pliner & Salvy, 2006; Ronteltap et al., 2007), which may affect their food choices. This study measures and applies the FTNS to assess consumer preference of *matooke* (fresh versus processed) in Uganda. *Matooke* is an East-African highlands cooking banana that is traditionally peeled, mashed and boiled or steamed in banana leaves after being harvested between three-quarters to full maturity (Florence Isabirye Muranga, Sampath, Marlett, & Ntambi, 2007). During this process, the color of the pulp changes from a creamy white to a yellowish color depending on original maturity of the bunch. Because *matooke* fruit is bulky and highly perishable, post-harvest losses are consistently high, up to a level of 45% (Florence I Muranga, Mutambuka, Nabugoomu, & Lindhauer, 2010; Florence I Muranga, Nabugoomu, & Katebarirwe, 2011). To substantially reduce the bulk of *matooke* starch, increase its shelf-life and diversify its use for bakery and confectionary industries, recent advances in processing (pre-gelatinization) have resulted in the development of banana flours, like raw, instant and extruded 'Tooke' flour (Florence I Muranga et al., 2011).

With banana as its main staple crops, Uganda also became one of the world's largest producers of *matooke*, ranking first in Sub-Saharan Africa, with an estimated production of about 9.5 million tons (i.e. 26.4% of the global production), cultivated by 72% of farmers (Karugaba & Kimaru, 1999). While Uganda also has the highest per capita consumption of *matooke*, estimated at 191 kg per year, *Tooke* flour was less successful. Since its introduction in 2008, processed banana flour only obtained a market share between 20% and 30% (Florence I Muranga et al., 2010). The low adoption of the *Tooke* flour raises a food technology neophobia question. Emerging processed food products based on novel technologies sometimes tend to raise concerns amongst consumers, who perceive them as unsafe, unnatural and unpleasant, hence the need for applying the FTNS to the case of processed *matooke* (Cooking Banana) flour.

## 2. Materials and methods

### 2.1. Data collection method

By using convenience sampling, a sample was drawn from banana consumers in the central business districts of Kampala, Wakiso and Mukono in Central Uganda. The majority of the population in these areas are traditional *matooke* consumers. These are also locations where 'Tooke' flour has been introduced.

Based on a pretested, structured questionnaire, face-to-face interviews were administered between April and May 2013. Out of the 220 respondents who completed the questionnaires, 209 questionnaires were considered useful for further analysis. Therefore, four enumerators were hired and trained specifically for the purpose of the data collection. Respondents were briefed on the nature and context of the study. Even though all of them knew what *matooke* is, each enumerator carried a packet of the *Tooke* flour for each interview session to ensure that respondents do not mistake the *Tooke* flour for other types of flour.

The survey questionnaire was structured into two major parts. The first section focused on the socio-demographic profile of the respondents. The following indicators were included: gender, age, marital status, household size, income level, education level, employment status and distance to the market. The second part assessed respondents' attitudes towards food technology using the 13-item FTNS scale as validated in various studies (Chen et al., 2013; Evans et al., 2010; Verneau et al., 2014). The various statements, measured on a 5-point Likert scale (degree of agreement/disagreement), refer to perceptions about new food technologies,

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