The Influence of Market Factors on Intention to Adopt a

"Radical" Product Innovation by Farmers

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Short Summary

This study proposes a model to explain the intention of farmers to adopt a radical product innovation. Particular attention is given to the influence of marketing factors. Results from illustrating the model for Dutch poultry farms are presented.

Introduction

Radical product innovation (RPI) in family farms may differ from RPI in medium-sized and large firms. In fact, RPI by a family farm is often an adoption process of a concept developed by customers or third parties. Adoption of RPIs is the outcome of problem-solving processes. In extended problem-solving models, the decision to adopt a new product is preceded by a positive intention. It is interesting to understand a farmer's intention to adopt an RPI for family farms, because intentions "capture the motivational factors that influence a behavior, they are indications of how hard people are willing to try, of how much of an effort they are planning to exert, in order to perform the behavior" (Ajzen, 1991). In this paper, a model explaining the intention of family farms to adopt an RPI will be developed and tested.

The proposed model addresses two issues. First, the influence of perceived market-related outcomes of RPI and a farm's perceived capabilities to produce the RPI on attitude towards RPI and subsequently on intention to adopt an RPI is investigated. This is an important issue, because a thorough assessment of a product innovation's impact on the market and a firm's capabilities to compete in the market is very important for new product success (e.g. Cooper, 1999). Second, this paper addresses the influence of current success on intention to adopt an RPI. A positive influence of current success on intention to adopt has been suggested (Day

and Wensley, 1988), while others argue for a negative influence (Zaltman, et al., 1973). This paper is structured as follows. First a theory that explains intention of family farms to adopt an RPI is presented. Second, on the basis of this theory, a conceptual model is specified and hypotheses about the relationships are presented. Third, the methodology to test the hypotheses is reported. Fourth, the estimation results are presented and conclusions are drawn and discussed.

Theory

A family farm is a firm that is run and controlled under the direct supervision of the farmer. The farmer's attitude towards the RPI is hypothesized to be an important driver of his/her intention to adopt an RPI. Market-related beliefs and production-related beliefs about the RPI are drivers of a farmer's attitude towards the RPI.

Intentions

It is interesting to study intentions, because they capture the motivational factors that influence a behavior. Furthermore, they explain behaviors of people directly in situations over which they have limited control (Ajzen and Fishbein, 1980). The limited control of family farms refers to their limited control over elements of the marketing mix, such as product specifications and product positioning. They can choose to adopt or not to adopt the product concepts that are presented to them, but it is very difficult for family farms to make changes to these product concepts. Then, understanding intentions is a necessary step to predict behavior (Ajzen, 1988, Ajzen and Fishbein, 1980). Ajzen (1988) proposes a theory that can explain human behavior in specific contexts by first explaining intention. He suggests that intentions are driven by attitude towards the behavior, subjective norm about the behavior, and perceived behavioral control. Attitude towards the behavior is "the degree to which a

person has a favorable or unfavorable evaluation or appraisal of the behavior in question" (Ajzen, 1991). Subjective norm is "the perceived social pressure to perform or not to perform the behavior" (Ajzen, 1991). It is based on a person's perceived ideas of people that are important to him/ her and the person's motivation to comply with the ideas of those people. "Perceived behavioral control refers to people's perceptions of the ease or difficulty of performing the behavior of interest" (Ajzen, 1991).

Intention to adopt a radical product innovation in family farms

RPI in family farms is supposed to be a situation over which the farmer's control is limited. This is explicitly captured by perceived behavioral control in Ajzen's (1988) theory of planned behavior. Therefore, the three drivers of intention in Ajzen's (1988) theory of planned behavior seem to be a good starting point to build a theory that explains a farmer's intention to adopt an RPI.

Characteristics of family farms have implications for the control that family farms have over RPI adoption and for the intention to adopt an RPI (Ajzen, 1988). Family farms, that operate in markets of pure competition, have limited control over the elements of the marketing mix and consequently over product innovation. Particularly in the case of RPI, they largely depend on product concepts developed by customers, suppliers, or third parties, because they lack economies of scale and scope to make efficiently use of an R&D staff. Family farms' control over prices is often limited. Particularly family farms operating in markets that come close to pure competition are price takers. Promotions by individual family farms selling homogeneous products do not make economic sense, because returns from promotions accrue to all farms selling the generic product. Family farms can influence to whom they sell their products but often its customers are larger and more powerful than the family farm itself.

Consequently, current customers, specifically their expressed needs, seem to be important for radical product innovation in family farms. Expressed needs for RPI by current customers will increase the farmer's perceived behavior control, because it makes RPI adoption by family farms easier. Furthermore, the influence of these expressed needs on the farmer's intention to adopt the RPI is hypothesized to depend on the family farm's dependence on its customers, since customers can force family farms to do what they want them to do, if family farms are dependent on their customers.

Despite the limited control over the elements of the marketing mix, family farms are autonomous, at least in the sense that they can decide to adopt or not. Therefore, the farmer's attitude towards the RPI will influence his intention to adopt the RPI. Furthermore, situational factors influence the relationship between attitude towards the RPI and intention to adopt the RPI (Ajzen, 1991). Current success is hypothesized to be a particularly influential situational factor for family farms, because the adoption of the RPI may harm existing products. Another situational factor that is hypothesized to influence the relationship between the farmer's attitude towards the RPI and intention to adopt the RPI is the innovativeness of the farmer.

Market-related beliefs and production-related beliefs about the RPI
The farmer's attitude towards the RPI is hypothesized to be an important explanatory variable for a farmer's intention to adopt the RPI (Ajzen, 1988). The farmer's attitude towards the RPI is based on his or her evaluation of the RPI. Specifically, the farmer's attitude towards the RPI is based on his perception of the likelihood of specific outcomes when adopting the RPI (Ajzen and Fishbein, 1980). These perceived outcomes of RPI adoption are categorized as market-related beliefs and production-related beliefs, because farmers assess the RPI in terms of its market opportunity, which is externally oriented and in terms of the family farm's

ability to produce the RPI, which is internally oriented (Cooper, 1999). Furthermore, each outcome is evaluated as good or bad and may vary in the extent to which it determines the farmer's attitude. In line with common practice, beliefs about the outcome of behavior under consideration are restricted to those that come easily to mind and that occur frequently in the research population (East, 1997).

Market-related beliefs about the RPI are beliefs about the impact of RPI adoption by the family farm on the family farm's market environment. Central elements in a firm's market environment are customers, competitors, and general trends (political/legal, economic, social/cultural and technological) that affect a firm's possibilities to serve its customers (Jaworski and Kohli, 1996). Therefore, market-related beliefs about RPI adoption are important drivers of a farmer's attitude towards RPI.

Market information is an important, probably the most important determinant of market-related beliefs. Market-related beliefs about RPI adoption may have a short-term orientation or a long-term orientation. In the short-term orientation, market-related beliefs about RPI adoption are about expected prices for the RPI and expected sales volumes of the RPI. Higher prices and/or higher sales volumes *ceteris paribus* lead to more profit, which will result in a more positive attitude of firms towards the RPI. In industries, such as agriculture, production, and therefore sales volumes are fixed in the short-term, e.g., annual harvest. Then, only beliefs about prices influence the farmer's attitude towards the RPI. In the long-term orientation, market-related beliefs are about customer and consumer perceptions of the RPI, such as benefit perceptions, competitive market position of the RPI, and perceived anticipation on general trends in the market environment. The market-related beliefs with a long-term orientation will concern both prices and sales volumes now, but also in the future.

Long-term market-related beliefs are considered important for a firm's long-term profit performance (Narver and Slater, 1990) and for product innovation success (Cooper, 1999). Therefore, they are hypothesized to influence a farmer's attitude towards RPI.

Market-related beliefs are not the only factors that determine a farmer's attitude towards RPI. The perceived family farm capabilities to produce the RPI also are important determinants of the farmer's attitude towards the RPI. In our theory, these determinants are referred to as production-related beliefs about the RPI. Perceived production costs are an important component of production-related beliefs, because *ceteris paribus* lower costs lead to more profit, which will result in a more positive attitude of the farmer towards the RPI. Farmers are often involved in the production process of the family farm (Nooteboom, 1994). Therefore, changes in production methods that affect production costs and working conditions may also have a direct influence on the farmer's attitude towards RPI.

The Model

On the basis of the presented theory a model is proposed in Figure 1, explaining a farmer's intention to adopt an RPI. The model distinguishes between current customers and potential customers, and it specifies the role of the farmer's innovativeness. Special features of the model are its focus on RPI and on the farmer's intention to adopt an RPI. Three factors are hypothesized to drive the farmer's intention to adopt an RPI.

First, the farmer's attitude towards the RPI drives his/her intention to adopt the RPI. This relationship is moderated by two concepts: the farmer's innovativeness and the family farm's current success. More (less) innovative family farms might be less (more) cautious (Rogers, 1995) and as a result might have a stronger (weaker) intention to adopt the RPI. Current

success is also expected to have a moderating influence on the relationship between farmer's attitude towards RPI and the farmer's intention to adopt the RPI. This influence could go both ways. On the one hand, Day and Wensley (1988) argue that firms should use their profits to sustain and improve a firm's skills and resources, which should lead to superior customer value or lower costs. It suggests that high (low) current success leads to a high (low) intention to adopt innovations, particularly RPIs. On the other hand, Zaltman, Duncan and Holbeck (1973) suggest that a gap between satisfactory performance and actual performance increases the search for innovation opportunities. This suggests that high (low) current success leads to low (high) intention to adopt RPI. The latter might be particularly prevalent for RPI in family farms, because family farms have limited time and resources for management tasks. Consequently, they can only manage RPI at the expense of their current products.

Second, "expressed needs for RPI by current customers" drive the "farmer's intention to adopt the RPI". This reflects the current customer's control over RPI in the family farm, its role as a plausible source of support for RPI in family farms, and the importance of innovative networks for RPI in small firms (Bessant, 1999). Based on the resource dependency theory and the theory of planned behavior (Ajzen, 1988), it is hypothesized that "expressed needs for the RPI by current customers" affect the family farm's intention to adopt the RPI directly and not via the "farmer's attitude towards RPI". Dependence on the current customer is included as a moderating variable on the relationship between "expressed needs for RPI by current customers" and the "farmer's intention to adopt the RPI". The *resource dependence* view on innovative activity (Cooper and Schendel, 1976, Foster, 1986, Pfeffer and Salancik, 1978) holds that firms allocate resources to innovative programs that are required by customers who provide the resources that the firm needs to survive. Furthermore, the resource dependence view holds that a firm's freedom to choose is limited. Therefore, the resource dependence

view may be particularly relevant for RPI in family farms, because family farms have limited financial resources and therefore need the support of their current customers to reduce the financial risk. In Ajzen's *theory of planned behavior* (1988) it is argued that models, which predict behavior should account for situations where subjects perceive limited behavioral control. A direct influence of expressed customer needs on intention to adopt the RPI is in line with that theory.

Third, "expressed needs for the RPI by potential customers" drive the farmer's intention to adopt RPI. Potential customers can play the same role for RPI as current customers, but often barriers exist when switching from current customers to potential customers. For example, some investments of family farms may have been made specifically for current customers. Furthermore, family farms have to invest in the new relationship with the potential customer.

In addition, three background variables are supposed to influence intention to adopt RPI, i.e., age of the farmer, the family farm's specialization, and subjective norm towards RPI. A negative relationship between age of the farmer and intention to adopt the RPI is hypothesized, because older farmers have gained a lot of experience with the products that they currently sell, and this experience would be lost to some extent if they adopted the RPI. The impact of specialization on the intention to adopt an RPI depends on the type of farm and type of RPI. In our case, specialization is hypothesized to have a negative influence on intention to adopt the RPI, because adopting the specific RPI, namely animal-friendly produced eggs, is difficult for specialized family farms. First, the specific RPI considered in this study requires land that may not be available on specialized family farms. Second, for the same production volumes, the RPI requires more labor, which may not be available in

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specialized family farms. Finally, subjective norm is considered to influence intention to adopt RPI, which is in line with the theory of planned behavior (Ajzen, 1988).

Figure 1: **Model explaining a farmer's intention to adopt an RPI**
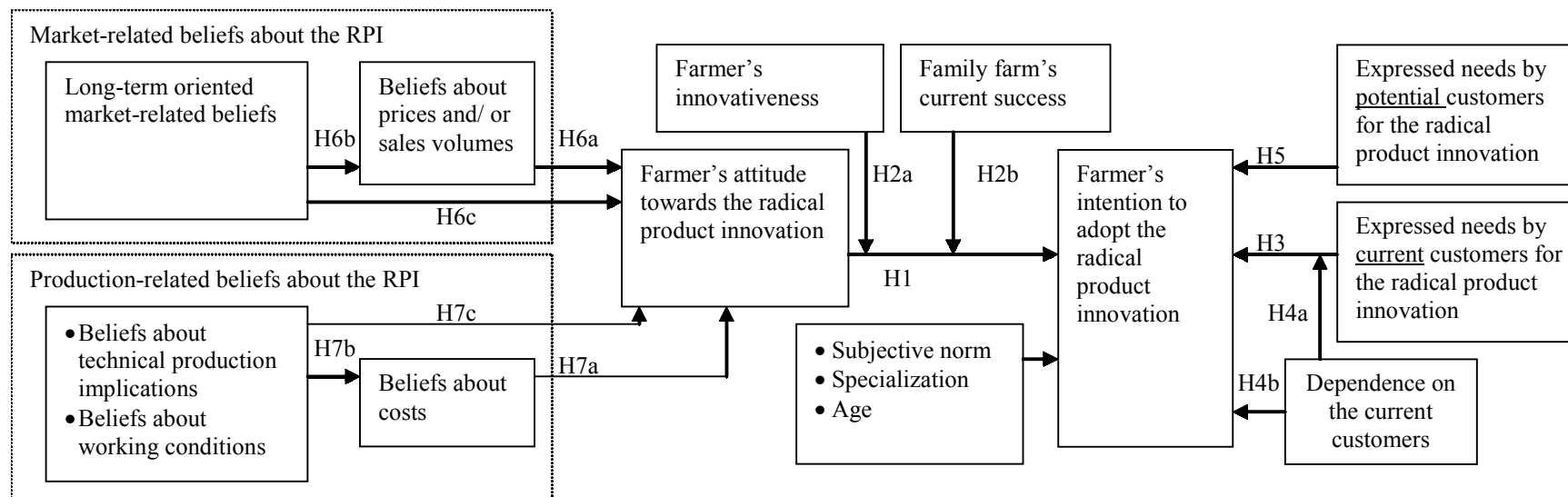
In the model, the "farmer's attitude towards adopting the RPI" is based on the farmer's beliefs about the RPI (Ajzen and Fishbein, 1980). To determine the extent to which "market-related beliefs about the RPI" determine the "farmer's attitude towards adopting the RPI", the farmer's beliefs about the RPI are categorized into market-related and production-related beliefs. As depicted in figure 1, "beliefs about prices and/or sales" are expected to mediate to some extent the influence of "long-term oriented market-related beliefs about the RPI" on the "farmer's attitude towards the RPI". "Long-term oriented market-related beliefs" refer to customer and consumer perceptions, competitive market positions, and perceived anticipation on general trends in the market environment. They are hypothesized to have a positive influence on prices and/ or sales volumes. The types of long-term oriented market-related beliefs to be included in the model vary per industry and are determined by elicitation with the group of family farms that is being examined (East, 1997).

"Beliefs about costs", as depicted in Figure 1, are expected to mediate partially the influence of "beliefs about technical production implications of the RPI" and "beliefs about working conditions" on the "farmer's attitude towards adopting the RPI". The specific "beliefs about technical production implications of the RPI" and "beliefs about working conditions" to be included in the model may vary per industry and are determined by elicitation with the group of family farms that is being researched (East, 1997).

Hypotheses

Leading scholars have suggested a positive relationship between attitude towards a behavior and behavior itself (e.g. Ajzen, 1991, Ajzen and Fishbein, 1980). In the marketing literature, the

causality of the relationship between attitude and behavior is still the subject of many debates for fast-moving consumer goods (fmcg) (East, 1997). Beyond fmcg, most studies support the view that attitude causes behavior, rather than the other way around (East, 1997). Particularly for high-involvement problems, like decisions about radical product innovations, the primacy of attitude is most likely (Mowen, 1990). The relationship between attitude towards a specific behavior and the actual behavior is mediated by intention to perform the behavior (Ajzen, 1988). Family farms have limited control over elements of the marketing mix, specifically RPI adoption, but they are free to take on the challenge. Therefore, a positive relationship between the farmer's attitude towards the RPI and the farmer's intention to adopt the RPI is hypothesized.

H1:   *The farmer's attitude towards the RPI positively influences the farmer's intention to adopt the RPI*

Midgley and Dowling (1978) describe the nature of innovativeness as related to the adoption of new products by consumers. Highly innovative decision makers are those who "decide to adopt an innovation independently of the decision of others" (Midgley and Dowling, 1978). In other words, when decision makers are highly innovative, their attitude towards the product innovation probably has an important influence on the intention to adopt the RPI. This can be illustrated by comparing, in Rogers' (1995) terminology, the characteristics of the "early majority" to those of the "late majority", assuming that "farmer's innovativeness" is distinctive between these two adopter categories. On the one hand, family farms in the "early majority", being more innovative, follow with deliberate willingness" (Rogers, 1995), which suggests a strong influence of the

"farmer's attitude towards the RPI" on the "farmer's intention to adopt the RPI". On the other hand, for the less innovative late majority, "the pressure of peers is necessary to motivate adoption" (Rogers, 1995), which suggests a much weaker influence of the "farmer's attitude towards the RPI" on the "farmer's intention to adopt the RPI".

H2a: The higher the farmer's innovativeness, the larger the influence of the farmer's attitude

towards the RPI on the farmer's intention to adopt the RPI

Christensen and Bower (1996) show that firms ignore ideas for new technologies that emerge in the organization, as long as they successfully serve their current customers with existing technologies. In the context of this study, this argument suggests that farmers discount their positive attitude towards RPI when they are successful with their current products. Zaltman, Duncan and Holbeck (1973) suggest that a gap between satisfactory performance and actual performance increases the search for innovation opportunities, which also suggests that current poor performance of a family farm has a positive influence on the relationship between the "farmer's attitude towards the RPI" and the "farmer's intention to adopt the RPI". This is in line with Rogers' (1995) assertion, particularly for the "late majority", that innovation might be an economic necessity. Therefore, it seems a plausible hypothesis that a family farm's current success limits the farmer's intention to adopt the RPI, even if (s)he acknowledges the benefits of the RPI. The following hypothesis is proposed.

H2b: The greater the family farm's current success, the smaller the influence of the farmer's

attitude towards the RPI on intention to adopt the RPI

The resource dependence view on innovative activity (Cooper and Schendel, 1976, Foster, 1986, Pfeffer and Salancik, 1978) holds that firms allocate resources to innovations that are required of the firm by current customers, who provide the resources that the firm needs to survive. It is easier for family farms to adopt RPIs, if current customers express a need for RPI, than if they do not express a need. In other words, the farmer's perceived behavioral control to adopt an RPI increases when current customers express a need for RPI. In this situation, Ajzen (1988) suggests a direct influence of expressed needs by current customers for RPI on intention to adopt the RPI. The following hypothesis is proposed.

H3: Expressed needs by current customers for the RPI positively influence the farmer's

intention to adopt the RPI

Customer needs for an RPI are crucial to make an RPI viable. Dependence on the current customer reduces the family farm's ability to adopt the RPI if current customers do not express a need for the RPI, because dependence on the current customer reduces the family farm's ability to target potential customers that may express a need for the RPI. In other words, dependence on the current customer makes RPI adoption difficult when current customers do not express a need for the RPI. Also, if current customers do express a need for an RPI, the family farm will not only be able to, but will even have to, adopt the RPI when the family farm depends on the current

customer. Therefore, it is hypothesized that dependence on current customers stimulates the intention to adopt the RPI in a family farm if current customers have expressed a need for radical product innovation, and vice versa.

H4a: The higher the dependence on the current customers, the larger the influence of expressed
needs for the RPI by current customers on the farmer's intention to adopt the RPI

Dependence on current customers reduces the farmer's perceived behavioral control over RPI adoption. This will reduce the motivation of farmers to pursue the RPI. This is in line with Ajzen's (1988) theory of planned behavior, where a person's perceived behavioral control directly influences the person's intentions. Therefore, it is hypothesized that "dependence on the current customers" also has a direct negative influence on the "farmer's intention to adopt the RPI".

H4b: Dependence on the current customers has a direct negative influence on the farmer's
intention to adopt the RPI

Family farms may respond to the expressed needs of potential customers as well as current customers. Therefore, expressed needs for RPI by potential customers may positively influence the farmer's intention to adopt the RPI. More formally:

H5: Expressed needs for the RPI by potential customers positively influence the farmer's

intention to adopt the RPI

Throughout the NPD process, new product concepts are evaluated based on marketing

assumptions (Cooper, 1993). Marketing assumptions are a farmer's beliefs about, for example,

market size, market potential, and market acceptance of the product innovation. In our model, the

farmer's attitude towards the RPI is his overall evaluation of the RPI, and market-related beliefs

about the RPI are his marketing assumptions. It is hypothesized that favorable market-related

beliefs about the RPI positively influence the farmer's attitude towards adopting the RPI. For

firms, including family farms, the overriding objective is profitability (Narver and Slater, 1990).

Since market-related beliefs about prices and sales volumes are directly related to a farm's

profitability, a direct relationship is hypothesized between beliefs about "prices and/ or sales

volumes" and the "farmer's attitude towards the RPI". This holds in particular for many family

farms where production and sales volumes are given in the short term, because production cannot

be increased. More formally:

H6a: Market-related beliefs about prices and sales volumes for the RPI influence the farmer's

attitude towards the RPI

"Long-term oriented market-related beliefs about the RPI", such as consumer acceptance,

perceived quality, and competitive position, are expected to influence profitability via "prices

and/or sales volumes".

H6b: Long-term oriented market-related beliefs about the RPI influence beliefs about prices and sales volumes of the RPI

Farmers are supposed to evaluate RPIs based on a long-term orientation, because it will take several years to break even. Moreover, RPI adoption may be necessary to assure long term survival of the family farm. Consequently, the farmer may have a positive attitude towards the RPI irrespective of prices and sales volumes. Therefore, a direct relationship is hypothesized between long-term oriented market-related beliefs about the RPI and the "farmer's attitude towards the RPI". More formally:

H6c: Long-term oriented market-related beliefs about the RPI influence the farmer's attitude towards the RPI

Farmers will make marketing assumptions to evaluate RPIs, but also production-related assumptions. It is hypothesized that production-related beliefs about the RPI also influence the farmer's attitude towards adopting the RPI. Since costs of the RPI are directly related to a farm's profitability, a direct relationship is hypothesized between "beliefs about costs of the RPI" and the "farmer's attitude towards the RPI". More formally:

H7a: Beliefs about costs for the RPI influence the farmer's attitude towards the RPI

Production costs emanate from technical production processes. Technical production implications affect costs. Similarly, working conditions affect costs, because working conditions influence productivity.

H7b: Beliefs about technical production implications of the RPI and working conditions influence beliefs about costs for the RPI

Particularly in family farms where the farmer is personally involved in the production process, beliefs about technical production implications and working conditions directly influence the farmer's attitude towards the RPI. The farmer does not like running a farm with frequent production problems and poor working conditions.

H7c: Beliefs about technical production implications of the RPI and working conditions directly influence the farmer's attitude towards the RPI

Methodology

Sample

The proposed model will be tested for farms in the Dutch laying hen industry. Thus, our testing refers to real decision makers in a real decision-making context, as opposed to testing respondents in an experimental laboratory setting, which seems important to understand the market behavior of family farms (e.g. Smith, 1982). Farms in the Dutch laying hen industry suit the purpose, since they are family farms (with average sales amounts per farm from layers of

582.084 Euro in 2000 (Anonymous 2002, p.172)) and have to respond to customer needs, which require radical changes in production methods. These changes towards sustainable, particularly animal-friendly, production methods are communicated in the market and are in fact perceived by the consumer as fundamental improvements in product quality (Bijleveld and Duindam, 2003, Eelen, 1989). Most family farms in this industry sell to only one customer/ wholesaler for a relatively long period of time, which makes it easy to isolate the influence of customers. Specifically, 90.5% of the respondents in the sample sell over 90% of their produce to their most important customer and only 4.5% switched to another main customer in the year prior to the year of the survey. Therefore, the influence of an occasional second customer is neglected.

At the time of the data collection (2000), the market for eggs was in a state of flux: customer needs and preferences with respect to eggs had been highly predictable for most of the 20th century, i.e., clean, undamaged, and fresh eggs. During the 1990's, more and more consumers, retailers, and wholesalers preferred eggs that were also produced in an animal-friendly manner. This trend has led to radical product innovations that require high investments in production methods, such as the birdcage stable with or without chicken run, the free-range stable, with or without chicken run, and the biological production of eggs[1]. In 1999, this radical product innovation had gained a market share of 45% in the Dutch market for fresh consumed eggs.

A random sample of 220 poultry farmers was drawn from a list including all farms with more than 1000 laying hens. The respondents were first contacted by phone to request their

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[1] Free-range stable is referred to in the Netherlands as scharrelstal. Birdcage stable is referred to in the Netherlands as volière, which is in fact a French name

participation. Over 90% of the respondents agreed to participate. Face to face interviews were conducted, using a computer-guided questionnaire. Exactly 200 interviews were completed.

In this paper, only a specific part of the respondents was used, because the farmer's *intention* to adopt the RPI is investigated. Those already having adopted such a production method had obviously passed the stage of intention. Consequently, only farmers, who had not yet adopted an animal-friendly RPI could be used for our analysis. Of our total sample of 200 poultry farmers, 125 respondents had not (yet) adopted the RPI, and they were used in our analyses. Consequently, the test of the model proposed in this paper is biased toward less innovative producers. It might particularly affect our findings about the impact of the farmer's innovativeness in our model, since the most innovative farmers with respect to sustainability had already adopted the RPI.

Measures

All items of the measurement scales are shown in appendix A. The scores for the multiple-item variables in the model were computed by equally weighing and adding the corresponding item scores. All independent variables in the model were standardized to make the coefficients in the model comparable and to make the interpretation of the influence of individual components in the model easier (Irwin and McClelland, 2001).

Farmer's intention to adopt the RPI is assumed to capture the farmer's motivational factors that influence the family farm's adoption of the RPI. It is an indication of how hard the farmer is willing to try, or how much of an effort (s)he is willing to exert, in order to adopt the RPI. (This

is in line with Ajzen's (1991) definition of intentions). The farmer's intention to adopt the RPI was measured using the Juster Scale, as suggested by Day et al. (1991). Respondents indicated the likelihood of their producing eggs in a free-range stable with a chicken-run within 10 years. The Juster Scale is an eleven-point scale with verbal descriptions and probabilities associated with each number. The verbal descriptions range from "no chance" to "certain". The complete scale is shown in appendix A.

Farmer's attitude towards adopting the radical product innovation refers to the degree to which the farmer has a favorable or unfavorable evaluation or appraisal of the radical product innovation (This is in line with Ajzen's (1991) definition of attitude). The farmer's attitude towards adopting the radical product innovation was measured using three items. Respondents indicated their attitude towards "producing eggs in a free-range stable with a chicken-run" using a seven-point semantic differential scale. The three semantic differential scales were anchored by "a bad idea versus a good idea", "not wise versus wise" and "not attractive versus attractive". In a principal-component analysis, all items loaded higher than 0.8 on the first component, before rotation (*n*=125). The reliability of the measure (Cronbach's alpha) was 0.86 (*n*=125).

Farmer's innovativeness was measured with five items taken from Pallister and Foxall (1998). With the items, the respondent indicates whether (s)he considers him/ herself as creative and inventive and whether (s)he is willing to try innovations before other people do. All items load higher than 0.59 on the first component, before rotation and were maintained in the final measure. The reliability of the measure (Cronbach's alpha) was 0.73 (*n*=125).

Family farm's current success was measured with five items. Success was discussed during three group interviews with members of the research population. Keywords that came-up during the discussions about farm success were profitability, income, and margin per egg, performance relative to competitors and financial results. The latter was used as a subjective evaluation of the former keywords. Five items were generated based on these keywords. All items load higher than 0.65 on the first component, before rotation and were maintained in the final measure. The reliability of the measure (Cronbach's alpha) was 0.80 ($n=125$).

Dependence on the current customer is defined as the firm's need to maintain a relationship with its current customers to achieve its goals (Kumar, et al., 1995). Replaceability of the current customers is used to measure the family farm's dependence on the current customers (Heide and John, 1988, Kumar, et al., 1995). Three items were taken from Kumar, Scheer and Steenkamp (1995) and adapted for use in this study, based on discussions with members of the research population. All items loaded higher than 0.65 on the first component, before rotation ($n=125$). The reliability of the measure (Cronbach's alpha) was 0.66 ($n=125$).

Expressed needs of current customers

Our respondents provided the name and address of their main customer at the time of the survey, which allowed an assessment of the effect of specific customers on the family farm's intention to adopt an RPI. A total of 54 different customers were identified. The customer's turnover in radically new products was used as an approximation for "expressed needs of current customers".

The customer's turnover in radically new products was estimated based on the percentage of eggs that had the "animal friendly" product attribute in the customer's assortment. The total number of eggs sold to each customer by the respondents was calculated in the computer-guided interviews, as well as how many of these eggs had the product attribute "animal friendly". Then, the percentage of eggs with the product attribute "animal friendly" was used as a proxy for the expressed needs of current customers.

Expressed needs of potential customers

In the Netherlands, most family farms with laying hens sell their eggs to assembler packing plants, which are trading companies that assemble eggs from family farms with laying hens, pack for consumers, and distribute to retail outlets. All assembler packing plants, except the family farm's current customers, were assumed to be potential customers for family farms with laying hens. To measure the "expressed needs of potential customers", respondents rated the following statement on a seven-point semantic differential scale anchored by very unlikely and very likely: "Assembler packing plants think I should produce free-range eggs". This measurement is suggested by East (1997) to measure referent beliefs in the theory of planned behavior.

Subjective norm and specialization

Subjective norm was operationalized with one single item, as suggested by East (1997). Respondents rated the following statement on a seven-point semantic differential scale anchored by very unlikely and very likely: "Most people who are important to me think I should produce Free-range eggs".

Specialization was operationalized with three items, where respondents indicated what percentage of their farm in terms of turnover, labor demand, and income is related to the production of eggs. All items loaded higher than 0.92 on the first component, before rotation. The reliability of the measure (Cronbach's alpha) was 0.93 ($n=125$).

Market-related beliefs about the radical product innovation

Three group discussions were conducted to elicit salient outcome beliefs about the RPI, i.e. free-range eggs, as suggested by East (1997). These group discussions resulted in a list of 24 outcome beliefs about the RPI. These outcome beliefs were included in the final questionnaire. Fourteen market-related beliefs were identified, including beliefs about higher prices for the RPI, though not including beliefs about higher sales volumes. The reason for this is that family farms in this particular industry are unable to increase their sales volumes in the short term. Therefore, good market performance of the RPI leads to higher profit via higher prices only and not via higher sales volumes. Subsequently the market-related beliefs were included in a principal-component analysis with a varimax rotation. Based on the Scree Test Criterion (Hair, et al., 1992), four components were selected for the principal-component analysis. The components were labeled based on the beliefs that loaded highest on that particular component after rotation. These labels were:

- Beliefs about consumer's perception, acceptance and willingness to pay for the RPI (5 beliefs)
- Beliefs about traditional product quality dimensions (2 beliefs)
- Beliefs about competitive position and compliance with legislation (4 beliefs)

- Beliefs about higher prices (3 beliefs)

Outcome beliefs were considered only for the component on which they had the highest loading. Then the beliefs that were considered for each component were used as separate measures. Each measure, their label, and the beliefs included in the measure are reported in appendix A. "Beliefs about higher prices" are expected to mediate the relationship between "long-term oriented market-related beliefs about the RPI" and the "farmer's attitude towards the RPI".

Production-related beliefs about the radical product innovation

Ten production-related beliefs were identified during the group interviews and included in the questionnaire. The production-related beliefs were included in a principal-component analysis with a varimax rotation. Based on the Scree Test Criterion (Hair, et al., 1992), two components were selected. The two components were labeled based on the beliefs that loaded highest on that particular component after rotation. These labels were:

- Beliefs about technical production implications and working conditions (6 beliefs) and
- Beliefs about costs because of production inefficiency (4 beliefs)

Outcome beliefs were considered only for the component where they had the highest loading. Then, the beliefs considered for each component were used as separate measures. Each measure, their label, and the beliefs included in the measure are reported in appendix A. The latter component, i.e. "beliefs about costs because of production inefficiency", is expected to mediate the relationship between "beliefs about technical production implications and working conditions" and the "farmer's attitude towards the RPI".

Estimation procedure

After obtaining scores for the variables in our model, ordinary least squares (OLS) regression is used to estimate the coefficients of the independent variables in our model (n= 125). This procedure is often used in this kind of research (e.g. Jaworski and Kohli, 1993, Lukas and Ferrell, 2000). Our procedure seems more appropriate than structural equation modeling (SEM), when sample sizes are small in relation to the number of parameters that need to be estimated with SEM[2]. Hair et al. (1992) recommend a minimum of five observations for each estimated parameter. This would require a minimum of 470 respondents. However, this introduces another problem, as maximum likelihood estimation in SEM becomes too sensitive when sample sizes exceed 400 respondents, making all goodness-of-fit measures indicate a poor fit (Hair, et al., 1992). Furthermore, the investigation of interactions is tedious with SEM (Ping, 1995), particularly when the interacting variables have multiple items (Jaccard and Wan, 1995, Jöreskog and Yang, 1996).

To further analyze the nature of the moderating variables in the model, i.e. "farmer's innovativeness", "current success", and "dependence on current customers", the simple slopes of regression lines at specific values of the moderating variables were tested (Aiken and West, 1991). Slopes were calculated for low, average, and high values of the moderating variable. Average values, minus and plus the standard deviation of the moderating variable are used as average, low and high values for the moderating variable. This analysis shows how the influence

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[2] Our model includes 45 items that load on 13 latent variables. The measurement model requires the estimation of 32 item loadings, and 45 error variances. Furthermore, the 13 coefficients in the structural model needs to be estimated and 4 error terms for the endogenous variables in the model. The total number of estimated parameters is 94.

of the independent variable depends on the level of the moderating variable. A t-test for whether the slopes differ from zero is calculated (Aiken and West, 1991).

In Ajzen and Fishbein's (1980) theory of reasoned action, attitude is a weighted average of outcome beliefs. Outcome beliefs and weights are obtained by direct questioning. Then attitudes are calculated. In our model, attitude towards RPI is also a weighted average of outcome beliefs, but outcome beliefs and attitude towards RPI are obtained by direct questioning. The weights of each outcome belief are estimated by regressing attitude towards RPI on outcome beliefs. Mediation of variables in the model, i.e. "beliefs about prices" and "beliefs about costs through production efficiency", is investigated in three steps (Baron and Kenny, 1986). First, the dependent variable is regressed on all the independent variables, including the mediating variable. The coefficient for the mediating variable should be significant, but the coefficient for the independent variable that is expected to be fully mediated should not be significant. Second, the dependent variable is regressed on all the independent variables, excluding the mediating variable. The coefficient for the independent variable that is expected to be mediated should now be significant. Third, the mediating variable is regressed on the other independent variables. The coefficient for the independent variables that the mediating variable is expected to mediate should be significant.

Results

Table 1 shows the results of OLS regression of the "farmer's intention to adopt the RPI" on the "farmer's attitude towards the RPI", "expressed needs by current customers for the RPI",

"dependence on the current customer", "expressed needs of potential customers for the RPI", the

"farmer's innovativeness", the "family farm's current success", and the background variables.

Table 1: **OLS results in which the farmer's intention to adopt the RPI is regressed on a number of explanatory variables**

	Farmer's intention to adopt the RPI
Farmer's attitude towards the RPI (H1)	0.76***
"Farmer's innovativeness" x "farmer's attitude towards the RPI" (H2a)	0.29*
"Family farm's current success" x "farmer's attitude towards adopting the RPI" (H2b)	-0.47***
"Farmer's innovativeness"	0.18
"Family farm's current success"	-0.13
"Expressed needs by <u>current</u> customers for the RPI" (H3)	0.70***
"Expressed needs by current customers for the RPI" x "dependence on the current customers" (H4a)	0.04
Dependence on the current customers (H4b)	-0.49***
"Expressed needs of <u>potential</u> customers for RPI" (H5)	0.46**
"Subjective norm"	-0.06
Age	0.00
Specialization	-0.66***
Constant	-3.331
N	125
F	7.4***
R^2 (adjusted R^2)	0.44 (0.38)

* p<0.1, ** p< 0.05, *** p=<0.01

The condition number is 5.77, which is far below 20 and indicates no problem with multicollinearity (Greene, 2003). The variance inflation factor (VIF) of each coefficient is smaller than 1.5. Since the R^2 is 0.44, the VIF of each coefficient in the model should be smaller than $1/(1-0.44)= 1.8$ to provide some assurance that multicollinearity is not a serious problem for a specific coefficient (Klein 1962). The correlation matrix of all the variables in our model is provided in appendix B.

Hypothesis 1 is supported by the significant coefficient for "farmer's attitude towards the RPI" (b=0.76, $p<0.01$) in table 1. This is the effect of "farmer's attitude towards the RPI" on "farmer's intention to adopt the RPI", for average values of the moderating variables, i.e., "farmer's innovativeness", and "family farm's current success" (Irwin and McClelland, 2001), because both moderating variables are standardized.

Marginal support is found for Hypothesis 2a, because the coefficient for the interaction term between "farmer's attitude towards the RPI" and "farmer's innovativeness" (b=0.12, $p=0.10$) in table 1 is significant at the 10% level only, but has the hypothesized sign.

Hypothesis 2b is confirmed by the significant negative coefficient for the interaction term between "family farm's current success" and "farmer's attitude towards the RPI" (b=-0.47, $p=0.01$) in table 1.

Hypothesis 3 that "expressed needs by current customers for RPI" positively influence "farmer's intention to adopt the RPI" is supported by the significant coefficient for "expressed needs by current customers for the RPI" in table 1 (b=0.70, $p<0.01$).

Hypothesis 4a is not confirmed. The coefficient for the interaction term between "dependence on the current customers" and "expressed needs by current customers for the RPI" (b=0.04, *p*=0.79) in table 1 is not significant. Hypothesis 4b is confirmed. "Dependence on the current customers" has a negative influence on "farmer's intention to adopt the RPI" (b=-0.49, *p*<0.01). Hypothesis 5 is confirmed by the significant coefficient for "expressed needs by potential customers for the RPI" (b=0.46, *p*=0.02) in table 1.

Two additional explanatory variables that were included as background variables, "subjective norm" (b=-0.06, *p*=0.87) and age (b=0.02, *p*=0.88), did not have a significant influence on "farmer's intention to adopt the RPI"[3]. Specialization, however, did have a significant negative influence on "farmer's intention to adopt the RPI" (b=-0.26, p<0.01). The latter result may be explained by the fact that this specific RPI can be combined with other activities that are common to mixed farms in our research population (e.g. arable farming). Moreover, specialization makes it harder to adopt, because large-scale production of this specific RPI is hard to carry through by specialized farms.

Using the results of table 1, the nature of the moderating variables on the relationship between "attitude towards adopting the RPI" and "intention to adopt the RPI" can be further shown by using the average score minus (plus) the standard deviation as the influence of "farmer's attitude

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[3] Subjective norm correlates with farmer's intention to adopt the RPI. Subjective norm also correlates with expressed needs for RPI by current customers and potential customers (see appendix A). This was expected, because, in family farms, current and potential customers also meet with the farmer's family members who are an important component in subjective norm. Subjective norm probably correlates with farmer's intention to adopt the RPI, because the subjective norm and the farmer's intention to adopt the RPI have the same explanatory variables, i.e. expressed needs for RPI by current customers and potential customers.

towards adopting the RPI" on "intention to adopt the RPI", when the moderating variables are relatively low (high). This means subtracting (adding) the coefficient for the interaction term from (to) the coefficient for "attitude towards adopting the RPI", because the moderating variables are standardized. Table 2 shows the results of these calculations.

Table 2: **Influence of "farmer's innovativeness" and "family farm's current success" on the relationship between "farmer's attitude towards the RPI" and "farmer's intention to adopt the RPI"**

Dependent Variable:	Farmer's intention to adopt the RPI			
	Farmer's innovativeness		Family farm's current success	
	Low	high	low	High
Influence of "farmer's attitude towards the RPI"	0.47 (p=0.07)	1.05 (p<0.01)	1.23 (p<0.01)	0.29 (p=0.27)

The results in table 2 confirm Hypothesis 2a by showing that the influence of "farmer's attitude towards the RPI" on the farmer's intention to adopt the RPI is positive and highly significant (b=0.1.05, p<0.01) when "farmer's innovativeness" is relatively high and positive, but only marginally significant (b=0.47, p=0.07) when "farmer's innovativeness" is relatively low[4].

Also, Hypothesis 2b is confirmed by the results in table 2. The influence of "farmer's attitude towards the RPI" on "farmer's intention to adopt the RPI" is positive and highly significant (b=0.1.23, p<0.01) when "family farm's current success" is relatively low and not significantly different from zero (b=0.29, p=0.27) when "family farm's current success" is relatively high.

Hypotheses 6a, 6b, 6c, 7a, 7b and 7c are tested using the procedure suggested by Baron and Kenny (1986), as described before. Table 3 shows the first step in the test for mediating variables, the results of an OLS regression of "farmer's attitude towards the RPI" on all "market-related beliefs about the RPI" and all "production-related beliefs about the RPI". The condition number is 4.97, which is far below 20 and hence indicates no problems with multicollinearity (Greene, 2003).

Table 3: Step one in the test for mediating variables: results of OLS regression of "farmer's attitude towards adopting the RPI" on "market-related beliefs about the RPI" and "production-related beliefs about the RPI"

	Farmer's attitude towards the RPI
Market-related beliefs about the RPI	
• Beliefs about consumer's perception, acceptance, and willingness to pay for the RPI (H6c)	0.10
• Beliefs about traditional product quality dimensions (H6c)	0.06
• Beliefs about competitive position and compliance with legislation (H6c)	0.22***
• Beliefs about prices (H6a)	0.24***
Production-related beliefs about the RPI	
• Beliefs about technical production implications and working conditions (H7c)	-0.12
• Beliefs about costs because of production inefficiency (H7a)	-0.30***
N	125
F	12.9***
R^2 (adjusted R^2)	0.40 (0.37)

* p<0.1, ** p< 0.05, *** p<0.01

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[4] *p* values are calculated using *Simple Slope Analysis by Computer* as described by Aiken and West (1991, p.18)

Both coefficients for the hypothesized mediating variables "beliefs about prices" (b=0.24, p<0.01) and "beliefs about costs because of production inefficiency" (b=-0.30, p<0.01) are significant, which confirms hypotheses 6a and 7a, respectively. The coefficient for "beliefs about competitive position and compliance with legislation" is also significant (b=0.22, p<0.01), which confirms hypothesis H6c for beliefs about competitive position and compliance with legislation.

The coefficients for the other market-related beliefs about the RPI, i.e. "beliefs about consumer's perception, acceptance and willingness to pay for the RPI" (b=0.10, p=0.22) and "beliefs about traditional product quality dimensions" (b=0.06, p=0.52), are not significant, which does not confirm hypothesis 6c for beliefs about consumer's perception, acceptance and willingness to pay for the RPI and beliefs about traditional product quality dimensions. The coefficient for "beliefs about technical production implications and working conditions" is not significant either, which does not confirm hypothesis 7c.

Table 4 shows the results of the second step in the test for mediating variables. "Farmer's attitude towards adopting the RPI" is regressed on the "market-related beliefs about the RPI" and the "production-related beliefs about the RPI", without the hypothesized mediating variables, respectively "beliefs about prices" and "beliefs about costs because of production inefficiency". Removing "beliefs about prices" as an independent variable results in a significant coefficient for "beliefs about consumer's perception, acceptance and willingness to pay for the RPI" (b=0.19, p=0.02). "Beliefs about traditional product quality dimensions" do not influence the "farmer's attitude towards adopting the RPI", because the coefficient is not significant (b=0.09, p=0.33).

Table 4: **Step two in the test for mediating variables: OLS results excluding the hypothesized mediating variables as independent variables**

	Farmer's attitude towards the RPI	
Market-related beliefs about the RPI		
• Beliefs about consumer's perception, acceptance, and willingness to pay for the RPI (H6c)	0.18**	0.08
• Beliefs about traditional product quality dimensions (H6c)	0.09	0.09
• Beliefs about competitive position and compliance with legislation (H6c)	0.24***	0.30***
• Beliefs about prices (H6a)		0.29***
Production-related beliefs about the RPI		
• Beliefs about technical production implications and working conditions	-0.08	-0.20**
• Beliefs about costs because of production inefficiency	-0.34***	
N	125	125
F	12.90***	11.9***
R^2 (adjusted R^2)	0.35(0.32)	0.33(0.31)

* p<0.1, ** p< 0.05, *** p<0.01

Removing "beliefs about costs because of production inefficiency" as an independent variable results in a significant coefficient for "beliefs about technical production implications and working conditions". This supports our hypothesis that the influence of "beliefs about technical production implications and working conditions" is mediated by "beliefs about costs because of production inefficiency".

The final step in the test for mediating variables is shown in table 5 where the hypothesized mediating variables "beliefs about prices" and "beliefs about costs because of production inefficiency" are regressed on all long-term oriented beliefs about the RPI.

Table 5: Step three in the test for mediating variables: OLS results with the hypothesized mediating variables as dependent variables

	"Beliefs about prices"	"Beliefs about costs…"
Market-related beliefs about the RPI		
• Beliefs about consumer's perception, acceptance, and willingness to pay for the RPI (H6b)	0.36***	0.06
• Beliefs about traditional product quality dimensions (H6b)	0.13	-0.11
• Beliefs about competitive position and compliance with legislation (H6b)	0.11	-0.29***
• Beliefs about prices		-0.18**
Production-related beliefs about the RPI		
• Beliefs about technical production implications and working conditions (H7b)	0.20*	0.27***
• Beliefs about costs because of production inefficiency	0.19**	
N	125	125
F	6.37	9.57
R^2 (adjusted R^2)	0.21(0.18)	0.29(0.26)

* $p<0.1$, ** $p< 0.05$, *** $p<0.01$

The results in table 5 show that "beliefs about consumer's perception, acceptance and willingness to pay for the RPI" is significantly related to "beliefs about prices" (b=0.36, $p<0.01$). This confirms hypothesis 6b that long-term oriented market-related beliefs about the RPI influence

beliefs about prices and sales volumes for the RPI, for this particular long-term oriented market-related belief. Other market-related beliefs, i.e. "beliefs about traditional product quality dimensions" (b=0.13, p<0.18) and "beliefs about competitive position and compliance with legislation" (b=0.11, p<0.24) are not significantly related, which does not confirm hypothesis 6b for these long-term oriented market-related beliefs. Furthermore, it shows that "beliefs about technical production implications and working conditions" are significantly positively related to "beliefs about costs because of production inefficiency", which confirms hypothesis 7b that beliefs about technical production implications of the RPI and poor working conditions influence beliefs about costs for the RPI.

In summary, some long-term oriented market-related beliefs, specifically "beliefs about consumer's perception, acceptance, and willingness to pay for the RPI", influence "farmer's attitude towards the RPI" via "beliefs about prices". Other long-term oriented market-related beliefs, specifically "beliefs about competitive position and compliance with legislation", directly influence "farmer's attitude towards the RPI". Still other long-term oriented market-related beliefs, specifically "beliefs about traditional product quality dimensions", do not influence "farmer's attitude towards the RPI".

"Beliefs about technical production implications and working conditions" influence "farmer's attitude towards the RPI" via "beliefs about costs because of production inefficiency".

Conclusions and discussion

Figure 2 summarizes the results by showing the relationships that have been confirmed in the analyses of our model. Our results confirm that the farmer's intention to adopt RPIs is driven by the farmer's attitude towards RPI, the expressed needs of current customers, expressed needs of potential customers, and the family farm's dependence on its current customers.

It appears that the attitude towards an RPI stimulates the farmer's intention to adopt the RPI. The conclusion that the influence of a farmer's attitude towards the RPI on the farmer's intention to adopt the RPI increases when success with current products is smaller is in line with Zaltman, Duncan and Holbeck (1973). They suggest that the gap between satisfactory performance and actual performance stimulates the search for innovation opportunities. Only marginal support was found for a moderating influence of the farmer's innovativeness on the relationship between attitude towards the RPI and the farmer's intention to adopt the RPI. But attitude towards the RPI appears to stimulate the farmer's intention to adopt the RPI, particularly when the farmer is highly innovative.

Current customers are very influential as to RPI in family farms. Expressed needs of current customers drive the farmer's intention to adopt the RPI. Furthermore, dependence on current customers reduces the farmer's intention to adopt an RPI.

Expressed needs by potential customers for the RPI also increase the farmer's intention to adopt the RPI. Our results on the intention of adoption confirm that family farms are motivated to

respond to potential customers, probably because the expected contribution to profits of potential customers is attractive for family farms. Chistensen and Bower (1996) suggest that managers in large firms are not motivated to respond to potential customers, because the expected contribution of potential customers to profits is initially often small for large firms. This differs from family farms, which tend to be sensitive to potential customer needs, at least at the intention stage. Therefore, family farms may be important to the early penetration of RPIs in agriculture (Rothwell and Dodgson, 1994).

Our findings elaborate on Cooper's (1999) suggestion that a thorough assessment of market characteristics and a firm's capabilities to compete in the market is often ignored in the evaluation of product innovations. It is shown that both market-related beliefs and production-related beliefs influence a farmer's attitude towards the RPI.

The influence of beliefs about the consumer's perception, acceptance, and willingness to pay for the RPI is fully mediated by beliefs about higher prices. In other words, the expected consumer satisfaction from an RPI will only stimulate the adoption of RPIs by family farms if it is expected to result in higher prices. Thus, the possible influence of the consumer's perception, acceptance, and willingness to pay for the RPI on the long-term performance of the RPI does not motivate family farms to adopt it. The influences of other long-term oriented market-related beliefs on farmer's attitude towards the RPI were not mediated by beliefs about prices. Competitive position and compliance with regulation had a direct influence on the farmer's attitude towards the RPI.

The influence of beliefs about traditional product quality dimensions on the farmer's attitude towards the RPI was not confirmed.

The influence of beliefs about technical production implications and working conditions on the farmer's attitude towards the RPI is fully mediated by expectations about costs.

Personal characteristics of the farmer appear to be of marginal influence on the intention to adopt RPI in family farms. Age does not influence the intention to adopt the RPI. Market environment, particularly the family farm's current customers, seems of much more influence on the intention to adopt RPI in family farms than the personal characteristics of the farmer.

Figure 2: Confirmed relationships in our model explaining a farmer's intention to adopt an RPI
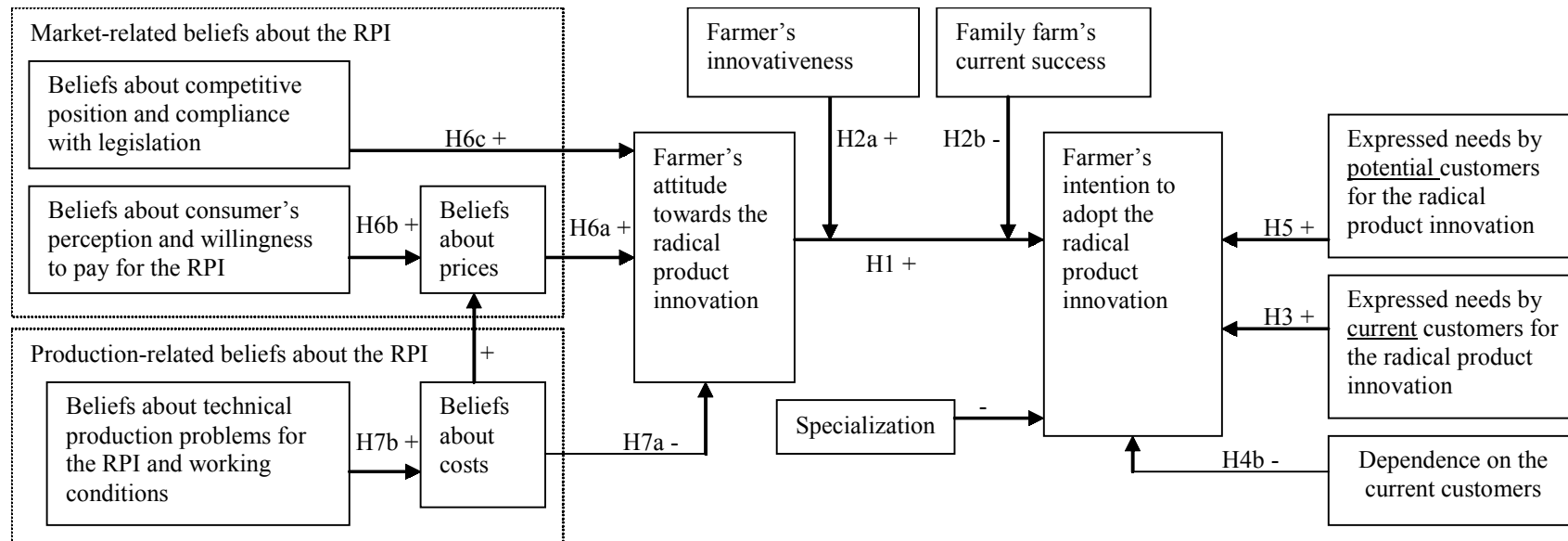
Appendix A

Intention to adopt the RPI

How likely do you consider it to be that you will produce eggs in a free-range stable with a chicken run?

(Hoe aannemelijk acht U het dat U binnen 10 jaar eieren produceert met kippen in een scharrel systeem met vrije uitloop?)

10	Certain or practically certain	99 % chance
9	Almost sure	90 % chance
8	Very probable	80 % chance
7	Probable	70 % chance
6	Good possibility	60 % chance
5	Fairly good possibility	50 % chance
4	Fair possibility	40 % chance
3	Some possibility	30 % chance
2	Slight possibility	20 % chance
1	Very slight possibility	10 % chance
0	No chance, almost no chance	1 % chance

Attitude towards the RPI

I consider keeping hens in a free-range stable with a chicken-run to be

Ik vind het houden van kippen in een scharrelsysteem met vrije uitloop

	A bad idee-3	-2	-1	0	+1	+2	+3 A good idea
	Unwise -3	-2	-1	0	+1	+2	+3 Wise
	Unattractive -3	-2	-1	0	+1	+2	+3 Attractive

Dependence on current customers (Alpha = 0.86)

1. There are other customers than my major buyer to whom I could sell my eggs (R)

   (Er zijn andere klanten dan mijn belangrijkste afnemer aan wie ik mijn eieren kan leveren)

2. It is costly for me to switch to another buyer

   (Het is voor mij kostbaar om om te schakelen naar een andere afnemer)

3. It would be difficult for me to replace my most important buyer without losing some income

   (Het zou voor mij moeilijk zijn om mijn belangrijkste afnemer te vervangen zonder dat mijn inkomen daardoor onder druk komt te staan)

Current success (Alpha = 0.80)

1. Compared to colleagues, I achieve a good margin per egg

   (Vergeleken met collega's haal ik een goede marge per ei)

2. Compared to colleagues, I achieve good financial results with layers

   (Vergeleken met collega's haal ik goede financiële resultaten in de legpluimveehouderij)

3. Compared to colleagues, I have a profitable layer business

   (Vergeleken met collega's heb ik een rendabel legpluimveebedrijf)

4. I acquire a good income from my layer business

   (Ik haal een goed inkomen uit mijn legpluimveebedrijf)

5. I achieve excellent financial results with my layer business

   (Ik behaal met mijn legpluimveebedrijf uitstekende financiële resultaten)

Farmer's Innovativeness (Alpha = 0.73)

1. I am reluctant to introduce new ways of doing things until I see them work well for other poultry farms

   (Ik ben terughoudend met het doorvoeren van nieuwe werkwijzen totdat ik zie dat het goed werkt op andere pluimveebedrijven)

2. I need to see other people use something new before I will consider it

   (Ik moet eerst zien dat andere mensen iets nieuws gebruiken voordat ik het zelf overweeg)

3. I often find myself skeptical of new ideas

   (Ik merk dat ik vaak sceptisch sta tegenover nieuwe ideeën)

4. I consider myself to be creative and original in my thinking and behavior

   (Ik zie mijzelf als creatief en origineel in denken en doen)

5. I am an inventive kind of person

(Ik ben een inventief persoon)

Specialisation (Alpha = 0.93)

Which part of your farm consists of laying hens in terms of (in a normal year):

(Welk deel van Uw bedrijf bestaat uit legpluimveehouderij (in een normaal jaar))

1. Turnover   In omzet

2. Labor requirements   In arbeidsbehoefte

3. Income   In inkomen

<u>Market-related beliefs about the RPI</u>

Beliefs about consumer's perception, acceptance, and willingness to pay for the RPI

1. In the eyes of consumers free-range systems with chicken-run are animal friendly

   (In de ogen van consumenten zijn scharrelsystemen met vrije uitloop diervriendelijk)

2. The consumer will accept the production of eggs in free-range systems with chicken-run

   (De consument zal de productie van eieren in scharrelsystemen met vrije uitloop
   accepteren)

3. Social organizations will accept the production of eggs in free-range systems with

   chicken-run

   (Maatschappelijke organisaties zullen de productie van eieren in scharrelsystemen met

   vrije uitloop accepteren)

4. In the future, consumers will pay extra for eggs produced in free-range systems with

   chicken-run

   (Consumenten betalen in de toekomst extra voor eieren geproduceerd met kippen in

   scharrelsystemen met vrije uitloop)

5. The production of eggs in free-range systems with chicken-run adds emotional value to eggs

(De productie van eieren in scharrelsystemen met vrije uitloop geeft gevoelswaarde aan het ei)

Beliefs about traditional product quality dimensions

1. Poultry farmers producing eggs in free-range systems with chicken-run have a high percentage of dirty eggs (R)

(Pluimveehouders die eieren produceren in scharrelsystemen met vrije uitloop hebben een hoog percentage vuile eieren (R))

2. Eggs from free-range systems with chicken-run are often contaminated with salmonella (R)

(Eieren uit scharrelsystemen met vrije uitloop zijn vaak besmet met salmonella (R))

Beliefs about competitive position and compliance with legislation

1. Eggs from free-range systems with chicken-run cannot compete with foreign eggs (R)

(Eieren uit scharrelsystemen met vrije uitloop kunnen niet concurreren met buitenlandse eieren (R))

2. The specific knowledge required to produce eggs in free-range systems with chicken-run gives Dutch poultry farmers a competitive advantage

(De specifieke kennis die nodig is voor scharrelsystemen met vrije uitloop geeft Nederlandse pluimveehouders een concurrentievoorsprong)

3. Keeping hens in free-range systems with chicken-run will fulfill all legal requirements in the future

(Het houden van kippen in scharrelsystemen met vrije uitloop voldoet in de toekomst aan alle wettelijke eisen)

4. Keeping hens in free-range systems with chicken-run is possible within state and community legislation

(Het houden van kippen in scharrelsystemen met vrije uitloop is mogelijk binnen de regels van gemeenten en provincies)

Beliefs about prices

1. Poultry farmers producing eggs in free-range systems with chicken-run receive an attractive bonus on their egg price

(Pluimveehouders die eieren produceren in scharrelsystemen met vrije uitloop ontvangen een aantrekkelijke toeslag op de eierenprijs)

2. Poultry farmers producing eggs in free-range systems with chicken-run receive a high profit margin per hen

(Pluimveehouders die eieren produceren in scharrelsystemen met vrije uitloop behalen een hoge marge per kip)

3. Poultry farmers producing eggs in free-range systems with chicken-run achieve good financial results

(Pluimveehouders die eieren produceren in scharrelsystemen met vrije uitloop behalen goede financiële resultaten)

Production-related beliefs

Beliefs about technical production implications and working conditions

1. Hens in free-range systems with chicken-run suffer from diseases a lot

   (Kippen in scharrelsystemen met vrije uitloop hebben veel last van ziekten)

2. Free-range systems with chicken-run lead to problems with cannibalization

   (Scharrelsystemen met vrije uitloop leiden tot problemen met kannibalisme)

3. Free-range systems with chicken-run lead to high environmental pollution

   (Scharrelsystemen met vrije uitloop leiden tot een hoge milieubelasting)

4. Keeping hens free from diseases is very hard in free-range systems with chicken-run

   (Kippen vrij houden van ziekten is zeer moeilijk in scharrelsystemen met vrije uitloop)

5. A free-range system with chicken-run is unhealthy for the poultry farmer

   (Een scharrelsysteem met vrije uitloop is ongezond voor de pluimveehouder)

6. A free-range system with chicken-run requires a lot of work during evening hours

   (Een scharrelsysteem met vrije uitloop vereist veel werk in de avonduren

Beliefs about costs because of production inefficiency

1. A free-range system with chicken-run is labor intensive

   (Eierenproductie in scharrelsystemen met vrije uitloop is arbeidsintensief

2. Egg productivity is low in a free-range system with chicken-run

   (De eierenproductie per kip is laag in een scharrelsysteem met vrije uitloop

3. Producing eggs in a free-range system with chicken-run is expensive

   (Productie van eieren in scharrelsystemen met vrije uitloop is duur

4. A free-range system with chicken-run is not efficient

   (Een scharrelsysteem met vrije uitloop is niet efficiënt

Appendix B

Table 3: Correlation coefficients between the variables in our model (*p* values between brackets)

	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.	15.
1. Farmer's intention to adopt the RPI															
2. Farmer's attitude towards the RPI	0.47 (0.00)														
3. Expressed needs by <u>current</u> customers for the RPI	0.32 (0.00)	0.25 (0.00)													
4. Expressed needs of <u>potential</u> customers for RPI	0.27 (0.00)	0.23 (0.01)	0.12 (0.20)												
5. Dependence on the current customers	-0.06 (0.50)	0.01 (0.93)	0.22 (0.01)	0.17 (0.07)											
6. Farmer's innovativeness	-0.05 (0.60)	-0.16 (0.07)	-0.05 (0.54)	-0.21 (0.02)	-0.14 (0.12)										
7. family farm's current success	-0.08 (0.35)	-0.12 (0.19)	0.15 (0.08)	-0.06 (0.54)	0.02 (0.79)	0.11 (0.23)									
8. Subjective norm	0.26 (0.00)	0.36 (0.00)	0.18 (0.04)	0.42 (0.00)	0.08 (0.37)	-0.09 (0.34)	-0.02 (0.79)								
9. Specialization	-0.28 (0.00)	-0.11 (0.22)	0.04 (0.65)	0.03 (0.72)	-0.12 (0.19)	0.13 (0.15)	0.13 (0.14)	-0.07 (0.42)							
10. Age	-0.07 (0.46)	-0.13 (0.16)	-0.03 (0.72)	-0.01 (0.87)	-0.06 (0.51)	-0.12 (0.17)	-0.01 (0.95)	-0.22 (0.01)	0.01 (0.88)						
11. Beliefs about consumer's perception, acceptance and willingness to pay for the RPI	0.10 (0.28)	0.20 (0.02)	-0.01 (0.88)	0.00 (0.96)	-0.36 (0.00)	0.18 (0.04)	0.22 (0.01)	0.09 (0.31)	0.06 (0.53)	-0.10 (0.27)					
12. Beliefs about traditional product quality dimensions	0.28 (0.00)	0.24 (0.01)	0.14 (0.12)	0.08 (0.36)	-0.04 (0.63)	0.08 (0.38)	-0.24 (0.01)	0.02 (0.85)	-0.06 (0.48)	-0.08 (0.38)	-0.05 (0.58)				
13. Beliefs about competitive position and compliance with legislation	0.25 (0.01)	0.42 (0.00)	0.14 (0.13)	0.19 (0.04)	0.03 (0.78)	-0.08 (0.37)	-0.02 (0.81)	0.14 (0.13)	-0.14 (0.13)	0.05 (0.56)	0.10 (0.25)	0.09 (0.31)			
14. Beliefs about prices	0.16 (0.08)	0.37 (0.00)	0.17 (0.07)	0.19 (0.03)	-0.10 (0.26)	0.03 (0.71)	0.07 (0.46)	0.34 (0.00)	0.01 (0.91)	-0.10 (0.26)	0.37 (0.00)	0.08 (0.40)	0.19 (0.04)		
15. Beliefs about technical production implications and working conditions	-0.28 (0.00)	-0.30 (0.00)	-0.09 (0.33)	-0.06 (0.52)	-0.03 (0.77)	0.08 (0.38)	0.06 (0.49)	-0.04 (0.67)	0.09 (0.31)	0.06 (0.51)	0.05 (0.61)	-0.53 (0.00)	-0.22 (0.01)	0.04 (0.63)	
16. Beliefs about costs because of production inefficiency	-0.10 (0.28)	-0.50 (0.00)	-0.11 (0.22)	-0.07 (0.42)	+0.03 (0.72)	0.06 (0.50)	0.07 (0.42)	-0.21 (0.02)	0.12 (0.19)	0.18 (0.05)	-0.02 (0.80)	-0.30 (0.00)	-0.39 (0.00)	-0.21 (0.02)	0.39 (0.00)

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