Invited paper presented at the 6th African Conference of Agricultural Economists, September 23-26, 2019, Abuja, Nigeria

Producer valuation of Geographical Indications-related attributes of export crops in Kenya: A choice experiment analysis

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Abstract

Globally, there is an increase in the protection of unique products as geographical indications (GI). GI provide consumers with information on product quality, reducing information asymmetry and creating opportunities for increased producer prices. Differentiating products based on production region is evident in the export market of beverage crops. Promotion of GIs is dependent on, among others, the products comparative advantage, producer preferences and market demand, generating considerable surplus to the producers. The objective of the study was to determine producers' valuation of attributes related to protection of export commodities as GI in Kenya. The study focused on Murang'a coffee (n=135), and Kirinyaga tea (n=137). Producers were given efficient choice sets with market and institutional attributes. From the analysis, coffee producers were more likely to register their commodities as geographical indications protected at regional level and having a minimum guaranteed return. Tea producers valued minimum guaranteed return most but preferred factory level protection. Tea producers were less likely to protect their products with GI compared to coffee producers.

Protection of export commodities as GI may provide solution to reducing marketing and pricing challenges to producers. However, as shown by the tea analysis, efficient field and factory management should also be evident.

Key words: Choice experiment; export commodities; geographical indications; producers; Willingness-to-pay

1. Introduction

Globally, there is an increase in the protection of unique products with geographical indications (GI), with a perceived view to environmental sustainability and income generation for the producers. In Kenya's Vision 2030, the Agricultural Sector Development Strategy (ASDS) is expected to transform agricultural production from subsistence to a commercially-oriented sector, which is key for growth in the country's economy (GoK, 2010). Some of the identified strategies to increase production and hence food security include improving productivity and access to markets as well as value addition for national, regional, and international markets.

According to the ASDS (2010 – 2020) (GoK, 2010), small scale producers account for 75% of total agricultural output and 70% of marketed produce. Specifically, small-scale farmers produce at least 65% of coffee and 50% of tea and, with exception of maize, wheat and sugar, almost 100% of all other crops. Most of the products are sold raw with little or no value added. Raw undifferentiated products reduce competitiveness in the export market as producers are not able to negotiate better prices for the bulky produce (GoK, 2010, 2013). Furthermore, the export market is characterised by stringent codes of practice that producers have to adhere to in order for the commodities to access the market.

When producer prices fail to offset the cost of production, the producers will often compromise on the input use or engage in unsustainable land use systems that are detrimental to the environmental sustainability of a rural landscape in the long run. This trade-off between environmental quality and profits is a delicate one. Use of price-based incentives can spur behavioural change among land users to ensure sustainable management of the production resources (Birol and Koundouri, 2008). Evident in tea producing regions of Kenya, it is possible for producers to increase production in order to benefit from the price-based

incentives, while conserving the environment and ecosystem, thus influencing the livelihoods of the rural communities positively (World Bank, 2012; GGBP, 2014).

Understanding the value of environmental sustainability and integrating the information in the policy-making process can therefore set the delicate balance between profits and environmental quality to a sustainable level. Studies have associated geographical indications (GI) with positive effects on sustainable rural development through ecological, economic and social benefits (Babcock and Clemens, 2004; Williams and Penker, 2009).

The basis of GI registration is that consumers value certain qualities of a product that are essentially attributable to the geographical characteristics of the production region. Producers on the other hand register and protect these unique qualities and document the codes of practice that govern the protection. Producers' decision to register such unique agricultural products, especially those already traded in the export market as GIs, would be dependent on the extent of demand for the qualities by consumers, as well as the composition and development of the market, both locally and internationally (Hansen, 2013; Vats, 2016). Furthermore, the producers' experience with the existing institutional and market environments are hypothesised to also influence their perception of incremental value that would accrue to them from investing in such a protection (Ruto and Garrod, 2009).

Differentiating products based on characteristics of the production region is evident in the export market of beverage crops, with different prices received by the producers. In Kenya, export prices for tea are known to differ depending on the source garden (factory) of the tea. This is attributed to characteristics of the production region and the field and factory management. The resulting quality and its consistency influence taste preference of consumer, some of whom are willing to pay premium prices for the higher grades and classes of tea. Whereas grades are based on the characteristic of the tea grain, the classes are determined by

the organoleptic characteristics, a major consideration for some of the international consumers who pay a premium price to access the beverage. Coffee buyers as well attribute different prices to the consumers' preference for coffee quality, which is dependent on attributes in specific regions of production (Gichovi, 2011; Blakeney and Mengistie, 2012; Bagal *et al.*, 2013; Melli, 2015).

The codes of conduct associated with such protection, if conditional on being environmentally sustainable, accord the society a range of benefits as well. These include enhanced rural landscape, improved water quality, better soil and water conservation, and future production due to biodiversity preservation, amongst others. Promotion of such high value commodities as GIs would therefore be dependent on, among others, the products comparative advantage, producer preferences and market demand (Blakeney *et al.*, 2012). Geographical indications, therefore, have potential to generate considerable surplus in form of economic and non-economic benefits to the agricultural export commodity producers in specific geographical regions, a reward for their long-term investment in building the reputation of the product (Herrmann and Teuber, 2010; Oana *et al.*, 2011).

The objective of this study was to determine agricultural producers' valuation of attributes related to potential protection of export commodities as geographical indication in Kenya. Specifically, the study aimed to (i) determine the attributes the producers would value as being important for marketing unique origin export commodities with geographical indications, and (ii) establish presence of heterogeneity in preferences among the producers.

The study focused on two export commodities perceived to have territorial based uniqueness that consumers prefer. These are Murang'a coffee and Kirinyaga tea, both produced in the highlands of Central Kenya, and described under the study site section.

2. Methodology

2.1 Model estimation – Application of choice experiments

The study was based on choice experiments, a non-market valuation technique. Since most of the attributes that producers consider in making production decisions are not traded in the market, non-market valuation was preferred to determine producers' preference. Whereas consumers consider attributes related to the quality of the good, including taste, colour among others, the attributes considered by producers tend to focus on enabling environment and institutions. These include access to market, suitability of production region, characteristics of value chain actors, and enabling organisations, amongst others. These influence the cost of production as well as the revenue and hence profits that the producers receive, and consequently influence the producers' production decisions.

Choice experiments are effective mechanisms for evaluating preferences for environmental policy. The theoretical framework of choice experiment modelling is based on the Lancaster consumer theory (Lancaster, 1966) with an econometric basis in the random utility maximisation (RUM) theory (McFadden and Zarembka, 1974; Hanley, Mourato and Wright, 2001; Louviere, Hensher and Swait, 2003). The consumer theory defines utility as the satisfaction an individual derives from characteristics that goods possess rather than from the entire good *per se* (Lancaster, 1966; Louviere, Hensher and Swait, 2003). According to the authors, consumer utility is not derived from the good but from characteristics that the goods possess, whether used singly or in combination, to produce the desired utility. Different consumers can hence derive different levels of utility from the same good.

Choice experiments help to assess the monetary value the respondents would attach to hypothetical changes made in the attributes of their good, and especially the non-monetary attributes (Dachary-Bernard, 2008). In reaching a final decision, the respondent is assumed to

have and use all relevant information and is willing to trade-off one attribute for another in the decision making process (Louviere, Hensher and Swait, 2003).

The random utility maximising model assumes that while the individual knows his preferences with certainty and does not consider them stochastic, the researcher is not able to observe all the components and hence treats the unobservable as random (Hanemann and Kanninen, 2001). According to this framework, the indirect utility function (*Uij*) for each respondent *i* can be decomposed into two parts: (i) a deterministic element, which is specified as *Xij* (characteristics of individual *i* presented with different alternatives *j* in the choice set) with parameter vector β; and (ii) a stochastic element, error term e_{ij}, which represents unobservable influences on individual producer choices (Hoffman and Duncan, 1988; Hanley, Mourato and Wright, 2001; Kosenius, 2013). The utility function is illustrated by Equation 1:

$$U_{ij}=bX_{ij}+e_{ij} \quad (1)$$

In their choice of production options, producers have preferences not only about productivity and profitability, but also about the various attributes of the good or service being valued (Jæck and Lifran, 2014). Therefore, based on Equation (1), producer *i* chooses the alternative *g* if the utility derived from that alternative exceeds the utility from alternative *q* (Equation (2).

$$U_g \geq U_q, \forall_q, g \neq q \quad (2)$$

In this study, the model was specified as a random parameters logit model. Whereas the multinomial logit assumes homogenous preferences across individuals, the random parameters logit model appreciates that heterogeneity exists among producers, and therefore extends the basic multinomial logit model by allowing the parameters associated with each observed variable to be random (Revelt and Train, 1998). The mixed logit model relaxes the assumption of '*independence of irrelevant alternatives*' (IIA), which stipulates that the ratio of the

probabilities of choosing any two options will be unaffected by the attributes or availability of other options. Further, where individual respondents make repeated choices, as was the case in this study, estimation is more efficient using mixed logit (Revelt and Train, 1998; Hensher, Rose and Greene, 2015; Greene, 2016).

In the mixed logit random utility model, an individual (i=1, 2…I) faces a choice amongst j=1,2,…,J alternatives in each of T choice scenarios. Individual i is therefore assumed to choose the alternative with the highest utility, having considered a full set of presented alternatives in each choice scenario t. Whereas heterogeneity could originate from other individual specific attributes or alternative specific constants, the model specification in this paper did not include any socio-demographic or attitudinal characteristics of the respondents nor a constant term. Since the study objective was to explore the producers' valuation of GI-related attributes by assessing the trade-offs between the attributes, the choice was expressed solely as a function of the attributes, in absence of more complex relationships (Louviere, Hensher and Swait, 2003; Campbell, Hutchinson and Scarpa, 2008).

The mixed logit model hence takes the following formulation:

$$U_{ijt} = \beta_i' x_{ijt} + \alpha_i^{'} z_{ijt} + \varepsilon_{ijt} \quad (3)$$

Where $\beta_i X_{ijt}$ is the vector for the non-monetary attributes defined as random parameters and assumed to be normally distributed, while $\alpha_i y_{ijt}$ represents the (random) cost attribute in the equation, specified as non-stochastic (variance equals zero) following (Hensher, Rose and Greene, 2015); β_i and α_i are individual random specific utility parameters; x_{ijt} is a vector of observed variables for individual i selecting an alternative j in choice set t; y_{ijt} is the vector for the cost variable for individual i for alternative j in choice set t. ε_{ijt} is a parameter vector that is randomly distributed across individuals (unobserved random disturbances that result in

unobserved heterogeneity). Therefore, in the random parameters logit model, the probability that an individual chooses alternative *j* is given by:

$$Prob[choice\ j|i,t,\beta_i] = \frac{\exp(\beta_i' x_{ijt} + \alpha_i' y_{ijt})}{\sum_{j=1}^{J_t} \exp(\beta_i' x_{ijt} + \alpha_i' y_{ijt})} \quad (4)$$

Based on the choice made, the mixed logit analysis estimates the impact on the producers' preference formation (of different attributes) resulting from the given change in cost of GI registration (following Hensher et al., (2015)). The cost variable was the normalising variable to determine the WTP while McFadden's ρ^2 was used to measure the overall fit of the model (Louviere, Hensher and Swait, 2003; Birol, Smale and Gyova, 2006; Greene, 2016). The producers' economic value (willingness to pay) for each attribute was derived from parameter estimates of each of the attributes β_x and the estimates of the cost attribute β_y. The willingness-to-pay value for each attribute represents the proportion of the monetary value that the producers would pay in order to adopt an attribute. It gives the monetary value of the utility coming from an extra unit of the specific attribute. The willingness to pay value (W) was derived as:

$$W = -\frac{\beta_x}{\alpha_y} \quad (5)$$

2.2 Study site selection and description

The study was conducted in two counties within Kenya where two export crops, Tea and Coffee, are grown and are reputed to have unique characteristics based on the region of production. These were Murang'a County for coffee production [n=135]) and Kirinyaga County for tea production [n=134]) (Figure 6.3-2). The characteristics that qualify the two origin products are summarised on Figure 1, based on a criteria compiled from different

literature sources (Barjolle and Sylvander, 2000; Giovannucci *et al.*, 2009; Vandecandelaere *et al.*, 2010; Bramley and Biénabe, 2013).

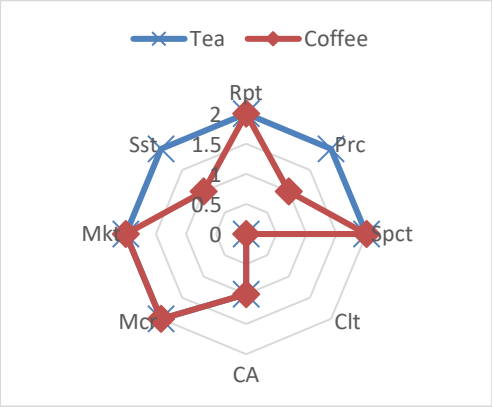

Figure 1: Characterisation scoring criteria for the selected potential GI products

Key: **Rpt**=Reputation, **Prc**=Premium price, **Spct**=Specificity/Uniqueness, **Clt**=Cultural aspects/linkages, **CA**=Collective action and institutions, **Mcr**=Macro institutions recognition and support, **Mkt**=Market attractiveness and scope of market, **Sst**=Environmental impact and sustainability

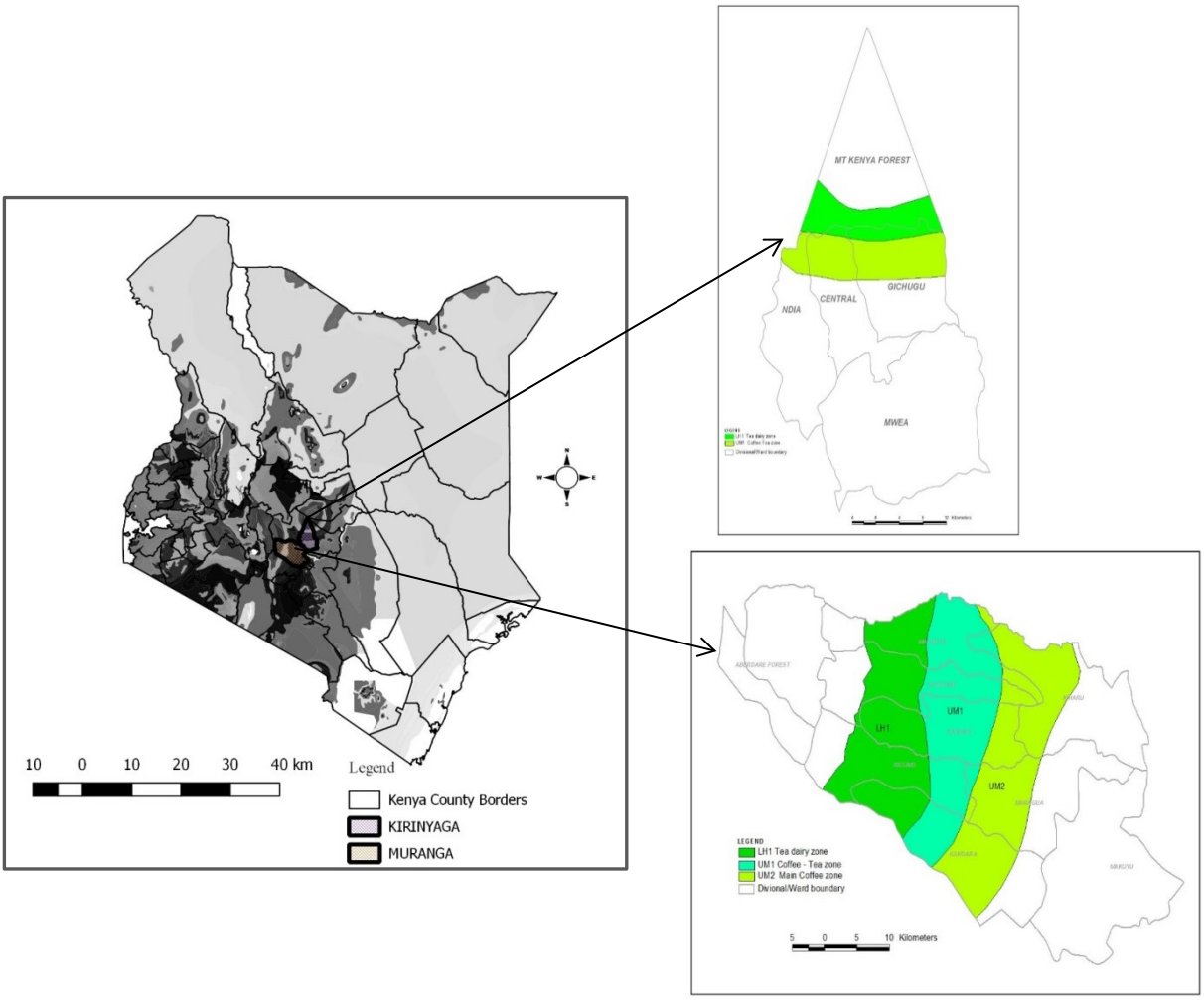

Figure 2: Map of Kenya showing study counties and agro-ecological regions

Murang'a County has three distinct coffee producing zones starting from the high altitude tea/dairy zone, the coffee/tea zone (both with one coffee season per year) to the main coffee zone on UM2 (with two coffee seasons in each year). Part of the coffee zones fall under the Mt. Kenya zone while the rest is more on the Aberdare ranges. Coffee from Murang'a and the bordering Nyeri Counties is said to have distinct taste that consumers are willing to pay a premium for. However, in most Coffee Societies, producers rarely benefit from the higher prices paid for their coffee. GI registration, if successful, would not only enhance the chances of producers accessing the higher prices, but would improve information flow between the producers and consumers. However, this has to exist within the prevailing value chain structure).

Tea production in Kirinyaga County is done on the Tea-Dairy zones and the Coffee-Tea zones. Whereas tea from the county generally attracts high prices due to place based attributes known to the consumers, the producers are not fully aware of the link between region of production and price. Tea production under the Kenya Tea Development Agency is characterised by clear environmental management practices going beyond tea production. Further, fertilizer is the only external input added to the Kenyan tea, hence reducing challenges related to residue levels as well as improving environmental management.

2.3 Design of choice experiments and data collection

The choice experiments were unique to each of the identified products. Focus group discussions and key informant interviews were held to develop and ascertain the attributes used in the choice experiments and the levels for each attribute (Table 1). Literature search was used to identify the attributes based on similar studies (Oh *et al.*, 2005; Birol, Smale and Gyova, 2006; Ruto and Garrod, 2009; Otieno, Ruto and Hubbard, 2011).

NGENE 1.1.2 software (Rose *et al.*, 2014) was used to develop the orthogonal design that had 36 choice sets. The orthogonal design was used as the test experiment. Each choice set had three alternatives comprising a pairwise combination of the orthogonal profiles and a status quo option, based on the current situation. These choice sets were organised in six blocks of six (6) sets each. Thirty-six (36) randomly selected respondents in each study area were presented with one block of choices. The results of the test experiments were analysed using NLOGIT 5. The resulting parameter estimates were used as the priors to generate the efficient choice sets in NGENE 1.1.2 software.

Twenty-four efficient choice sets were designed, organised in six blocks of four (4) sets each. Each respondent in the study was randomly assigned with a series of T=4 efficient choice sets

(1 block). In each choice set, the respondent made a choice from J=3 alternatives (scenarios), the third comprising attributes level for the status quo. An example of a choice scenario presented to respondents is shown on Table 2.

Table 1: Attributes and levels for choice experiment for the study products

Attribute	Levels assumed for each attribute	Products for which attribute applies	
		Coffee	Tea
Expected price information received at beginning of season (ExPRICE)	0=No prior expected price information received [NoExPrice] 1=Information on expected prices received prior to sale [ExPriceSell] 2= Information on expected prices received beginning of season [ExPriceSeas]	Yes	Yes
Minimum guaranteed return (MGR)	0=No minimum guaranteed price (rely on markets) 1=Minimum guaranteed price received	Yes	Yes
Preferred level of GI protection (PrLEV)	0=No protection (Retain current) [FactoryPrtLvl] 1=County level CountyPrtLvl] 2=Regional level [RegPrtLvl]	Yes	Yes
Cost of maintaining the Protection (COST) KES/HH/year)	Kenya Shillings (KES) to be paid by each household each year [100 KES appx ≈ 1USD]	75 100 200	100 200 400

The choice experiments were conducted between June and August 2015. The sampling frame comprised the respective commodity small-scale producers within the region specified as having unique and differentiating qualities of the product. The data was analysed using Limdep/Nlogit version 6.0 (Greene, 2016). The models were estimated using maximum simulated likelihood procedures of the random parameters logit with 100 Halton draws for the simulations (Hensher, Rose and Greene, 2015).

Table 2: An example of a choice set presented to respondents in Kirinyaga County

Block 2, Scenario 2

Attribute	Alternative A	Alternative B	Alternative C
Time expected price information received	Expected price information received just before sale of tea	Expected price information received just before sale of tea	No expected price information received before sale
Minimum guaranteed price of tea	No minimum guaranteed price	No minimum guaranteed price	No minimum guaranteed price
Preferred protection of tea as a GI	Mt. Kenya level protection	County (Kirinyaga) protection	Factory level protection
Cost of registering and maintaining the GI (KES/HH/year)	KES.200	KES.200	KES.100
I prefer alternative:			

3. Results and discussions

3.1 Random parameter model estimates

The maximum likelihood estimates for the mixed logit models for each of the potential GI commodities are presented on (Table 3). The log-likelihood at convergence was -234.3 and -290.4 for coffee and tea models respectively. Both models were found to be statistically significant with a X^2 statistic of 717.9 and 526.7 respectively for the coffee and tea models. The cost attributes for both commodities had the expected negative signs and were statistically significant at 1% level.

In the coffee model results, all estimated coefficients were significant at 1% and 5% levels. In the tea model results, only three coefficients were statistically significant at 1% and 5% levels.

These were coefficients for receiving expected price information at the beginning of the tea picking season, having a minimum guaranteed price and protecting products at factory prices. The cost coefficient was also significant. Receiving price information at the beginning of the season increases the likelihood of coffee producers to choose GI registration by at least 3.4 compared to 4.7 as a result of receiving information just before selling. Having minimum guaranteed returns and a regional level GI protection would have the greatest impact (7.7 and 7.1 respectively) on the producer's choice. The coefficients are much lower for the tea analysis suggesting that, based on the selected attributes, coffee producers would derive more value from GI protection compared to the tea producers (Table 3).

Further, there was evidence of preference heterogeneity around the mean for at least 3 attributes in each of the coffee and tea models at 95% confidence level as depicted by the significant standard deviation of the coefficients (Table 3). The standard deviation measures the magnitude of differences in respondents' preferences for the attribute (Johns *et al.*, 2008).

Table 1: Coefficients and distributions of random parameter logit estimates for the utility functions of the export crop commodities

Attributes	Coffee		Tea	
	Coeff	Std Dev of coeff	Coeff	Std Dev of coeff
Price info at beginning of season	3.393*** (1.465)	2.751* (1.626)	1.492*** (0.547)	1.714*** (0.497)
Price info just before selling	4.752*** (1.615)	3.289*** (1.291)	0.762 (0.494)	0.671 (0.815)
Minimum guaranteed return	7.685*** (2.456)	5.098*** (1.832)	3.472*** (0.610)	2.507*** (0.543)
Factory level protection			0.976** (0.403)	1.642*** (0.377)
County level protection	2.628*** (1.016)	2.300* (1.289)	0.213 (0.435)	0.911 (0.732)
Regional level protection	7.129*** (2.330)	3.346** (1.346)		
COST	-0.013** (0.003)		-0.004*** (0.001)	
McFadden R^2 adjusted	0.605		0.476	
Log-likelihood	-234.3		-290.4	
Chi square	717.9***		526.7***	

****, **, * denotes significance at 1%, 5%, 10% level; standard error in brackets*
Shaded cells denote that the attribute was not part of the analysis for the product

3.2 Producers' valuation (willingness to pay) for GI related attributes

The producers' valuation, assessed through the willingness to pay, is based on the WALD test using Delta method and shows the significance based on the Z-statistic (Table 4). Coffee producers are willing to pay more in order to have a minimum guaranteed return (KES 609.7) (minimum expected price) for the coffee delivered at the factory, followed by having a regional level of protection (KES 564.9). From the results, we can derive that the coffee producers are willing to pay on average KES 1,444 (appx USD 13.5) for a regional GI level protection that assures the producers of receiving approximate price information at the beginning of the season and have a minimum guaranteed return.

The attribute valued most by the tea producers was having a minimum guaranteed return, for which they were willing to pay KES 922 (appx USD 8.8). Having a factory level protection (status quo) was the second valued attribute by the producers. Price variations among KTDA run factories within the same region explain the producers' preference for factory rather than regional protection level. Overall, from the two significantly valued attributes, tea producers are willing to pay on average KES.1,181 (appx USD.11.25) to protect their tea as a factory-level geographical indication with minimum guaranteed return. During the focus group discussions with the producers, there was concern regarding the fluctuation of tea prices across years, yet labour costs remained fixed, implying a decrease in their profits. The producers also expressed concern that a regional rather than factory level protection may eliminate competition within the same study region and probably compromise the quality of tea. This would further explain their preference for factory level protection. However, GI protection would in essence provide a codes-of-practice that would fit in the current factory organisation and accord producers' prices based on their level of adherence to the laid down codes.

Table 1: Producers' willingness to pay for GI attributes for tea and coffee

Attributes	Coffee		Tea	
	WTP Estimates	**95% confidence interval**	**WTP Estimates**	**95% confidence interval**
Price info beginning of season	268.9**	(63 – 474)	396.2*	(-74 – 867)
Price info just before selling	376.5***	(146 – 607)	202.3	(-131 – 535)
Minimum guaranteed returns	609.7***	(225 – 995)	922.0***	(246 – 1598)
Factory level protection			259.3***	(108 – 411)
County level GI protection	208.2**	(34 – 382)	56.7	(-167 – 280)
Regional level GI protection	564.9***	(221 – 909)		

Attributes	Coffee		Tea	
	WTP Estimates	**95% confidence interval**	**WTP Estimates**	**95% confidence interval**

***, *** - significant at 95% and 99% level of significance*

Conclusion

At least 80% of Kenya's coffee and tea are traded in the export market, either through direct sales or through the auction coordinated by the respective Directorates (Coffee Directorate and Tea Directorate). The WTP analysis infers an implied preference by producers for the attributes for each of the commodities. The results indicate the incentives that producers perceive as important for the successful registration of their unique products as geographical indications. The higher the WTP value for each attribute, the more its importance is to the producers.

The attributes related to minimum guaranteed returns ranked highly for both export commodities. How much of the product premium prices actually accrue to the producers would not only impact their livelihoods but also the protection of the environment and biodiversity associated with each product. The results indicate that coffee producers would derive higher value from GI protection compared to tea producers. It is likely that the coffee producers view GI protection, as explained to them, as a means to reduce market failures associated with inadequate access to information and low prices, among others. This is an important consideration when making the policy guidelines that will accompany the GI bill, when formulated.

In tea production, the differences in prices associated with factories within the same production region imply that other than geographical characteristics in the region of production, farmer and factory management factors are important attributes to the quality of the tea in the cup. Efforts on how to streamline the field and processing management in order to ensure that

quality of tea attained is similar in a production region would strengthen the producers' interest for a regional level protection. Having more volumes with consistent quality and presence of geographical-related characteristics in the final product would earn the producers a greater stake in attracting consistent and better prices for their produce. Whereas current structure of the tea value chain accords the producers in the study region high prices, protection and marketing of the tea based on the *terroir*-based characteristics would provide more information to consumers and probably provide producers with higher bargaining power for consistent prices for their products.

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