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## Creating a market for price swaps: Case study of an innovative risk management instrument in the Belgian-Dutch pear market

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**Abstract:** While the benefits of using futures to manage price risk are widely recognised, only certain groups of farmers have suitable futures at their disposal. This paper discusses an innovative instrument, developed in the Belgian-Dutch pear market, that provides an alternative to futures markets by creating a market for price swaps. Thus, the instrument provides some benefits of market-traded derivatives (like futures) while remaining a relatively simple instrument, which requires fewer market transactions. The paper describes key properties of the swap contracts and the platform used to trade them. In addition, it compares the conditions required for establishing price swap markets and futures markets. Thus, our study informs the design of similar risk management instruments for commodities and contexts where futures are absent.

**Keywords:** collective action; financial derivatives; fruit; risk management

As agriculture is a risky business, policymakers and advisors have been advocating and stimulating the use of risk management instruments. This has particularly been the case in Europe, following the Common Agricultural Policy's shift from managed to unmanaged markets over the last decades (Veerman et al. 2016; Michels et al. 2019). One of the advocated solutions for managing price risk is the use of financial derivatives, which allow farmers to manage risk without interfering with production choices and marketing channels. The financial derivatives used in agriculture can be classified as futures, options, and price swaps (Kang and Mahajan 2006). Among these categories, futures have by far received the most attention. Futures markets are considered beneficial as they provide an anonymous market of derivatives, allowing farmers to manage price risk without incurring counterparty risk, and assisting in the price discovery process in commodity markets.

However, not all commodities are suitable for futures trading. Futures contracts are more likely to succeed when the underlying commodity is storable and standardised, the commodity's prices are sufficiently volatile, and the commodity's market is sufficiently large and active (Pennings and Leuthold 1999; Bergfjord 2007; Siqueira et al. 2008). Futures contracts regularly fail because they attract insufficient market participants, a situation described as insufficient market depth or liquidity. Most of the commodity futures contracts that have been introduced have failed (Bergfjord 2007).

In addition, using futures requires considerable marketing skills and effort. While US farmers commonly use futures, this is much less the case in Europe (Pennings and Egelkraut 2003; Michels et al. 2019). Successful EU futures contracts exist for cereals (wheat, maize, rapeseed), potatoes and milk products (skimmed milk powder, butter). However, pig futures never reached high liquidity levels (Ziegelbäck and Kastner 2013; Adämmer et al. 2016)

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and were terminated in 2017. As research on the drivers of European farmers' futures use is scarce (Anastassiadis et al. 2014), it is still poorly understood why EU farmers' futures use is comparatively low.

It is useful to examine whether other financial derivatives can help to manage price risk when futures markets are absent, or their adoption is constrained. Price swaps (or "swaps") are especially promising in this case, as they are simple to understand and use. A swap is a contract to exchange a variable price against a fixed price. Swaps are bilateral contracts, traded over-the-counter (OTC). Swaps are widely used in the oil market, but much less in the agricultural sector. Among the few examples are the pig meat price swaps recently established in France (Cordier 2018) and Belgium (Vilt 2017). While trading contracts OTC does not require farmers to be knowledgeable about derivatives markets, it has some inherent disadvantages as compared to futures. OTC markets are not transparent unless public bodies mandate the registration of contracts, and hence do not contribute to price discovery. Second, bilateral OTC contracts are subject to counterparty risk, i.e. the risk that a counterparty defaults on the financial exchange (Kang and Mahajan 2006). Furthermore, as OTC swaps disclose the identity of hedgers, these reveal strategic information by entering swaps.

Creating an (anonymous) market for financial derivatives (as exchanges do for futures) would offer key advantages. This paper discusses The Fruit Trading Company (FTC) case, which shows how this can be done. FTC developed an innovative instrument to create an anonymous market for pear price swaps. We describe key properties of FTC's swap contracts and the platform used to trade them. Also, we evaluate the potential of swap trading platforms by comparing the conditions for establishing them with those for futures markets, as developed by Siqueira et al. (2008) and Bergfjord (2007). Our case study thus illustrates how swap trading platforms may be used as a risk management instrument providing similar benefits as futures markets.

The paper proceeds by describing the case in the following sections. The case description provides background, explains how the instrument works and discusses its uptake by farmers and pear buyers. The third section discusses the conditions under which FTC's swap trading platform was developed, and how these compare to futures markets' conditions. It also briefly discusses the implications of establishing FTC's instrument for farmers and the pear market in general. The fourth section concludes.

## CASE DESCRIPTION

**Background.** FTC's establishment is rooted in the Belgian-Dutch pear market crisis that has followed the Russian import ban on EU pears in 2014. Russia was the primary destination market for Belgian and Dutch pears; the loss of formal access to this market resulted in severe income losses for farmers. In 2018, a political action group of Belgian fruit farmers called "Actiegroep Fruittelers/Groupe d'Action des Producteurs de Fruits" (AGF) was established, demanding, among other things, better pear prices to policymakers (FreshPlaza 2019; Vilt 2019). This action group supported the agricultural business advisory company DLV to develop an instrument to secure fixed pear prices over the sales season. DLV sought to base the instrument on financial derivatives, as this is the company's expertise. Using futures was not an option: while futures for fresh fruit exist<sup>1</sup>, these are not useful for hedging EU pear prices. As an alternative, DLV developed an exchange-like trading platform for price swap contracts, expected to deliver similar benefits as futures markets. The company sometimes refers to the instrument as "pseudo futures market".

FTC aims to involve both Belgian and Dutch Conférence pear farmers. Both countries are specialised in Conférence pear production for export. The mild coastal climate gives Belgium and The Netherlands a strong competitive advantage in the global pear market. Over 55% of the Belgian and 35% of the Dutch tree fruit acreage consisted of Conférence pear trees in 2019, and production levels are still rising (Figure 1). When combined, Belgium and The Netherlands are the largest pear exporter worldwide, accounting for 27.3% of global pear exports in 2014 (WAPA 2020).

The majority of pear farmers are members of a cooperative. While historically both Belgian and Dutch cooperatives used auctions to price pears, nowadays only Belgian cooperatives still do so. However, the auctions organised by Belgian cooperatives are still crucial for the price discovery process. Auction prices are used as a reference for price negotiations in any type of contractual arrangement between producers and wholesalers in the Benelux, and beyond. Auctions provide an anonymous market, where prices are determined by the quantity of supply and demand at the time of auctioning (Bijman and Hendrikse 2003). Therefore, auction prices are expected to be more elastic than prices negotiated in con-

<sup>1</sup>The first apple futures were launched on the Zhengzhou Commodity Exchange in 2017.

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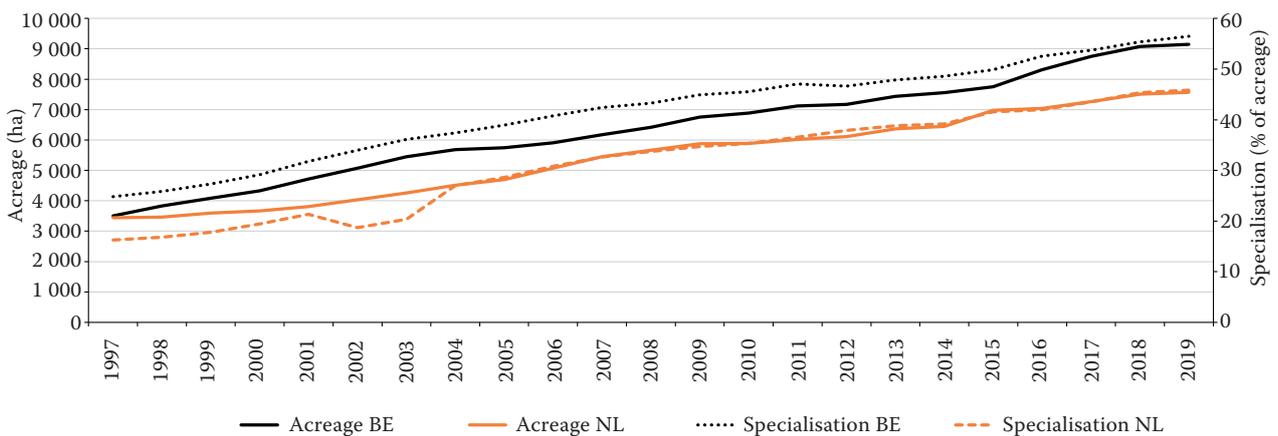


Figure 1. Conférence pear acreage and specialisation level in Belgium and The Netherlands

BE – Belgium; NL – The Netherlands

Source: Authors, based on data from Statbel (2020a) for Belgium and CBS (2020) for The Netherlands

tractual arrangements involving personal relationships; and thus intensifying price volatility. Indeed, Belgian auction prices of Conférence pears are volatile (Figure 2).

Figure 2 shows that prices tend to increase between harvesting in September and the end of the sales season (May to July). As predicted by commodity storage theory (Saha and Stroud 1994), pear farmers respond to this opportunity by delaying sales to later dates in the sales season. The currently available technology allows storage of pears up to a full year when stocks are cleared. The highly common strategic delaying of sales is a barrier for the uptake of risk management instruments such as forward contracts and cooperative-based price pooling. However, it may be used as a risk management strategy by itself (Taušer and Čajka 2014).

**Creating a market for price swaps.** The aim of FTC was to create an instrument offering similar benefits as futures. They, therefore, decided to create a market

of swap contracts, instead of futures contracts. Over two years, FTC developed an online swap trading platform that allows trading swap contracts similarly as futures contracts are traded on exchanges. To illustrate how this can be done, we describe key properties of the swap contracts and trading platform used, and how these evolved over time.

Swap contracts that are concluded between a cooperative, called "Agro Trading Company" (ATC), and pear buyers. ATC groups several farmer collectives active in the trade of financial derivatives, such as FTC. FTC offers a certain quantity of swap contracts based on the total amount of pears registered for hedging by its members. Farmers enter price swaps by joining the cooperative and registering a certain quantity of pears – between 10% and 30% of their expected yield – for hedging. Buyers enter price swaps by negotiating a fixed price with FTC for an offered contract, that specifies the quan-

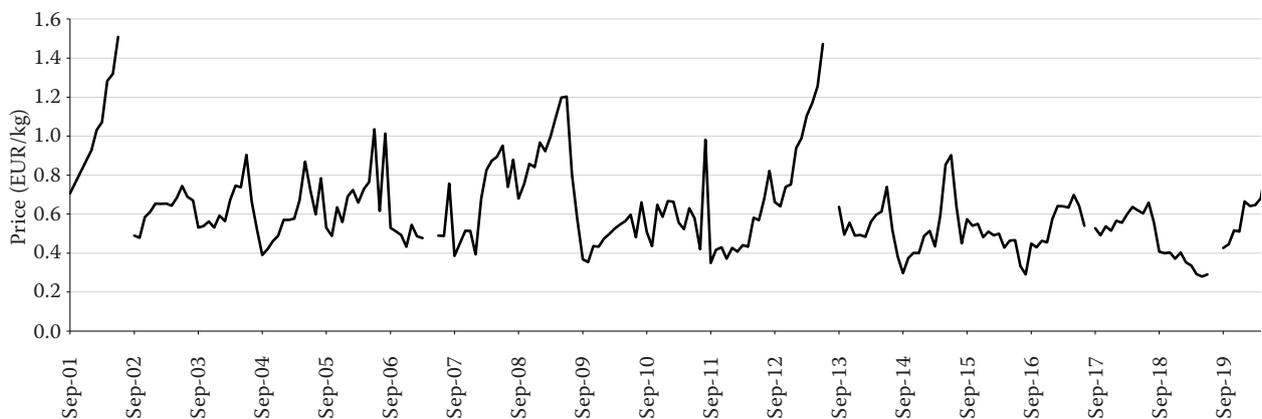


Figure 2. Monthly average producer prices for Conférence pear in Belgium, 2001–2020. Conférence pear prices generally increase from harvest (early September) towards the end of the sales season

Source: Statbel (2020b)

tivity of pears to be hedged and the time period over which prices are swapped. Upon expiry of the contract, the difference between the agreed fixed price and market prices that prevailed is calculated and cash settled between FTC and the buyer. FTC's gain or loss is then distributed over its members, proportionally to the amount of pears they hedged in the respective time period. The trading platform costs are borne by farmers, who pay a commission of EUR 0.01 per kg to FTC.

A major advantage of this system over OTC swaps (and other OTC contracts, like forward contracts) is that individual farmers are not subject to counterparty risk. As swap contracts are concluded between the cooperative and buyers, this risk is borne by the cooperative's members collectively. In turn, the cooperative mitigates this risk by demanding members and buyers to make a deposit or to provide a bank guarantee covering EUR 0.15 per kg hedged. This amount is expected to cover cash settlement in nearly all cases.

**Lessons learnt and adaptations.** The development of a suitable trading platform was subject to several trials and errors. In FTC's first year of operation, the fixed price and contract size were determined by the date of the contract agreement. The offered fixed prices and contract sizes were adjusted weekly by the steering committee of members, and displayed on FTC's website. Negotiation was limited to bidding on the fixed price offered by FTC by e-mail. The difference between the fixed price and the average market price prevailing over the rest of the sales season was compensated through cash settlement. This settlement mechanism is depicted Figure 3A.

The first year's system, however, proved to have disadvantages. Most farmers do not sell pears continuously over the sales season but on a limited number of moments in time caused full-season swaps to be ineffective hedges. Farmers selling all pears earlier in the sales season do not need to hedge against price fluctuations late in the season, and *vice versa*. More specifically, the steep price increase in January 2020 (cf. Figure 3) caused the average reference market price to rise for all swap contracts initiated before this month, thus making the financial exchange in these contracts more favourable for buyers. Members who sold all pears before January did not profit from these market prices, and thus compensated buyers for profits they did not gain in the physical market. As a result, members called for shorter contract periods. Also, buyers were in favour of shorter contracts. Offering fixed prices on a monthly basis was considered ideal, but the volume offered by members was deemed too low to allow sufficient transactions (liquidity) of monthly contracts. Therefore, swap contracts were chosen to cover periods of two or three months in the second year, "called quarters". This settlement mechanism is shown in Figure 3B. The fixed prices offered for the different quarters were adjusted at biweekly meetings of the steering committee.

The first year also revealed that swaps' hedging effectiveness is lowered by settling against a market price that is not weighed according to physical transaction volumes. In May 2020, auction prices were very high, while transaction volumes were very low, causing these prices to disproportionately affect the financial

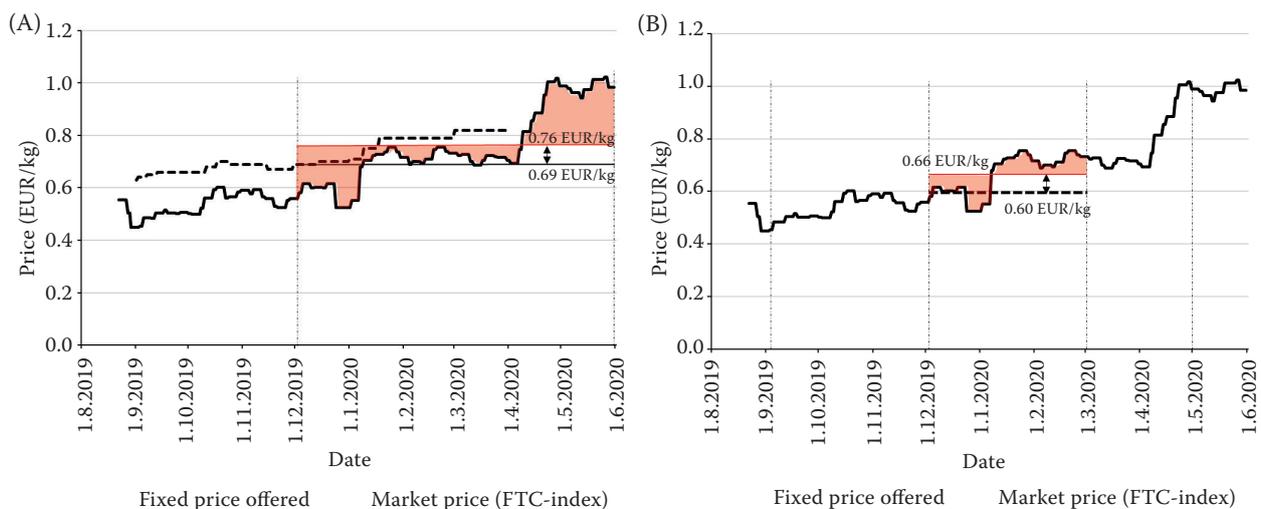


Figure 3. Illustration of The Fruit Trading Company's (FTC) price swap mechanism in (A) year one and (B) two of operation, using reference market prices of year one (2019–2020)

Source: Authors, based on private company data of DLV

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exchange as compared to gains incurred in the physical market. To avoid such problems in the future, FTC will no longer offer swap contracts for the period of May in the second year, assuming that the pear market can only become very thin from May onwards. An alternative solution would be to weigh prices according to sales volumes; however, this requires accurate data on transaction volumes.

Besides changes to the swap contract specifications, major changes were applied to the trading platform. In the first year, bids were made privately. FTC concluded it would be better to show bids publicly, in order to have public information on both suppliers' and buyers' reservation fixed prices. This would create a more complete market for price swaps, offering a more valuable price discovery process. It thus was decided to develop a trading platform similar to exchanges, where parties (either FTC or a buyer) publicly announce bids for a certain quantity of contracts for a certain fixed price. When a bid is placed equalling a counterparty's bid, a swap contract is automatically generated. The trading platform thus mimics the bidding process of futures markets.

**Farmer and buyer participation.** At the start of the 2019–2020 sales season, the first year of operation, 87 pear farmers joined FTC. After this first year, the number of members slightly increased to 91. Only four members are Dutch, while all the rest are Belgian. The number of Belgian farmers participating in FTC is substantial: their *Conférence* acreage corresponds to 17.8% of the Belgian acreage. The lower participation by Dutch farmers is explained by AGF's instrumental role in establishing FTC. In addition, it could be explained by the looser deposit requirement for Belgian farmers: contrary to Dutch members, they are not required to deposit EUR 0.15 per kg hedged. A bank provides this deposit for Belgian farmers unable or unwilling to provide the deposit. In case a member would default on cash settlement, the bank

covers the amount owed to FTC and will reclaim it on the farmer.

The hedging intentions of members at the start of the second year indicated they are satisfied with FTC's instrument. Out of the 73 members who hedged in both the first and second year of operation, 74% stated they would hedge the same quantity in the second year as in the first, 23% stated they would increase the quantity hedged, and 3% stated they would reduce the quantity hedged. Members could still increase the hedging quantity for the second and third quarter up to the start of these quarters. The pear quantity hedged already increased from 7 783 to 8 146 tonnes. The increase in participation is notable as farmers incurred losses by hedging in the first year.

An online survey among FTC members<sup>2</sup> showed that 82% of the respondents believed the stability of their income will improve by participating in the project, whereas 45% believed the level of their income will improve (Table 1). In addition, 66% believed they will gain better insight into the pear market by participating. A small number of farmers participated because FTC is a form of collective action that could improve their bargaining power vis-à-vis wholesalers. These results indicate that farmers have appropriate expectations of the instrument. This is not self-evident, as research has shown that European farmers' sometimes expect financial derivatives to enhance prices rather than stabilise them (Bergfjord 2007; Michels et al. 2019).

At the buyers' side, both wholesalers and retail stores purchased swap contracts from FTC. Out of the 7 738 tonnes offered for hedging, 6 500 tonnes were sold. Buyers' participation in FTC is thus considered to be successful. The participation of buyers in swap trading may have been motivated by (valid) expectations that prices in the 2019–2020 season would be higher than the fixed prices offered. Whether buyers are motivated to secure fixed prices in years without short supply has yet to be seen.

Table 1. Farmers' responses to statements regarding their motivation to join The Fruit Trading Company (%; *N* = 51)

	Yes	No	I do not know
I believe my income will improve because of the FTC project	45	22	33
I believe my income will become more stable because of the FTC project	82	6	12
I believe I will gain better insight in the pear market because of the FTC project	66	16	18

FTC – The Fruit Trading Company

Source: Authors' data

<sup>2</sup>The survey was distributed to all 84 members intending to participate in the second year, out of which 51 completed the questionnaire.

## DISCUSSION

### Conditions for creating a price swap market

The FTC case description allows us to evaluate the conditions under which they created a market for price swaps and how these compare with the conditions for futures markets. We draw upon the conditions for futures markets developed by Siqueira et al. (2008) and Bergfjord (2007). By benchmarking against the conditions for futures markets, the potential for creating price swap markets for other commodities and contexts is illustrated.

*Product storability.* Traditionally, only storable products were considered suitable for the establishment of futures, as storage allows arbitrage by physical delivery when commodity and futures prices diverge. Nowadays, technology allows a very wide range of agricultural products to be stored over time, and physical delivery has become rare in futures contracts, making the role of product storability for the viability of futures markets unclear. Swap contracts, either market-traded or traded OTC, only require that market participants supply or purchase the commodity regularly over an extended amount of time. Storability is not needed for products that are produced near-continuously, such as milk, pig meat, and certain vegetables. Products produced over a limited amount of time, such as arable products and tree fruits, need to be somewhat storable. Whereas pears could be stored up to one year, the sales season lasts for only 8–10 months. FTC is thus able to trade swap contracts covering this time period.

*Product homogeneity and measurability.* Futures markets require standardised products, to avoid ambiguity on the commodity underlying the futures contract. Also, price swaps require a well-known, widely accepted quality grading system. Price swaps depend on a common quality grading system to allow the definition of a reference market price. If swap traders' physical market income variation is highly correlated to variation in the reference market price, the swap is an effective hedge. FTC could rely on the single quality grading system of the Belgian fruit auctions to define a reference market price. As discussed in the case description, Belgian and Dutch market prices in any contractual arrangement are highly correlated to Belgian auction prices; thus, allowing effective hedging for all farmers.

*Market size and activity.* Futures markets are only viable if the futures contract is sufficiently traded. Futures markets, therefore, require a large enough market of the underlying commodity, containing a sufficient number of potential hedgers. A price swap trading in-

strument is less sensitive to this requirement. Unlike futures markets, the number of contracts traded does not affect the hedging effectiveness of a swap. A swap trading platform can be an effective risk management instrument for markets that are too small to support futures. However, some market "thickness" is needed for bids and asks to converge. The Belgian-Dutch pear market is expected to be in this intermediate situation. Belgium and The Netherlands produce approximately 330 and 350 million kg of *Conférence* pears per year. At a market price of roughly EUR 0.50 per kg, this corresponds to a production value of roughly EUR 150 million per country. FTC has been able to ensure sufficient "thickness" at the supply side created by grouping individual farmers in a cooperative and spreading their aggregated demand for swaps over time. On the demand side, however, they depend on participation by buyers. As only a small number of buyers has participated so far, the instrument still appears somewhat vulnerable to market "thinness" at the demand side.

*Market information.* Futures markets participants need information on the quantity of storage and the quantity, quality and price of transactions of the underlying commodity to shape their price expectations. Swaps may be established and traded without this information if prices fluctuate around one average value over time. However, if prices vary substantially per season and within the season, swaps require this market information. *Conférence* pear stocks of the world's leading producers are published monthly by the World Apple and Pear Association (WAPA). Also, Belgian cooperatives update their members (and thus indirectly FTC) monthly on their stocks. Combined with auction data, these data appear to inform pear market participants well. It is, however not clear whether these data are entirely sufficient: not all contracts for the first two quarters of the second year were sold, due to persisting differences in price expectations between FTC and buyers.

*Market price volatility.* Risk management instruments such as futures contracts and price swaps are only useful when the spot market is subject to price volatility. Analysts have proposed various threshold volatility levels at which futures markets become attractive. As swap markets require fewer participants than futures markets to function properly, they will likely require lower volatility levels to attract a sufficient number of participants. Belgian monthly pear auction prices are characterised by a coefficient of variation<sup>3</sup> of 0.41, reflecting a level of volatility compared to those of cocoa, barley, and pork bellies, which

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are considered volatile commodities, and for which futures markets have been established (Bergfjord 2007).

*Degree of competition.* Futures markets are more likely to be established when the markets for underlying commodities are characterised by a high degree of competition. In this case, market participants are more exposed to price volatility. This argument equally applies to price swap markets. The Belgian-Dutch pear market is indeed characterised by a high degree of competition. The suppliers (farmers) are many and often do not cooperate. Whereas the majority is member of a cooperative, many sell pears individually and compete with other farmers and (their own) cooperatives. Formal contracts, guaranteeing long-term purchase or even forward prices, are rare. Neither is there substantial product differentiation that could shield participants from the competition: geographical labels, environmental labels, or quality labels cover only marginal shares of the production.

*Absence of alternatives.* Both futures contracts and price swaps are more likely to attract hedgers if no alternatives are available to manage price risk. Belgian and Dutch pear farmers indeed have little alternatives to do so. Pooling risk among cooperative members is uncommon, no useful futures contracts are available, and contracts shifting risk to buyers are rare.

#### **Implications of creating a price swap market**

Having observed just one year of price swap transactions and the subsequent adjustments by FTC, it is still early to discuss the Belgian-Dutch pear market's implications. However, these first experiences already give some indications on the potential and the limits of the instrument. As FTC is used mainly by Belgian pear farmers, the discussion refers to implications for them.

FTC has enriched the portfolio of pear farmers' risk management instruments with financial derivatives. This is highly valuable, as both farm-level instruments (such as diversification and product differentiation) and cooperative-level instruments based on risk pooling are poorly developed in the sector. The value of this addition is testified by the fast uptake of the instrument by Belgian pear farmers.

By creating an anonymous market for price swaps, FTC has also addressed market imperfections in the Belgian supply chain, whose exporting stage is rather highly consolidated. Seven wholesale companies<sup>4</sup> and two cooperatives are the major actors competing at this stage. Anecdotal evidence suggests that the pricing by Bel-

gian auctions is sometimes not fully competitive, but influenced by collusion. Moreover, buyers have incentives to suppress auction prices as only a minor share of the pear volume is sold by auctioning: lower auction prices imply that prices in other contractual arrangements – which supply the majority of pears – are lower. Losses incurred from buying a less-than-optimal quantity of pears at the auction could easily be compensated by gains in other arrangements. Dutch horticultural cooperatives abandoned the auction pricing mechanism to prevent this type of strategic behaviour by buyers (Bijman and Hendrikse 2003). The pricing of market-traded price swaps provides a valuable independent price discovery process: it reveals the reservation prices of buyers.

#### **CONCLUSION**

While the benefits of using futures markets are widely recognised, only certain groups of farmers have useful futures at their disposal. Futures contracts in agriculture regularly fail because they attract insufficient market participants. In search of a risk management instrument that could offer similar benefits as futures, FTC developed an alternative derivatives-based instrument for Belgian and Dutch pear farmers, who do not have futures at their disposal. FTC developed an online trading platform where price swap contracts are traded similarly as futures contracts are traded on exchanges. The instrument was quickly adopted by Belgian pear farmers but has not yet attracted many Dutch farmers.

The first year of swap contract trading has learnt that FTC's instrument can enable farmers to effectively manage price risk. It can do so without interfering with production and physical marketing choices, while at the same time providing a price discovery process that is independent from the physical market. The instrument thus appears to offer a valuable alternative for futures, that could be established in some cases where the conditions for establishing a futures market are not fulfilled. In particular, trading price swaps demands less liquidity than a viable futures market does. For example, the application of FTC's instrument to greenhouse vegetables in Belgium and The Netherlands are already being examined. By discussing this instrument's properties, how it evolved over time, and under which conditions it was established, this study may inform the design of similar instruments for other commodities and contexts.

<sup>3</sup>The coefficient of variation is calculated as the standard deviation of a price series divided by its mean.

<sup>4</sup>The judgement on which wholesale companies do and do not play a major role in exporting is of course somewhat arbitrary.

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