Journal of Cleaner Production 165 (2017) 846–854

Contents lists available at ScienceDirect

Journal of Cleaner Production

journal homepage: www.elsevier.com/locate/jclepro

Rice farmers' preferences for fairtrade contracting in Benin: Evidence from a discrete choice experiment

Goedele Van den Broeck*, Pieter Vlaeminck, Karen Raymaekers, Katrien Vande Velde, Liesbet Vranken, Miet Maertens

Division of Bio-economics, Department of Earth and Environmental Sciences, KU Leuven, Celestijnenlaan 200E, 3001 Heverlee, Belgium

ARTICLE INFO

Article history:
Received 9 February 2017
Received in revised form
13 July 2017
Accepted 17 July 2017
Available online 17 July 2017

Handling Editor: Yutao Wang

Keywords:
Global value chains
Private standards
Contract-farming
Rice
Organic
Fairtrade certification

ABSTRACT

Private standards such as Fairtrade have emerged as a response to consumer, civil society and corporate concerns about the production conditions of imported food. Many studies have investigated the welfare implications of smallholder participation in Fairtrade schemes and consumers' willingness to pay for Fairtrade and other labelled products. On the other hand, no study has yet investigated farmers' preferences for Fairtrade and other private standards. Such insights would be valuable to improve the efficiency of certification schemes and ensure that they are tailored to farmers' needs. Using a choice experiment, this study investigates the preferences of smallholder rice farmers in Benin for Fairtrade and Organic standards and compares the value of three types of contracts (domestic, Fairtrade, and Fairtrade-Organic). The results indicate that farmers positively value contracts, but prefer domestic over Fairtrade contracts because the former involve fewer requirements. At current market prices, farmers are willing to accept a Fairtrade contract that includes fertiliser and child labour restrictions and a social premium, but they are not willing to accept a Fairtrade-Organic contract that completely prohibits chemical input use. The results imply that adding organic requirements to Fairtrade contracts may undermine the adoption and spread of Fairtrade certification in the Beninese rice sector.

1. Introduction

Agri-food trade between low- and high-income countries has increased rapidly over the past decades. This trade is increasingly subject to private standards, which have emerged as a response to consumer, civil society and corporate concerns about various aspects of food production and trade (Giovannucci and Ponte, 2005; Swinnen and Maertens, 2007). Private food standards include baseline standards focussing on food quality and safety issues as well as sustainability standards focussing on ethical and environmental aspects (Henson and Humphrey, 2010).

Fairtrade (FT) is a sustainability standard that aims to ensure the benefits of trade reach smallholder producers in low-income countries (FLO, 2011). These benefits include anti-cyclical mark-ups on prices, long-term trading relationships, credit facilities and consulting to build producers' capacity. FT includes requirements on production practices, working conditions, labour remuneration, environmental management and social policies. FT certification has expanded steadily, and in 2014 involved more than 1.65 million farmers and workers, 63.9% of them located in Africa (FLO, 2016). Bananas, cocoa, coffee, flowers, sugar and tea account for 90% of the produce sold by FT-certified farmers, but other commodities such as rice, with 4.6 billion tonnes sold in 2015, are gaining in importance as well. FT is increasingly combined with other private standards in double or multiple certification; most commonly it is paired with Organic (Org) certification, which focusses on organic farm practices and consumer and environmental health.

FT has been extensively discussed in the scientific literature. On the one hand, research has focussed on smallholders' access to FT contracts and its implications for farmers' welfare. Some studies find positive impacts on smallholders' income, poverty alleviation, agricultural productivity, innovation and subjective well-being (e.g. Balineau, 2013; Becchetti and Costantino, 2008; Chiputwa et al., 2015; Weber, 2011), while others find no effects (e.g. Akoyi and Maertens, 2017; Bacon et al., 2008; Barham et al., 2011; Mitiku et al., 2017; Ruben and Fort, 2012; Valkila, 2009). Access to FT contracts is often confined to better-off farmers, as the poorest smallholders with few productive assets lack initial capital to apply

* Corresponding author.
E-mail address: goedele.vandenbroeck@kuleuven.be (G. Van den Broeck).

http://dx.doi.org/10.1016/j.jclepro.2017.07.128
0959-6526/

for FT certification and are not able to comply with FT requirements (Ruben and Fort, 2012). Another critique is that FT is too supply driven: farmers producing under FT requirements are not able to sell their produce under FT conditions if demand is not high enough (Barham and Weber, 2012). The demand side of FT and other standards has been extensively investigated through studies on the preferences of consumers in high-income countries and their willingness to pay (WTP) for FT and other certified food products (e.g. Grunert et al., 2014; Vecchio and Annunziata, 2015).

This paper takes a different view and assesses FT certification from the perspective of farmers themselves. No study investigating farmers' preferences for FT and other private standards could be found. This is surprising, given assertions that smallholder certification can be more effective if better knowledge about farmers' marketing and contract preferences is available (Abebe et al., 2013; Blandon et al., 2009; Gelaw et al., 2016; Schipmann and Qaim, 2011). A discrete choice experiment (DCE) is used to analyse the willingness of farmers to accept FT and some Org requirements; which requirements form a barrier for adoption; and which benefits are valued by farmers.

The DCE was conducted among 305 smallholder rice farmers in Savalou, Benin, to investigate the farmers' preferences for FT and combined Fairtrade-Organic (FT-Org) contracts in comparison to domestic contract schemes. The rice sector is interesting because rice is an emerging FT product. The Fairtrade Labelling Organisation (FLO) states in its 2016–2020 strategy that it aims at expanding FT certification for rice and other staple food products, as well as improving the impact of FT in these sectors. Insights on farmers' preferences in the rice sector can be valuable for adapting and fine-tuning FT specifications and *modus operandi* for expansion and improved impact in this emerging FT sector. To this end, this paper focusses on the rice sector in Benin as a particular case study. While Benin is not a major rice exporter, the government does aim at developing a rice export (and a modern domestic) sector, and is investing in rice production and value chain upgrading (Demont and Ndour, 2015). In the study area in the Savalou region, contract-farming for the domestic market is common, and farmers have received support from a public-private partnership between a development NGO and a food retailer to set up an FT-certified rice export chain as an example case of value chain upgrading. Findings from this particular case study cannot be easily generalised for the main rice exporting countries or the main FT products. Yet the findings yield insights into farmers' preferences that are relevant for expanding FT certification in staple food sectors and improving its uptake and impact, and we translate these insights into direct policy advice for the public-private partnership in the region and the government of Benin.

The DCE design used in the study is a stated preference method and provides *ex ante* insights on farmers' preferences for various individual specifications and requirements of FT(-Org) contracts. This would not be possible in a more classical study on actual adoption (and hence revealed preferences) as the actual variation in and experience with FT specifications and requirements is very limited. Moreover, it is argued that a DCE is better suited than other stated preference methods (contingent valuation and conjoint analysis) to model farmers' behaviour regarding FT contracts. In a DCE respondents are asked to choose between bundles of attributes that make up different contracts, which is less complex and more realistic than asking respondents to state a willingness to accept a contract, as in contingent valuation methods. DCEs have been argued to be better suited to model economic behaviour than conjoint analysis because of the method's theoretical basis in random utility theory (Louviere et al., 2010). DCEs can be complementary to qualitative research on farmers' preferences; their added value is that hypothetical scenarios can be tested and trade-offs quantified.

2. Research background

2.1. The rice sector in Benin

Similar to other countries in Western Africa, consumption of rice in Benin has increased sharply during the past decade. As consumers prefer imported Asian rice over domestic rice, imports grew from 72,000 tonnes in 2001 to nearly 1.4 million tonnes in 2013 (Fig. 1). Since the 2008 food price crisis, nevertheless, the government has been aiming to achieve national rice self-sufficiency by 2018 (MAEP, 2011). Rice production quadrupled in the past decade and increased most sharply in 2011, reaching more than 200,000 tonnes. However, the domestic rice sector remains characterised by low quality and low added value (Demont and Ndour, 2015).

2.2. Research area

The study area includes three districts (Doumé, Tchetti and Kpataba) in the municipality of Savalou, located in Collines Department of Benin. This department is recognised as having the largest lowland rice potential in the country (MAEP, 2011). Rice is mainly grown by smallholder farmers in rain-fed lowland production systems with only one rice harvest per year. Farmers mainly commercialise threshed, un-milled paddy rice through spot market exchanges, either with traders collecting paddy rice at the farm gate or with vendors at the nearest market.

Savalou was purposely selected because two rice contracting schemes have been implemented in this municipality. The first scheme is an FT contracting scheme organised by a Belgian NGO in collaboration with a Belgian retail group. The scheme was set up in 2009 with the intention of using the incentives of an FT contract as a lever to upgrade the quality and reputation of domestic rice production to meet the standards of an international market. This entailed the revitalisation of existing producer organisations and the adherence of farmers to FT certification requirements (VECO, 2011). Through this scheme a symbolic quantity (36 tonnes) of high-quality long grain FT-certified rice was exported to Belgium. Farmers received an FT price of 536 FCFA/kg (0.82 EUR/kg), which is 40% higher than the local market price of 370 FCFA/kg (0.56 EUR/kg) for long grain rice and more than three times the local market price of 150 FCFA/kg (0.23 EUR/kg) for the lower quality paddy rice.

The second scheme was initiated in 2006 by the *Centre International de Développement et de Recherche* (CIDR) to connect farmers to the domestic urban market in an efficient and sustainable way. It is a contract-farming scheme based on the social business model of *Entreprises de Services et Organisations de Producteurs* (ESOP), a private enterprise that contracts groups of 10–15 producers organised into producer organisations for the delivery of high-quality rice. At the beginning of each season, the ESOP and farmer groups agree on a written contract specifying the quantity of rice to be delivered, the delivery time, a fixed producer price (which was 150 FCFA/kg or 0.23 EUR/kg for local paddy rice in 2012) and some quality specifications. In return, the ESOP provides inputs (seeds, fertiliser and herbicides) on credit, training on quality improvements, and technical field assistance. The ESOP collects the paddy rice in the villages, processes it and sells it as local quality rice in domestic urban markets.

2.3. Data collection

Data were collected in two phases. First, household survey data were collected in April and May 2013 in the four main rice producing districts in Savalou (Doumé, Tchetti, Ouesse and Kpataba). A

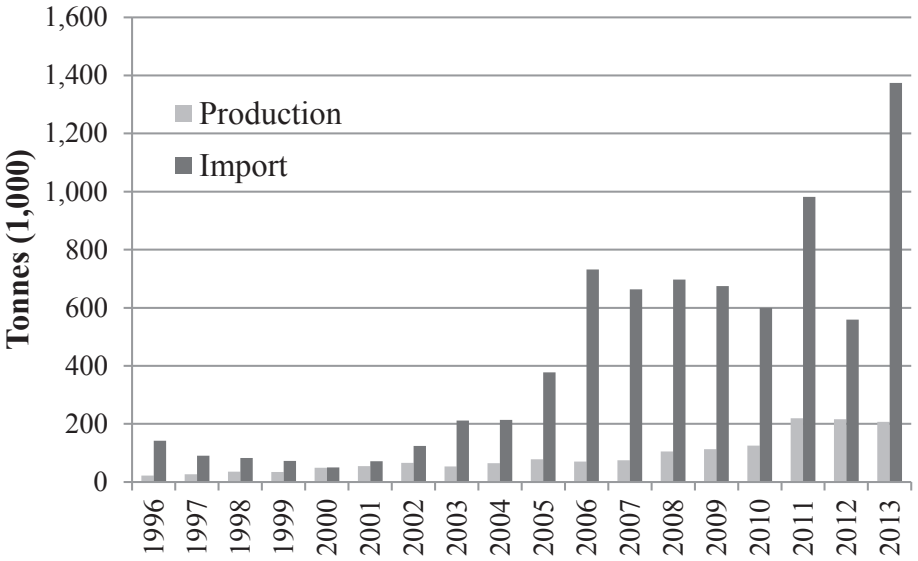

Fig. 1. Evolution of paddy rice production and import in Benin (FAOSTAT, 2016).

two-stage stratified random sample was drawn. In the first stage, 21 villages were selected in the four districts according to the presence of contract-farming. In the second stage, rice farming households were stratified according to their participation in the FT and ESOP schemes. In total, 396 households were sampled in the selected villages. A quantitative structured questionnaire was used, including various modules on household demographics, different income sources, land and non-land assets, and agricultural production and commercialisation. One module asked for farmers' perceptions on the benefits and barriers of contract-farming in general and FT contracts specifically. The household survey data were complemented with information from a village survey on infrastructure, accessibility, market access and rice farmer groups. In the second phase, a DCE was implemented in August and September 2013 in the districts of Doumé, Tchetti and Kpataba. Thirteen villages from the original household sample were selected, resulting in a final sample of 305 farmers.

3. Choice experiment

This study assessed farmers' preferences for FT(-Org) certification using a DCE. This is a stated preference method which can be used to reveal which FT(-Org) certification attributes have a higher likelihood of being supported by farmers. The method has been used recently to understand farmers' marketing, contracting and certification preferences in Ethiopia, Honduras, Kenya and Thailand (Abebe et al., 2013; Blandon et al., 2009; Gelaw et al., 2016; Meemken et al., 2017; Schipmann and Qaim, 2011). In a DCE, farmers are presented with several choice cards that include alternative varieties of a good or service – in this case a contract type – differentiated by their attributes and attribute levels. They are then asked to select their most preferred alternative. This allows us to infer an indirect utility function based on the different attributes.

3.1. Attributes and levels

Potential attributes were identified based on the contract details of the FT and ESOP schemes in Savalou as well as the general FT(-Org) standards for small producer organisations (FLO, 2011). After three group discussions with farmers and three field tests, six attributes were selected (Table 1): herbicide use, chemical fertiliser use, child labour, FT (social) premium, input provisions and a (minimum) selling price. Added together, these requirements constitute various hypothetical and real marketing, contracting or certification options. Many other contract characteristics, such as form of contract, relation to the buyer or payment mode, can also influence the willingness to enter into a contract (Abebe et al., 2013; Schipmann and Qaim, 2011). Because the focus of this paper is on preferences for FT(-Org) contracts, and because too many attributes may result in cognitive overload during the choice process, more general contract attributes that are not FT specific were not included.

The first and second attributes (herbicide and chemical fertiliser use) relate to Org standards and specifications of environmental protection in FT standards. FT ensures that farmers implement agricultural practices that are sustainable, minimise health and safety risks and protect biodiversity, while Org prohibits chemical fertiliser and herbicide use. Both attributes consist of three levels: 1) forbidden; 2) training and precise dose or just reduced dose; and 3) no restrictions, with the first level relating to Org and the second to FT.

The third attribute, child labour, relates to specifications on

Table 1
Attributes and attribute levels used in the choice experiment.

Attribute	Attribute levels
Herbicide use	Forbidden
	Training and precise dose
	No restrictions (OO)
Chemical fertiliser use	Forbidden
	Reduced dose
	No restrictions (OO)
Child labour	Forbidden
	No restrictions (OO)
Fairtrade premium	FT premium (30 FCFA/kg)
	No FT premium (OO)
Input provision	In cash
	In kind
	No provisions (OO)
Selling price	115, 135, 150 (OO), 165, 180, 200 FCFA/kg

Note: The national currency FCFA stands for *Franc Communauté Financière d'Afrique* and has a fixed exchange rate to the Euro: €1 is 655.957 FCFA; OO = levels of the opt-out option.

labour conditions in FT standards and consists of two levels: 1) forbidden; and 2) no restrictions. FT standards state that members of the producer organisation must not employ children below the age of completion of compulsory schooling – which is between six and eleven in Benin – and in any case not below the age of 15, unless under strict conditions such as after school and for non-hazardous activities.

The fourth attribute, FT premium, relates to the social premium that is paid directly by the buyer to the farmer organisation and consists of two levels: 1) no premium; and 2) a premium of 30 FCFA/kg (0.05 EUR/kg) for paddy rice. FT certification implies a social premium that is specified by FLO as a fixed premium reflecting the difference between the FT minimum price and the actual market price, or as a mark-up of usually 15% over the market price (FLO, 2016). The social premium used in the DCE reflects the actual premium in the FT scheme in the region (VECO, 2011). The premium can be used for a wide range of investments, including investments to increase farm productivity and to improve community infrastructure such as health centres or schools. Its purpose is democratically decided on by the producer groups.

The fifth attribute, provision of seeds, fertiliser and herbicides, consists of three levels: 1) no input provision; 2) provision in cash; and 3) provision in kind, with the latter two provided in the beginning of the season. Typically, contract-farming schemes provide some advance crop financing to producer groups. When fertiliser and herbicide is forbidden in the same contract, the design of the DCE is constrained to not provide inputs.

The price levels for the last attribute, selling price, are set around the mean price the farmers in the household survey sample received in the previous rice season (2012), namely 150 FCFA/kg (0.23 EUR/kg) for paddy rice. The price attribute has six levels: 115, 135, 150, 165, 180 and 200 FCFA/kg. This maximum price level corresponds to an explicit mark-up of 33% with respect to the market price (150 FCFA/kg) and an implicit mark-up of 53% if the value of the FT social premium (30 FCFA/kg or 0.05 EUR/kg) is included.

3.2. Design and implementation

Based on the attributes and their levels, choice cards were constructed with two unlabelled contract scenarios and one opt-out option defined as selling independently on the market (Fig. 2). Ngene software was used to create a D-efficient design (D-error = 0.0468) and priors of the parameters were derived from focus group discussions. Eighteen choice cards were created in two blocks and nine different choice cards were presented to each farmer. These were shown in a random order to account for possible order and starting point effects. The DCE was carefully implemented after explaining the purpose, emphasising the hypothetical nature (see 3.4 below) and demonstrating a first test card.

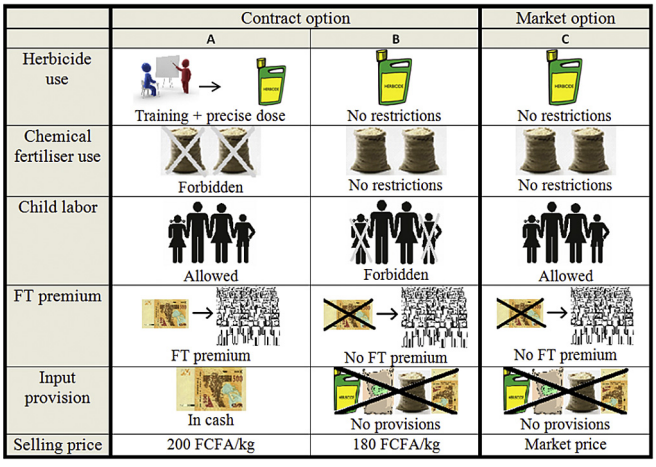

Fig. 2. Example of a choice card.

3.3. Econometric analysis

Econometric analysis of choice experiments is based on random utility theory (Louviere et al., 2010). This means that the total utility associated with a contract scheme can be decomposed into a deterministic component depending on the attributes and an unobservable stochastic component. A mixed logit (MXL) model with 500 Halton draws is used to analyse the DCE data (Greene and Hensher, 2003). An MXL model accounts for preference heterogeneity across respondents by allowing a distribution around the mean value of the coefficients. The equation for the choice probability is specified as:

$$P_{ijt} = \frac{\exp(\beta_i X_{ijt})}{\sum_{j=1}^{Ji}\exp(\beta_i X_{ijt})};\ \text{and}\ \beta_i = \beta + \Delta z_i + \Gamma\varepsilon_i \quad (1)$$

where individual i chooses alternative j in choice card t with probability P. β_i is a vector of coefficients associated with preferences for the attributes X_{ijt} while z_i is a vector of standard deviations and ε_i is the error term. All parameters except the price attribute are specified to be normally distributed. An alternative-specific constant (ASC) is included in the model, coded 1 for the market option and 0 for the contract scenarios. A negative coefficient thus indicates a positive utility of moving away from the market option into a contract scheme. All categorical variables are dummy-coded since this allows more straightforward interpretation.[1]

To explain possible sources of preference heterogeneity a latent class (LC) model is used, which assumes a heterogeneous population that consists of a number of latent classes (Greene and Hensher, 2003). Preferences are assumed to be homogenous within each latent class but to differ across classes. The probability equation is specified as:

$$P_{ijt|l} = \frac{\exp(\beta_l X_{ijt})}{\sum_{j=1}^{Ji}\exp(\beta_l X_{ijt})} \quad (2)$$

where each individual i gets assigned with a certain probability to a latent class l. To describe the sources of heterogeneity, preferences and farm and farmer characteristics are compared across the different classes.

Values of WTP and willingness to accept (WTA) for the different contract attribute levels are derived as:

$$\textit{marginal WTP} = -\frac{\beta_{attribute}}{\beta_{price}}$$

This is calculated directly at the estimation stage via the WTP-space model.[2] These welfare estimates are added up to construct the relative value of a domestic rice contract characterising the existing ESOP scheme; an FT contract; and an FT-Org contract for

[1] Effects coding was tested and found to result in similar ASC parameters ($ASC_{EC} = -2.996$; $ASC_{DC} = -2.630$), indicating the absence of a dummy-trap.

[2] It has been argued that WTP-space models derive more stable welfare estimates than via the MXL model because they are obtained through estimation rather than simulation (Hole and Kolstad, 2012). This study tested both methods and found similar magnitudes.

export production:

$$WTP_{ESOP} = \frac{-\left(\beta_{Herbicidesreduced} + \beta_{Kindprovisions}\right)}{\beta_{price}}$$

$$WTP_{FT} = \frac{-\left(\beta_{Herbicidesreduced} + \beta_{Fertilizerreduced} + \beta_{Nochildlabor} + \beta_{Kindprovisions} + \beta_{FTpremium}\right)}{\beta_{price}}$$

$$WTP_{OrgFT} = \frac{-\left(\beta_{Herbicidesforbidden} + \beta_{Fertilizerforbidden} + \beta_{Nochildlabor} + \beta_{Kindprovisions} + \beta_{FTpremium}\right)}{\beta_{price}}$$

3.4. Limiting potential bias

There are three potential sources of bias. First, DCEs are prone to hypothetical bias resulting (mostly) in overestimation of WTP (Cummings and Taylor, 1999). The influence of hypothetical bias in this DCE is limited because farmers in the region are familiar with contract-farming and because the separate attributes are close to farmers' everyday reality. A "cheap talk script" was used to explain the problem of hypothetical bias and explicitly ask participants to focus on the actual cost of the hypothetical alternatives. Cheap talk scripts are a common and effective way to manage hypothetical bias in DCEs (Cummings and Taylor, 1999). Second, selection bias could arise if farmers' contract experience influences their preferences. While this study reveals preference heterogeneity related to contract experience, it refrains from making any causal inferences on the impact of contract experience. In addition, potential non-response bias is completely eliminated by including an opt-out option. Third, attribute non-attendance (ANA) could result in biased estimates. The models in this study fail to control for ANA due to a lack of data on stated ANA and a lack of convergence of latent class models with inferred ANA – with the latter being a common problem (Lagarde, 2013). The influence of ANA is likely small in this DCE because of its relatively simple design with only six attributes, all of which significantly affect farmers' choices (Table 3). Moreover, Ortega and Ward (2016) argue, based on a DCE among rice farmers in India, that the influence of ANA is insignificant.

4. Results and discussion

4.1. Farm and farmer characteristics

Table 2 describes farm and farmer characteristics, and compares farmers with and without contract-farming experience. This section discusses the main differences. The multidimensional poverty index is on average relatively high (0.30), but under the poverty threshold of 0.33, with no significant differences across contract experience. Farmers' organisations are common in the research area; 82% of the farmers are members, and nearly all of the contract-farmers. Farmers cultivate on average 8.4 ha of land, of which 13% is allocated to rice, with contract-farmers cultivating more land and farmers with FT experience allocating more land to rice production. Average rice yield (2 tonnes/hectare) and selling price (156 FCFA/kg or 0.24 EUR/kg) are low, but both are higher for contract-farmers. They also apply nearly twice as much fertiliser as farmers without contract experience. The main constraints on increased rice production and profitability were given as lack of mechanisation (mentioned by 25% of the farmers), difficult input and credit access (18%), weeds and pests (17%) and low soil fertility (12%).

When asked about the main advantages of ESOP and FT contracts, farmers most frequently mentioned a guaranteed market (31% of ESOP and 26% of FT farmers), access to inputs and credit (22% of ESOP farmers) and higher prices (25% of FT farmers). The main problems and disadvantages of contracts are perceived to be delayed payments (19% of ESOP and 16% of FT farmers), low prices (27% of ESOP farmers) and difficulties in respecting all contract requirements (23% of FT farmers). Non-contract-farmers identified the major barrier to participation to be the limited availability of contracts (mentioned by 36%).

4.2. Farmers' preferences for FT certification

Table 3 reports the results of the MXL and LC models for farmers' preferences for FT contracting. First, the results of the MXL model (1) are described. All coefficients and standard deviations (except for reduced dose of fertiliser) are significant, indicating that there is heterogeneity in preferences across farmers. The ASC is strongly negative, indicating that farmers prefer producing rice under some type of contract compared to independently selling rice on the market. This is in contrast with previous findings for sweet pepper farmers in Thailand (Schipmann and Qaim, 2011) and small-scale producers of fresh fruits and vegetables in Honduras (Blandon et al., 2009), who preferred to sell their produce independently on the spot market. This contrast can partially be explained by the specific context. The rice sector in Collines Department is characterised by low quality, low added value, substantial market imperfections and high transaction costs. In such circumstances, contract-farming may overcome market imperfections and reduce transaction costs. These results indicate that farmers indeed perceive contract-farming as beneficial and that they are generally willing to enter contract-farming schemes.

In addition, farmers prefer contract schemes that offer a higher selling price, supply advances (whether in cash or in kind) and provide a premium. In general they have a negative preference for contract terms relating to the social and environmental requirements of FT standards. Complete restrictions on child labour, herbicide use and especially on fertiliser use are strong

Table 2
Sample characteristics.

Variable	Full sample		Non-contract farmers		Farmers with FT experience			Farmers with ESOP experience		
	Mean	St.Dev.	Mean	St.Dev.	Mean	St.Dev.		Mean	St.Dev.	
Male head *(dummy)*	0.94	*0.24*	0.91	*0.28*	0.96	*0.20*	*	0.96	*0.21*	*
Age head *(years)*	42.21	*11.77*	41.18	*11.94*	43.65	*11.75*	**	42.61	*11.34*	
Education head *(years)*	2.36	*3.64*	2.84	*4.12*	2.15	*3.18*	*	1.96	*3.15*	**
Adults *(number)*	2.72	*1.16*	2.76	*1.24*	2.77	*1.12*		2.67	*1.03*	
Children *(number)*	3.71	*2.31*	3.52	*2.29*	3.93	*2.34*	*	4.22	*2.30*	***
Children in agr. *(number)*	2.13	*1.74*	1.91	*1.70*	2.42	*1.78*	***	2.49	*1.83*	***
Multidimensional Poverty Index	0.30	*0.15*	0.29	*0.14*	0.29	*0.15*		0.30	*0.16*	
Market distance *(km)*	4.93	*4.48*	4.33	*4.46*	5.21	*4.63*	*	6.20	*4.31*	***
Difficult credit access *(dummy)*	0.41	*0.49*	0.40	*0.49*	0.40	*0.49*		0.42	*0.50*	
Member organisation *(dummy)*	0.82	*0.39*	0.64	*0.48*	1.00	*0.00*	***	0.98	*0.13*	***
Livestock *(units)*[a]	8.35	*7.11*	7.35	*6.59*	9.70	*8.02*	***	10.42	*8.06*	***
Land cultivated *(ha)*	3.19	*6.58*	2.29	*3.32*	4.35	*9.15*	***	4.86	*9.85*	***
Cultivated land with rice *(share)*	0.13	*0.13*	0.13	*0.11*	0.15	*0.15*	*	0.13	*0.12*	
Rice yield *(ton/ha)*	1.97	*1.08*	1.85	*0.96*	2.14	*1.20*	**	2.13	*1.11*	**
Rice price *(FCFA/kg)*	156.22	*33.46*	150.20	*28.37*	164.41	*40.74*	***	159.97	*32.31*	***
Herbicides for rice *(l)*	1.08	*2.55*	1.19	*2.84*	0.92	*2.29*		1.08	*2.49*	
Fertilizer for rice *(kg)*	137.06	*241.89*	100.78	*108.76*	181.35	*346.92*	***	191.43	*364.46*	***
Observations	305		148		126			112		

Note: One-sided t-tests are used to test differences in means compared to non-contract farmers. Significant differences are indicated with *p<0.1, **p<0.05 or ***p<0.01.
[a] One livestock unit equals 1 cow/horse, 0.8 donkey, and 0.2 sheep/goat.

Table 3
Mixed logit and latent class models for farmers' preferences for FT contracting.

	Mixed logit model				Latent class model					
Observations	8208				8208					
Log likelihood	−1817				−1670					
	Mean		Standard deviation		Class 1 Prob.52.9%		Class 2 Prob. 39.9%		Class 3 Prob. 7.2%	
ASC	−2.625 (0.196)	***	*Fixed*		−2.475 (0.260)	***	−6.936r (1.243)	***	0.922 (0.492)	*
Selling price (FCFA/ kg)	0.019 (0.002)	***	*Fixed*		0.014 (0.002)	***	0.026 (0.007)	***	0.025 (0.006)	***
Training and precise herbicide	0.461 (0.133)	***	0.875 (0.160)	***	0.348 (0.127)	***	−0.157 (0.266)		0.356 (0.341)	
Herbicide use forbidden	−1.132 (0.149)	***	1.259 (0.140)	***	−0.918 (0.144)	***	−0.982 (0.318)	***	−0.543 (0.382)	
Reduced dose of fertilizer	−0.551 (0.100)	***	−0.053 (0.420)		−0.211 (0.102)	**	−0.760 (0.172)	***	−0.478 (0.328)	
Fertilizer use forbidden	−2.271 (0.173)	***	1.809 (0.174)	***	−0.496 (0.121)	***	−3.354 (0.427)	***	−1.411 (0.393)	***
Child labor not allowed	−0.273 (0.117)	**	−1.123 (0.125)	***	−0.259 (0.106)	**	−0.282 (0.174)		−0.734 (0.306)	**
In cash provision	1.016 (0.120)	***	−0.600 (0.197)	***	0.975 (0.119)	***	0.564 (0.229)	**	0.499 (0.358)	
In kind provision	1.000 (0.112)	***	0.794 (0.174)	***	1.038 (0.131)	***	0.528 (0.205)	***	0.471 (0.340)	
FT premium	0.748 (0.106)	***	0.942 (0.120)	***	0.421 (0.094)	***	0.788 (0.160)	***	0.494 (0.298)	*

Note: Standard errors are reported between parentheses. Significant effects are indicated with *p<0.1, **p<0.05 or ***p<0.01.

disincentives for farmers to enter into a contract. Such restrictions would lead to lower yields – and actual yields are already substantially below potential yields (Wopereis et al., 2013). However, the positive coefficient for training and precise dose of herbicide use suggests that this disincentive could be countered by the contracting party if some form of extension service is provided. Extension services could help farmers to understand the reasoning for limiting herbicide use and the benefits of applying a more precise dosage.

Second, the results of the LC model are discussed and sources of preference heterogeneity are explored by comparing characteristics across different classes (Table 4). The optimal number of classes is three according to the Akaike Information Criteria (AIC = 3555) and the Bayesian Information Criteria (BIC = 3523). The average probability of belonging to the first class (LC1) is 52.9%, while it is 39.9% for LC2 and 7.2% for LC3. The preferences of LC1 farmers largely correspond with the MXL model, because this class represents the majority of the farmers in the sample. The preferences of LC2 farmers are quite similar but there are some differences. LC2 farmers have a strong preference to produce under contract and are indifferent to a reduction in herbicide use or a prohibition of child labour, but have a strong aversion to a complete prohibition of fertiliser use. These preferences are related to their farm and farmer characteristics. Compared to LC1, farmers of LC2 are more likely to be members of a farmers' organisation and have experience with FT contracting, and allocate more land to rice production. This suggests that rice cultivation and previous contract experience are perceived to be positive for these farmers and that they are more

Table 4
Farm and farmer characteristics across different classes

	Latent class 1		Latent class 2			Latent class 3		
Male head	0.96	(0.02)	0.91	(0.03)	*	0.91	(0.06)	
Age head	41.23	(0.95)	43.56	(1.05)		42.91	(2.65)	
Education head	2.13	(0.28)	2.47	(0.32)		3.09	(0.99)	
Adults	2.66	(0.08)	2.66	(0.10)		3.55	(0.44)	***
Children	3.78	(0.19)	3.39	(0.18)		4.59	(0.68)	
Children in agr.	2.14	(0.14)	1.93	(0.14)		3.00	(0.53)	**
MPI	0.31	(0.01)	0.30	(0.01)		0.26	(0.03)	
Market distance	5.09	(0.36)	4.11	(0.38)	*	7.91	(0.95)	***
Credit access	0.43	(0.04)	0.40	(0.04)		0.27	(0.10)	
Org. member	0.78	(0.03)	0.87	(0.03)	**	0.82	(0.08)	
ESOP experience	0.34	(0.04)	0.41	(0.04)		0.32	(0.10)	
FT experience	0.34	(0.04)	0.50	(0.05)	***	0.36	(0.10)	
Land cultivated	7.99	(0.54)	8.02	(0.65)		12.31	(1.93)	***
Livestock units	3.14	(0.52)	2.62	(0.40)		7.02	(2.87)	**
Share of rice	0.12	(0.01)	0.16	(0.01)	**	0.09	(0.02)	
Rice yield	2.06	(0.09)	1.91	(0.10)		1.52	(0.18)	**
Price	153.77	(2.31)	158.98	(3.47)		158.41	(7.44)	
Herbicides	1.29	(0.23)	0.78	(0.18)		0.95	(0.34)	
Fertilizer	108.73	(7.91)	180.03	(32.51)	**	102.20	(19.25)	

Table 5
Welfare estimates (in FCFA) for contract attributes derived from willingness-to-pay in space (WTP-S) model.

Attributes		Mean	95% CI
Herbicide use	No restrictions	Reference	
	Training and precise dose	+16	[2,30]
	Use forbidden	−67	[-85,-49]
Fertiliser use	No restrictions	Reference	
	Reduced dose	−33	[-44,-22]
	Use forbidden	−115	[-145,-86]
Child labor	Allowed	Reference	
	Forbidden	−20	[-29,-10]
Provisions	No provisions provided	Reference	
	In cash	+55	[38,71]
	In kind	+48	[36,61]
FT premium	No FT premium offered	Reference	
	FT premium offered	+37	[24,51]

The national currency FCFA stands for *Franc Communauté Financière d'Afrique* and has a fixed exchange rate to the Euro: €1 is 655.957 FCFA.

willing to enter into a new contractual agreement. LC2 famers are more likely to be female and to have FT experience, which might explain their lower aversion to child labour prohibition. Studies have shown that women have stronger preferences than men against child labour and in favour of child schooling (e.g. Emerson and Souza, 2007; Reggio, 2011). In addition, FT farmers might have been made more aware of the negative consequences of child labour through their FT experience. LC2 farmers apply large quantities of fertiliser (almost twice as much as LC1 farmers), which might explain their high aversion to fertiliser restrictions.

The preferences of LC3 farmers are quite different from LC1 and LC2. In contrast to the first two classes, LC3 farmers prefer to sell rice independently on the market, which is in line with findings from Schipmann and Qaim (2011) and Blandon et al. (2009). The aversion to contracts is likely related to the fact that these farmers are relatively well endowed compared to LC1 and LC2 farmers. They have more family labour, livestock and landholdings, but allocate relatively less land to rice cultivation and attain lower rice yields. This suggests that rice production is not the main income-generating activity for these farmers, lowering the attractiveness of a rice contract scheme. LC3 farmers are less multidimensionally poor and find access to credit less difficult.[3] This is in line with past studies that found poor farmers more willing to sign a contract, as they were more likely to lack the assets to produce marketable surpluses themselves (Barrett, 2008), and contracts being used by credit-constrained farmers to circumvent credit market imperfections (Swinnen and Maertens, 2007). This also explains why LC3 farmers are indifferent to contracts that offer input provisions compared to contracts without such provisions. However, LC3 farmers live further away from the market and thus face higher transaction costs, which would be an incentive to enter into a contract (Masakure and Henson, 2005; Schipmann and Qaim, 2011). The opposite effect is likely explained by the fact that rice production is less important for the more remote LC3 farmers. They also have a quite strong aversion to contracts that prohibit child labour. This is probably because they employ more children on their fields than LC1 or LC2 farmers.

4.3. Valuation of domestic and FT(-Org) contracts

Table 5 presents the monetary valuation (i.e. marginal WTP/WTA estimates) of different contract attributes, based on the estimated coefficients in the MXL model (1) and derived from the WTP-space model. Three important results can be drawn from the WTA/WTP values. First, the WTP value for the FT premium (37 FCFA/kg or 0.06 EUR/kg) approximates closely the value of the real FT premium (30 FCFA/kg or 0.05 EUR/kg) paid to farmers' organisations in the FT scheme. This is an indication that the estimates are realistic and that the DCE was well understood by the farmers. Second, farmers need a significant compensation to accept a contract that prohibits the use of herbicides and fertiliser. This indicates that farmers prefer to apply chemical inputs when soil fertility is low and weed pressure high, and that introducing organic production requirements in FT or other contracts will require substantial compensation in terms of higher contract prices. Third, farmers dislike contracts with child labour restrictions. If sufficient input provisions and extension services are provided, however, these benefits can outweigh the disadvantages related to child labour restrictions.

Table 6 presents the relative values of three different contracts: an ESOP contract for the domestic market, and a regular FT contract and FT-Org contract for the export market. These values reveal which contracts are preferred by farmers and for which contracts premium payments are needed to make the contract acceptable or self-enforcing. The values of the ESOP and FT contract are positive, meaning that farmers identify these contracts as a way to improve their current situation.[4] The ESOP contract for the domestic market, with the least number of restrictions, is preferred most. This suggests the potential of upgrading the domestic rice supply chain through contract-farming. The Savalou region is characterised by large market imperfections and high transaction costs due to poor infrastructure and malfunctioning institutions. Principle-agent and transaction cost theory predict that under such circumstances contract-farming is more likely to be self-enforcing (Barry et al., 1992; Williamson, 1979), which explains the positive value of the ESOP contract. This is also in line with recent empirical evidence that demonstrates a positive impact of rice ESOP contract-farming in Benin (Maertens and Vande Velde, 2017). While research has mostly focussed on international, high-demanding value chains, this study supports the view of Gómez et al. (2011) that research should focus on opportunities in domestic markets as well. Although FT contracts implement more stringent requirements, the

[3] Although the differences are quite large, they are not significant due to the larger standard errors in LC3, which represents a small segment of the sample.

[4] The positive values for the domestic and FT contracts do not imply that contracting parties should lower their prices, but should be interpreted as the implicit cost or shadow price of market imperfections solved by the contract.

Table 6
Relative value of different farming contracts.

	Independent	ESOP contract	FT contract	Organic-FT contract
Herbicide userestricted?	No	Training + doses	Training + doses	Yes
Fertiliser userestricted?	No	No	Yes, reduced	Yes
Child labourallowed?	Yes	Yes	No	No
Provisions provided?	No	Yes, in kind	Yes, in kind	Yes, in kind
FT premiumoffered?	No	No	Yes	Yes
Relative contract value	0	+65 FCFA/kg	+50 FCFA/kg	−97FCFA/kg

results indicate that farmers are willing to adhere to these standards if provisions, a social premium and a minimum selling price are provided.

The picture is different for the FT-Org contract, where a significant compensation of 97 FCFA/kg (0.15 EUR/kg) needs to be paid on top of a minimum selling price and social premium for farmers to participate. For a staple crop like rice, it is doubtful whether such incentive payments are financially viable to sustain the existence of this type of contract (Swinnen and Vandeplas, 2011). The need for significant compensation is in line with existing studies on the costs and impacts of organic coffee certification (e.g. Beuchelt and Zeller, 2011; Mendez et al., 2010) but contradicts findings on farmers' positive attitudes towards organic rice farming in the Philippines (Chouichom and Yamao, 2010) and on the need for a transition period for organic rice farming to become profitable (Becchetti et al., 2012; Taotawin, 2011).

5. Conclusion

This study uses a DCE to examine the preferences of smallholder rice farmers in Benin for FT contracts. The results indicate that the majority of smallholders prefer to market their produce under a contract compared to selling it independently on the market. Contracts with higher prices, a premium and input provisions are more likely to be accepted, while complete restrictions on herbicide and pesticide use and child labour reduce this likelihood. Preferences for contract-farming are positively correlated with previous contract-farming experience, and with being resource- and credit-constrained. These findings indicate that farmers perceive contract-farming as a way to overcome the constraints caused by market imperfections. The results show that farmers have the highest willingness to accept a domestic contract in which extension and inputs are provided by the buyer without any restrictions on fertiliser use and child labour. This may confirm previous findings that although farmers value environmental and social aspects, their preferences regarding certification remain mainly economically driven. At current market prices, farmers are also willing to accept an FT contract that includes fertiliser and child labour restrictions alongside a social premium, but they are not willing to accept an FT-Org contract that completely prohibits chemical input use. To accept the latter, farmers require significant monetary compensation.

These findings have implications for the rice sector in Benin. Results imply that rice contract-farming might be effective to better link farmers to domestic urban markets and upgrade domestic rice value chains in the interest of food security. This supports the view that research should focus more on opportunities in domestic markets instead of a narrow focus on international, high-demanding value chains. The findings on FT-Org certification imply that a rather large price premium is necessary for farmers to accept organic standards and to make FT-Org contracts self-enforcing. Concretely, this means that adding organic requirements to the public-private FT scheme in the Savalou region in Benin may undermine the adoption and expansion of the scheme.

Given the specificity of the case study, its findings cannot be generalised for rice exporting countries such as Thailand and India or for the major FT products such as coffee and bananas. The broader implications of the findings are limited. Yet this study documents the importance of combining consumer studies, a common practice, with producer studies, a less common practice. If standards such as FT are to bridge the gap between production practices in low-income countries and consumer expectation in high-income countries, standard design should be systematically informed by both consumer and producer preferences. DCE research can contribute to this as it can be a powerful tool to understand farmers' production and marketing preferences. Public and private investments in "linking farmers to markets" programmes have increased substantially over the past decade. The effectiveness of such investments could be enhanced if farmers' preferences are more systematically taken into account in the design of such programmes.

Acknowledgements

This work was supported by VLIR-UOS (Vladoc scholarship programme), FWO (Research Foundation Flanders) and the KU Leuven Special Research Fund (OT programme). The authors thank Aliou Diagne at AfricaRice in Cotonou for facilitating and supporting the fieldwork and Matty Demont from the International Rice Research Institute for helpful comments during the preparation of fieldwork and early drafts of the paper.

References

Abebe, G.K., Bijman, J., Kemp, R., Omta, O., Tsegaye, A., 2013. Contract farming configuration: smallholders' preferences for contract design attributes. Food Pol. 40, 14–24.
Akoyi, K.T., Maertens, M., 2017. Walk the talk: private sustainability standards in the Ugandan coffee sector. J. Dev. Stud. http://dx.doi.org/10.1080/00220388.2017.1327663.
Bacon, C.M., Ernesto Mendez, V., Gómez, M.E.F., Stuart, D., Flores, S.R.D., 2008. Are sustainable coffee certifications enough to secure farmer livelihoods? The millenium development goals and Nicaragua's Fair Trade cooperatives. Globalizations 5 (2), 259–274.
Balineau, G., 2013. Disentangling the effects of fair trade on the quality of malian cotton. World Dev. 44, 241–255.
Barham, B.L., Callenes, M., Gitter, S., Lewis, J., Weber, J., 2011. Fair trade/organic coffee, rural livelihoods, and the "agrarian question": southern Mexican coffee families in transition. World Dev. 39 (1), 134–145.
Barham, B.L., Weber, J.G., 2012. The economic sustainability of certified coffee: recent evidence from Mexico and Peru. World Dev. 40 (6), 1269–1279.
Barrett, C.B., 2008. Smallholder market participation: concepts and evidence from Eastern and Southern Africa. Food Pol. 33 (4), 299–317.
Barry, P.J., Sonka, S.T., Lajili, K., 1992. Vertical coordination, financial structure and the changing theory of firm. Am. J. Agric. Econ. 74 (5), 1219–1225.
Becchetti, L., Costantino, M., 2008. The effects of fair trade on affiliated producers: an impact analysis on Kenyan farmers. World Dev. 36 (5), 823–842.
Becchetti, L., Conzo, P., Gianfreda, G., 2012. Market access, organic farming and productivity: the effects of Fair Trade affiliation on Thai farmer producer groups. Aust. J. Agric. Resour. Econ. 56, 117–140.
Beuchelt, T.D., Zeller, M., 2011. Profits and poverty: certification's troubled link for Nicaragua's organic and fairtrade coffee producers. Ecol. Econ. 70 (7), 1316–1324.
Blandon, J., Henson, S., Islam, T., 2009. Marketing preferences of small-scale farmers

in the context of new agrifood systems: a stated choice model. Agribusiness 25 (2), 251–267.
Chiputwa, B., Spielman, D.J., Qaim, M., 2015. Food standards, certification, and poverty among coffee farmers in Uganda. World Dev. 66, 400–412.
Chouichom, S., Yamao, M., 2010. Comparing opinions and attitudes of organic and non-organic farmers towards organic rice farming system in North-Eastern Thailand. J. Org. Agric. 5 (1), 25–35.
Cummings, R.G., Taylor, L.O., 1999. Unbiased value estimates for environmental goods: a cheap talk design for the contingent valuation method. Am. Econ. Rev. 89 (3), 649–665.
Demont, M., Ndour, M., 2015. Upgrading rice value chains: experimental evidence from 11 African markets. Glob. Food Secur. 5, 70–76.
Emerson, P.M., Souza, A.P., 2007. Child labor, school attendance, and intrahousehold gender bias in Brazil. World Bank Econ. Rev. 21 (2), 301–316.
FLO (Fairtrade International), 2011. Fairtrade Standard for Small Producer Organizations.
FLO (Fairtrade International), 2016. Growing Better Futures: Annual Report 2015–2016.
FAOSTAT, 2016. http://faostat.fao.org/.
Gelaw, F., Speelman, S., Van Huylenbroeck, G., 2016. Farmers' marketing preferences in local coffee markets: evidence from a choice experiment in Ethiopia. Food Pol. 61, 92–102.
Gómez, M.I., et al., 2011. Food value chains, sustainability indicators and poverty alleviation. Science 332 (6034), 1154–1155.
Giovannucci, D., Ponte, S., 2005. Standards as a new form of social contract? Sustainability initiatives in the coffee industry. Food pol. 30 (3), 284–301.
Greene, W.H., Hensher, D.A., 2003. A latent class model for discrete choice analysis: contrasts with mixed logit. Transp. Res. Part B 37 (8), 681–698.
Grunert, K.G., Hieke, S., Wills, J., 2014. Sustainability labels on food products: consumer motivation, understanding and use. Food Pol. 44, 177–189.
Henson, S., Humphrey, J., 2010. Understanding the complexities of private standards in global agri-food chains as they impact developing countries. J. Dev. Stud. 46 (9), 1628–1646.
Hole, A.R., Kolstad, J.R., 2012. Mixed logit estimation of willingness to pay distributions: a comparison of models in preference and WTP space using data from a health-related choice experiment. Empir. Econ. 42 (2), 445–469.
Lagarde, M., 2013. Investigating attribute non-attendance and its consequences in choice experiments with latent class models. Health Econ. 22, 554–567.
Louviere, J.J., Flynn, T.N., Carson, R.T., 2010. Discrete choice experiments are not conjoint analysis. J. Choice Model. 3 (3), 57–72.
Maertens, M., Vande Velde, K., 2017. Contract-farming in staple food chains: the case of rice in Benin. World Dev. 95, 73–87.
MAEP, 2011. Strategie national pour le developement de la riziculture au Benin.
Masakure, O., Henson, S., 2005. Why do small-scale producers choose to produce under contract? Lessons from nontraditional vegetable exports from Zimbabwe. World Dev. 33 (10), 1721–1733.
Mitiku, F., de Mey, Y., Nyssen, J., Maertens, M., 2017. Do private sustainability standards contribute to poverty Alleviation? A comparison of different coffee certification schemes in Ethiopia. Sustainability 9 (2), 246–267.
Meemken, E., Veettil, P.C., Qaim, M., 2017. Toward improving the design of sustainability standards: a gendered analysis of farmers' preferences. World Dev. (forthcoming).
Mendez, V.E., et al., 2010. Effects of Fair Trade and organic certifications on small-scale coffee farmer households in Central America and Mexico. Renew. Agric. Food Syst. 25 (03), 236–251.
Ortega, D.L., Ward, P.S., 2016. Information processing strategies and framing effects in developing country choice experiments: results from rice farmers in India. Agric. Econ. 47, 493–504.
Reggio, I., 2011. The influence of the mother's power on her child's labor in Mexico. J. Dev. Econ. 96, 95–105.
Ruben, R., Fort, R., 2012. The impact of fair trade certification for coffee farmers in Peru. World Dev. 40 (3), 570–582.
Schipmann, C., Qaim, M., 2011. Supply chain differentiation, contract agriculture, and farmers' marketing preferences: the case of sweet pepper in Thailand. Food Pol. 36 (5), 667–677.
Swinnen, J., Vandeplas, A., 2011. Rich consumers and poor producers: quality and rent distribution in global value chains. J. Glob. Dev. 2 (2).
Swinnen, J., Maertens, M., 2007. Globalization, privatization, and vertical coordination in food value chains in developing and transition countries. Agric. Econ. 37, 89–102.
Taotawin, N., 2011. The Transition from Conventional to Organic Rice Production in Northeastern Thailand: Prospect and Challenges. Environmental Change and Agricultural Sustainability in the Mekong Delta. Springer, Netherlands, pp. 411–435.
Vecchio, R., Annunziata, A., 2015. Willingness-to-pay for sustainability-labelled chocolate: an experimental auction approach. J. Clean. Prod. 86, 335–342.
VECO, 2011. Promotion of the Rice Value Chain in Benin: Cooperation between Beninese Farmers' Organisations, the Belgian Retailer Colruyt and the NGO.
Valkila, J., 2009. Fair Trade organic coffee production in Nicaragua: sustainable development or a poverty trap? Ecol. Econ. 68 (12), 3018–3025.
Weber, J.G., 2011. How much more do growers receive for Fair Trade-organic coffee? Food Pol. 36 (5), 678–685.
Williamson, O.E., 1979. Transaction cost economics: the governance of contractual relations. J. Law Econ. 22, 233–262.
Wopereis, M.C., Johnson, D.E., Ahmadi, N., Tollens, E., Jalloh, A., 2013. In: Realizing Africa's Rice Promise. CABI.