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Consumer knowledge, information sources used and predisposition towards the adoption of wood pellets in domestic heating systems

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ABSTRACT

Previous work on consumer psychology has focused on social attitudes towards environmental concerns through a behavioural perspective. In order to complete and verify the outcomes and statements of such research, this study used a perception-based approach involving a focus group and personal interviews to provide a more holistic understanding for adopting wood pellet-based heating systems or boilers. Concretely, the study probed the following issues: (i) the knowledge level of end consumers concerning biofuels in general and pellets in particular; (ii) main information sources; (iii) the level and intention of biofuel and pellet use among end consumers; (iv) the influence of subsidies or funding support for the purchase of pellet boilers/stoves; and (v) the influence of consumers' environmental concerns on their biofuel and pellet consumption. These variables were crossed with a set of socio-demographic variables of the sample population. The statistical analysis verified that knowledge about biofuels was directly related to knowledge about pellets. Most respondents knew very little about pellets, largely due to a lack of information and communication. Friends were the principal information source, followed by family members. Finally, while environmental concern may bear some weight in the decision to adopt these heating systems, the existence of subsidies for their purchase was more important in consumers' ultimate decision.

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1. Introduction

The EU is the second largest power market in the world, with 450 million consumers, and is moreover the worldwide leader in

demand management, promotion of new and renewable energy forms, and development of low CO₂ emissions technologies, which makes it the ideal region to lead the worldwide search for energy solutions [1]. Furthermore, renewable energy resources have the potential to supply about one third of the electricity demand by 2020, and they currently satisfy around 20% of the electricity requirements in Denmark, 8% in Spain and 6% in Germany [2]. In this context, the European Council approved the so-called 20–20–20 goals [3,4] that establish the EU-271 strategic energy policy goals for 2020 to save energy consumption, reduce greenhouse gas emission levels, share renewable energies in total EU consumption, and increase the amount of biofuel in the transport fuel mix [5].

Increasing social demand for environmental reasons, the necessary reduction of energy dependency, and the energy policies established by the European Union have magnified the impact of renewable energies in Spain.

The generation of electricity from vegetable biomass amounted to just 1% of total electricity demand nationwide in 2009. This is a very low percentage in light of Spain's high biomass potential, considered to be the third country in Europe in this potential [6]. Yet vegetable biomass development is lower than was once predicted, and it is hardly relevant in comparison with electricity or petrol consumption. In 2009, there was a decrease with respect to 2008 in the generation of electric energy through nuclear power plants and fossil fuels, whereas the production through renewable technologies increased with respect to 2008 (coal –25.8%, nuclear –10.6%, natural gas –10.1%, fuel –3.7%, vegetable biomass and residue +4.8%, hydraulic +12.6%, solar +136.2%, wind +14.3%). The greatest contribution to primary energy was from biomass and residue (3.6%, despite having fallen 1.4%) [7,8].

Vegetable biomass pellets have become popular in many countries, especially in Europe, where the pellet market is now a large and rapidly developing sector. The growing demand for pellets has led to a greater number of pellet plants and higher production capacities [9,10].

The densification of vegetable biomass improves its handling, transport and storage conditions [11–13], and reduces its moisture content, increasing the calorific value [13–16]. The homogeneous characteristics of this densified biomass make pellets a convenient biofuel for residential use in automatic furnaces that require low maintenance [13,15].

Residential heating is an important area to target regarding energy use [17]. In the domestic market, most pellets are used in households (52%) and the rest (48%) in medium- and large-scale boilers [18]. The low price of pellets used to be a marketing tool; now, however, raw material prices are on the rise. The lack of subsidies for converting heating systems is also slowing the development of new pellet boilers [10].

Previous studies report on the diffusion of wood pellet heating in Sweden, Finland, Austria, Denmark and Norway [19–24]. They all identify similar factors contributing to the slow diffusion of

wood pellets: fuel price, high investment cost, lack of technology and service [17].

The aim of the present study is to provide a more holistic understanding of mechanisms involved in the adoption of wood pellet heating systems in households. This calls for determining any barriers that impede development of this technology along with psychological factors that might affect a consumer's final decision.

2. Theoretical background and objectives

Not only are information sources important for energy efficiency in general; financial aid and the influence of socioeconomic characteristics should not be underestimated in studies about adopting heating systems.

2.1. Adopting pellet-based innovative heating systems: Determinant factors

The choice of an innovative heating system (IHS) based on biofuel, such as pellets, does not depend only on technological advantages (greater heating power and lesser CO₂ emissions) and favorable economic conditions. The comprehension and perceived support of such trends by the general public is also essential. Thus, successful diffusion of IHS calls for a sound product and a solid marketing strategy, which in turn must account for factors determining the decision making of the consumer [17].

Firms must strive to improve the product and accentuate the advantages of a pellet system, while heightening consumers' awareness of this heating system [15]. The perceived attributes of an innovation, as other variables, will necessarily affect the rate of adoption.

Tapaninen et al. [25] demonstrated that public perception of the characteristics of pellet heating systems had an impact on their adoption in Finland. This is the framework for introducing policies incentivizing biofuel use, reducing prices and costs, to encourage adoption and scale economies.

Divulging knowledge of a technology entails a social communication process through persons, like the links of a chain, and the mass media are known to influence the decisions surrounding the adoption of individual technology [26]. While mass media effectively create knowledge about an IHS, personal channels are more effective in forming and modifying attitudes toward it, and therefore influence the decision to adopt or reject the new system [27].

Still, consumers are divided regarding their personal characteristics, socio-economic traits, and cultural backgrounds, as well as in their capacity to take risks and face uncertainty, and such heterogeneity also affects the rate of diffusion of these heating systems [15]. That is, residential use of IHS will depend heavily on the attitude and perceptions of the potential consumers. The inclusion of contextual factors or external considerations and possible barriers in terms of

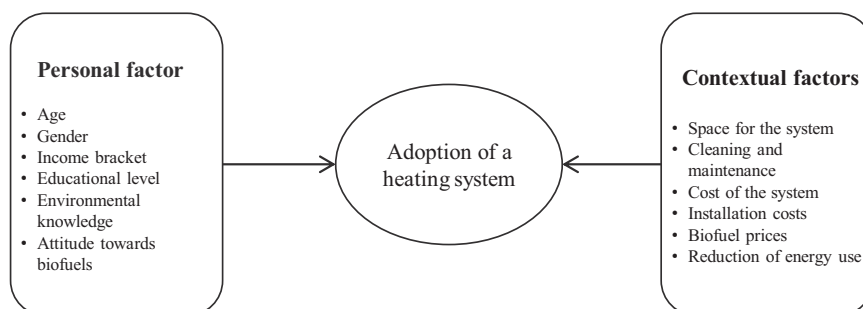


Fig. 1. Influential factors in the process of “innovation-decision” about an IHS. Source: Based on Nair et al. [29], Mahapatra and Gustavsson [27,30].

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