

Restructuring international food chains: Building sustainable and all-inclusive food chains at the primary stages

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Abstract

Although it is often acknowledged that effective inclusion of small-scale primary producers in international chains is crucial for alleviating poverty in developing countries, few insights exist about how to build sustainable and all-inclusive food chains especially those based on scarce natural resources. In order to address challenges that marketing and development policy and institutions as well as small-scale primary producers in the agro-ecological sector face in promoting sustainable practices, this paper focuses on the use of contracts. The paper investigates whether small-scale primary producers would engage in contracts that oblige them to implement sustainable and quality-improving practices and if so under what conditions. Results show that primary producers (fishermen in this study) are open to sustainability-quality enhancing contracts provided that such contracts also enhance their welfare and economic benefits. Implications for building sustainable and all-inclusive international marketing channels are discussed.

1.0 Introduction

Poverty and inequality continue to be widespread in developing economies (Wade 2004) even as globalization and integration of world markets offer opportunities for economic development (Bardhan, 2006; Thorbecke and Nissanke, 2006). Poor small-scale producers in developing economies are increasingly being excluded and marginalized from global marketing channels (Nissanke and Thorbecke, 2006; Van de Meer, 2006). The competitiveness of their production and income-earning opportunities is often constrained by lack of access to improved technologies, high transaction costs, inadequate institutions and infrastructure among others. Besides, many poor small-scale primary producers do not have adequate formal education such that they often have limited or no exit options to effectively integrate into other sectors of the economies. Consequently, many of the poor depend on unsustainable practices leading to depletion of natural resources.

Both marketing and economics literature acknowledge that increasing poverty and degradation of natural ecosystems are some of the major failures of the existing marketing systems (Wilkie and Moore, 1999) and trade and economic policies (Basu, 2006). For example, Wilkie and Moore (1999) question whether the benefits arising from the existing marketing system are equally distributed across all sectors of the society and the extent to which the marketing system would protect public interests or act as a steward of the society's resources. Similarly, Nissanke and Thorbecke (2006) question whether the present form of market integration is conducive to a growth and structural transformation process that is capable of engendering and sustaining pro-poor economic growth and favourable distributional consequences. This literature however provides limited insights to help in building sustainable and all-inclusive food chains especially those based on scarce natural resources. Redistributing the benefits of marketing and protecting natural resources would require restructuring the marketing system and international chains in particular. Small-scale primary producers especially from low-income countries should be integrated into the international food chains in a way that secures their livelihoods, enhance their economic gains and motivate them to implement sustainable practices. In short, the marketing system and international food chains in particular, need to be restructured so that they uphold the three pillars, i.e., the people, profit and planet dimensions of sustainable development (Brundtland

et al, 1987) at all levels but crucially so, at primary stages where the poor producers are the primary custodians of the natural resources..

The purpose of this paper is therefore to investigate how to address the challenges that marketing and development policy and institutions as well as small-scale primary producers in the agro-ecological sector of low-income countries face in promoting sustainable practices. The paper focuses on the use of contracts as mechanisms to (re)structure the behaviour of primary producers in order to implement sustainable practices and improve the quality of fresh commodities. The paper focuses on small-scale fishermen in the international fresh Nile perch channel from Lake Victoria. Specifically, the paper investigates: (1) whether small-scale fishermen would be willing to engage in contracts that oblige them to implement sustainable fishing practices and (2) if so what would be the terms of contracts? The rest of the paper is organised as follows; the next section outlines a theoretical background outlining the basic hypothesis of the paper. The research methodology used to empirically explore the hypothesis follows. Results and their implications for building sustainable and all-inclusive food chains conclude the paper.

2.0 Theoretical background

Economic transactions are often (re)structured to mitigate against known hazards arising from market failures (Grewal and Dharwadkar, 2002). Different institutional frameworks and processes are devised to shape human interaction through (re)structuring incentives (North, 1990). Contracts entail agreements to undertake future transactions under predefined promises, obligations, outcomes, procedures (Poppo and Zenger, 2002). The choice of contracts over other mechanisms may depend on a number of factors such as type of product, legal framework, market conditions and past experiences and relationships between transaction partners (Key and Runsten, 1999; FAO, 2001; Singh, 2002).

Small-scale primary producers especially in agriculture favour contracts to address such market failures as access to credit facilities for production inputs, technologies and services, price risks, information asymmetries, access to profitable input and output markets and quality improvement (Key and Runsten, 1999; Masakure and Henson, 2005; FAO, 2001; Singh, 2002; Glover 1987). However, the success of contracts depends on the context under which they are applied (Cannon, Achrol and Gundlach, 2000; FAO, 2001). FAO (2001)

suggests that no contract should be ventured into unless there are profitable markets; enabling physical -, social- and regulatory environments as well as property rights. For example, the decision to engage in contractual transaction may have to be done with the expectation that, subject to other conditions, it will be profitable (FAO, 2001). If producers, buyers or both fail to achieve consistent and attractive economic gains or profits, a contract venture may collapse.

In view of the complex context under which contracts are applied, the use and effectiveness of contracts in structuring economic transactions has generated arguments and counter-arguments (e.g., Williamson, 1985; Fafchamps, 2004). Nevertheless, use of contracts shows no signs of abating (Lusch and Brown, 1996). The arguments for use of contracts have been founded on the transaction cost economics and agency theory (Williamson, 1985), and social - and network theory (Wrong, 1968). Economics literature acknowledges that contracts minimise market failures facing small-scale primary producers thereby enhancing their integration into global market (Masakure and Henson, 2005; Singh, 2002). This paper applies similar lessons to common property resources (Demsetz, 1967) i.e. fisheries to assess if the use of contracts can enhance sustainable practices among small-scale primary producers in developing countries. The basic assumption of this study is that contracts that address the constraints and challenges that small-scale primary producers in the agro-ecological sector face would enhance their motivation and ability to implement sustainable practices. Hence, the willingness of small-scale primary producers in fisheries to engage in such contracts is assumed to depend on the terms of contracts (see Figure 1.0)

Insert Figure 1.0 here

Willingness to engage in contracts:

The focus of this study is to determine fishermen's willingness to engage in contracts that oblige them to implement sustainable practices. Contracts are in this study understood simply as oral or written agreements between fishermen and buyers (or other stakeholders).

The terms of contract:

One major contribution of the contract transactions is that it addresses the market failures that small-scale primary producers face (Key and Runsten, 1999). As such, the terms of contracts reflect the constraints to be addressed and obligations to be fulfilled by transaction partners. In this study, the terms of contract include: (1) access to production facilities; (2) access to price information; (3) selection of contract partner and (4) enforcement mechanisms. The basic assumption is that addressing some of the major constraints that primary producers face in their production and marketing activities would influence their willingness to engage in sustainability-enhancing contracts.

In developing economies, inadequate use of appropriate production inputs and technologies has been attributed to poor markets and high costs for the technologies such that many poor producers do not afford (Key and Runsten, 1999). Appropriate production technologies are required to enhance sustainability as well as meet quality standards in international channels. For example, the use of good fishing gear is critical to protect juvenile fish for sustainability. Similarly, specialised tools such as ice or cooling facilities are needed to maintain freshness of the fresh products such as fish. Access (or lack of it) to these production facilities improve (limit) the extent to which fishermen may implement sustainable practices and meet quality demands. As access to improved technologies is one of the major constraints facing small-scale producers in developing economies (FAO, 2001; Masakure and Henson, 2005) one would envisage that small-scale primary producers would be willing to adopt mechanisms through which improved technologies are provided. In the context of this study deals, production facilities are considered as tools and facilities necessary to implement sustainable fishing practices (i.e. good fishing gear) and keep fish fresh (cooling facilities).

According to theory of perfect competition, imbalance in access to market (price) information skews bargaining advantage to those with market (price) information. For small-scale primary producers lack of price information not only compromises their bargaining power but also increases price risks that translate into income uncertainties (Masakure and Henson, 2005; Platteau and Abraham, 1987). Although price information can be accessed in different ways such as media or marketing institutions, these facilities are often out of reach to poor small-scale primary producers in developing countries. This study considers access to price information through contract prices that are periodically agreed upon and fixed in the contracts. Having contract prices would minimise fishermen's uncertainty over price and

ultimately, over income. Existing literature suggest that minimizing price risks through fixed contract prices is a common practice and motivation for small-scale producers, for example, to engage in contract farming (FAO, 2001; Masakure and Henson, 2005).

One of the strategic decisions for partners intending to engage in contracts is the selection of contract partners. According to social- and network theory, past relationships between transaction partners may impede or enhance continuity of relationships (Wathne, Biong and Heide, 2001; Wuyts and Geyskens, 2005). Prior research provides considerable insights about why actors select transaction partners such as social and structural bonds (Wuyts and Geyskens, 2005); history of good relationship (Hibbard, Kumar and Stern, 2001) and anticipation of better economic gains (Wathne, Biong and Heide, 2001). Anticipation of better economic gains may be an important motivation for small-scale fishermen because, being relatively poor, their welfare depends on their daily income (Platteau and Abraham, 1987). In the setting of this study, we find out if selection of contract partner between existing buyers and new buyers would influence fishermen's willingness to engage in sustainability enhancing practices.

Contracts, no matter how well they might be designed, are bound to be violated in one way or another (Antia and Frazier, 2001). Enforcement is the disciplinary action taken when partners violate the terms of contract. Since the success of contracts depends on the context in which they are applied including property rights (FAO, 2001; Cannon, Achrol and Gundlach, 2000), the way sustainable practices are enforced in common property resources such as the fisheries might influence whether or not fishermen would be motivated to engage in sustainability-enhancing contracts in the first place. For example, fishermen engaged in contracts to use good fishing gear may catch less fish (i.e., without the juveniles) compared to those who use bad gear outside contract fishing. Unless non-contracted fishermen are punished for using bad gear, those under contractual obligation to use good gear might be losing. Due to the ineffectiveness of the public institutions, fishermen willing to engage in sustainability-enhancing contracts may not be assured that irresponsible ones would be dealt with accordingly. In this study, enforcement is considered from the perspective of withdrawing fishing licenses and that buyers enforce sustainable practices by not buying fish if fishermen do use unsustainable fishing practices. Withdrawing fishing licences implies that public institutions that have the legal authority to give or revoke fishing licenses continue to

enforce sustainable fishing practices. If buyers enforce sustainable practices means that fishermen that use unsustainable fishing practices will not sell their fish.

In view of the preceding overview, the study addresses the following questions

- Would provision of production facilities influence fishermen's willingness to engage in sustainability and quality-enhancing contracts and if so, which facilities?
- Would minimising price (and income) risks through provision of price information influence fishermen's willingness to engage in sustainability and quality-enhancing contracts?
- Would selection of contract partners influence fishermen's willingness to engage in sustainability and quality-enhancing contracts and if so which partners would fishermen want to engage in contracts with?
- Would enforcement mechanisms influence fishermen's willingness to engage in sustainability and quality-enhancing contracts?

3.0 Methodology

Data were collected from fishermen in the Nile perch channel from Lake Victoria to Europe through a conjoint analysis survey. The study was conducted from April to June 2005. Fishermen were selected on the basis of the landing sites in Kenya. Initial visits to some of these inland beaches revealed that in some beaches fishermen had either stopped landing Nile perch or relocated to other beaches leaving too few (as few as 2) fishermen landing Nile perch. We then targeted beaches with at least ten fishermen landing Nile perch in order to avoid beaches with very few fishermen where tracing them could be time consuming without any assurance of finding them. In order to minimise coverage bias (Blair and Zinkhan, 2006), we selected 18 beaches covering 5 out of 8 districts of the Kenyan shore of Lake Victoria. Visits to the landing sites were unannounced in order to minimise selection bias (Blair and Zinkhan, 2006). Upon landing, fishermen were approached and those who accepted were interviewed. A total of 278 fishermen were approached and six did not participate for various reasons including lack of time after long fishing trips and unwillingness to be interviewed.

In order to assess how fishermen may develop willingness to engage in the hypothetical sustainability – enhancing contracts, a conjoint analysis was used (Wittink, Vriens and Burhenne, 1994) in a personal interview setting. Questionnaires were pre-tested

twice in three beaches involving 11 fishermen that led to minor modifications to the definitions and initial measurement scales. Initially, conjoint profiles were to be rated on a 7 point Likert scale which proved difficult for the respondents to differentiate especially 2 from 3 and 5 from 6. Consequently, the scale was changed to a 5-point scale where 1 was least willing and 5 was most willing to engage in the contract. The use of 5-point Likert scale is common in empirical studies (e.g., Burnham, Frels and Mahajan, 2003; Cannon and Homburg, 2001).

A full profile presentation method often recommended for few (up to 10) factors was used (e.g. Green and Srinivasan, 1978). As fishermen would have to evaluate 16 i.e. $2*2*2*2$ profiles, excluding holdout profiles, a fractional factorial main effect design (Hair et al, 1998) was used to minimise information load by reducing the profiles to 8 while maintaining the orthogonality of the factors. In the end, fishermen evaluated 12 contracts which included four holdout profiles. Prior to evaluation, fishermen were briefed about the objectives of the conjoint tasks, the attribute levels and how the profiles were to be evaluated. Fishermen were asked to consider the real life situation, i.e., the degradation of the Nile perch and the quality deterioration of the fish they catch and sell. Then, they were asked to imagine that they are being approached to engage in contracts that oblige them to use good fishing gear for Nile perch according to the Fisheries Act of Kenya (Kenya Government, 1991). Then conjoint profiles were presented and explained to the respondents, one at a time

Besides the conjoint experiments, we measured some covariates i.e., demographic characteristics including age, level of education, income, gear ownership, other major income sources and kinship relations. Age was measured in years. The level of education is the number of years of formal education. Income is measured as average monthly income. Gear ownership was measured as whether or not fishermen owned the fishing gear that were using. Other major income source determines whether a fisherman personally has other major income sources besides fishing. Kinship relationship with buyers determines whether or not fishermen had biological relations with middlemen they were trading with, e.g., as brother, sister or parents.

Validation

Data were examined for any peculiarities. One questionnaire had missing information on one profile and so it was dropped. Three other profiles had very extreme scores (e.g. similar scores across profiles) and they too were dropped. Then a conjoint analysis was undertaken on the remaining (274) respondents. To determine the validity of the model, first, we assessed the model fit. Then, we further assessed the predictive validity in predicting the holdout sample (Green and Srinivasan, 1990). In order to assess the model fit, we examined the Pearson correlation coefficients that give the correlation between the original and predicted preference scores. The Pearson coefficients revealed that the model did not adequately represent all respondents' data because correlation coefficients for 8 questionnaires did not show significant internal validity. They were dropped leaving a sample of 266 respondents with an average Pearson correlation coefficient of .893 with standard deviation of .093.

In order to determine the predictive validity for the model, we assessed the extent to which the model predict the willingness of the holdout sample (Green and Srinivasan, 1990). We examined the Kendall's tau for the holdout sample, which revealed that for 24 respondents the model did not generalise beyond the sample. These respondents had low Kendall's tau of less than .30 and were also dropped leaving a final sample of 242 with an average Kendall's tau of .756 with a standard deviation of .168.

Data analysis

After individually scrutinizing respondents, an exploratory analysis was performed with ordinary least squares regression to determine the types of contracts fishermen would be willing to engage in and then characterise the fishermen into segments that may explain their preferences.

A regression analysis to explain fishermen's willingness to engage in particular contracts as a function of the terms of contracts, i.e., main effects was undertaken. In order to eliminate possible effects of fishermen's extreme preferences for particular profiles, preference scores for the eight calibration profiles were standardized to make them comparable across fishermen. The standardized preference scores were then used as the dependent variable. As the profiles were the unit of analysis, it means that with 8 calibration profiles, the total profiles used in the analysis was the product of the number of profiles and the number of respondents (i.e., $8 * 242 = 1936$). After standardizing the preference scores,

the attribute levels were coded following an effect-coding scheme (Cohen and Cohen, 1983) in order to represent the different levels of the factors in the regression analysis. Under such a scheme, the first level of each factor (e.g., access to fishing gear) is coded as -1, and the other (e.g., access to ice) as +1. These attribute level dummies were then used as explanatory variables for the standardized preference scores.

In order to assess if there were identifiable segments of fishermen with similar willingness to sign up for particular contracts, cluster analysis was undertaken. Fishermen segmentation with respect to the types of contracts they would be willing to engage in is important for the implementation of the contracts. Cluster analysis was done on the partworths utilities of the standardised preferences: first, a hierarchical clustering procedure and then a K- means cluster analysis based on the results of the hierarchical cluster analysis.

4.0 Results

This section gives results of the types of contracts fishermen would be willing to engage in and the characteristics of the fishermen who are willing to engage in similar contracts.

The types of contracts fishermen would be willing to engage in

Table 1.0 shows that the terms of contract explain about 25% of the variation in the fishermen's willingness to engage in sustainability and quality - enhancing contracts.

Insert Table 1.1 here

These results are consistent with the assumption of this study that fishermen's willingness to engage in sustainability and quality- enhancing contracts will depend on the terms of contract. The results show that fishermen would be willing to engage in contracts in which good fishing gear is provided ($p < .01$) in contrast with those in which ice for quality management is provided. The results also show that fishermen would be willing to engage in contracts in which fish prices are fixed ($p < .01$) compared to those in which prices are fluctuating. The results also show that fishermen would be willing to engage in contracts with processors ($p < .01$). Further, the results show that fishermen would be willing to engage in contracts in which fishermen who violate conditions for sustainable fishing are not allowed to sell fish compared to contracts in which fishing gear and licenses are withdrawn ($p < .01$). This

means that fishermen prefer that the private sector especially the buyers should also take up responsibility to enforce sustainable practices by not buying fish from fishermen with bad gear. This is in direct contrast with the status quo where the public institutions (the fisheries department in this case) confiscate or arrest fishermen found using bad gear.

Although we did not have hypotheses to suggest which contract term is contributing most to fishermen's willingness to engage in contracts, the results show that access to production facilities contributed the most followed by access to price information to minimise risks, selection of contract partner and enforcement mechanisms in that order.

Possible fishermen's segments

The preceding results show that fishermen are willing to engage in different contracts. We assume that there could be homogeneous segments of fishermen willing to engage in similar contracts. To determine this, we first ran a hierarchical cluster analysis with Ward's method to get an idea about the possible number of distinct groups. Following Hair et al (1998), we inspected the agglomeration coefficients which showed that large changes in the coefficients occurred when moving from 5 to 4 clusters, from 3 to 2 clusters, and from 2 to 1 cluster, suggesting either five-, three-, or two- homogeneous clusters. Then, we ran K-means cluster analysis with five; three and two clusters, in which we used the cluster means from hierarchical cluster analysis. Table 1.2 gives the mean utilities for each of the clusters from the K-means cluster analyses. A comparison of the clusters shows that the five-cluster solution reveals more between group heterogeneity than the other cluster solutions. We therefore think that the five-cluster solution could segment fishermen better. We briefly describe the clusters in the five cluster solution.

Insert Table 1.2 here

Cluster 1 which is the smallest among all clusters, is very unique. It is the only cluster that has a high utility for contracts with middlemen. We call this cluster a *Clan* because middlemen belong to the same local communities as fishermen. This may compel some fishermen to continue trading with the middlemen. *Cluster 2* is similar to cluster two in the three- and two-cluster solutions. This cluster has the highest preference for contracts in which

ice for quality improvement is provided among all clusters in all cluster solutions. We call this cluster *Quality* sensitive.

Cluster 3 comprises fishermen that would primarily engage in contracts in which good fishing gear is provided and it is the largest cluster among all clusters in all cluster solutions. Given their strongest willingness to engage in contracts in which good fishing gear is provided, we call this cluster *Green* fishermen that seek sustainability above anything else. *Cluster 4* comprises fishermen that cannot be uniquely identified by the contracts they would engage in. In general, they would engage in contracts in which fish prices are fluctuating, contracts with processors and ice is provided, in that order. Due to lack of decisive types of contracts, we call this cluster as *Opportunists* who may want to grab anything that comes their way. *Cluster 5* comprises fishermen who would primarily engage in contracts in which fish prices are fixed. In view of their decisive willingness to engage in contracts in which fish prices are fixed to minimise price risks, we call this cluster a *Price risk-averse*.

In order to identify fishermen that prefer particular contracts, we profiled the segments according to their demographic characteristics. We used the Tukey's honestly significant difference test to compare cluster means for age, level of education and a Chi-Square to assess if there was any significant association between kinship relations, ownership of fishing gear and having other major income generating activities. The results show significant difference in age and a significant association between kinship relations and having other income activities with cluster membership ($p < .05$) (see Table 1.3)

Insert Table 1.3 here

Cluster 1- the Clan has the highest proportion, i.e. 4 out 12 (33%) fishermen that have kinship relations (e.g. brother, sister, parents or direct cousin) with middlemen they trade with. This may suggest that the Clan are willingness to engage in contracts with middlemen may be due to their kinship relations. Cluster 2 – the Quality sensitive fishermen are on average the youngest (27 years) compared to the rest of the fishermen. They have the least average monthly income probably explaining their need for quality improvement to boost their income. Cluster 3 – the Green fishermen have the highest proportion of fishermen (about 63%) that had no other income generating activities besides fishing. This may explain why they want to have good fishing gear to promote sustainable fishing to protect their only major

source of livelihood. The Green fishermen also have the lowest proportion (about 11%) of fishermen with kinship relations with middlemen. Cluster 4 – the Opportunists cannot be uniquely profiled by their demographic characteristics. Although Cluster 5 – the Price risk averse, has the highest number of fishermen that own fishing gear and also have other income generating activities, they still need to minimise price risks by willing to engage in contracts that provide price information.

5.0 Discussion and implications

This study was set out on the presumption that appropriate mechanisms are needed to restructure the transactions at the primary stages of the international channels in order to build sustainable and all-inclusive international food chains. Deciding how contracts may restructure the transactions at the primary stages of ecological products necessitated an inquiry into whether primary producers would be willing to engage in contracts that oblige them to implement sustainable and quality improving practices and what the terms of the terms of contracts would be. On the basis of the results, we conclude that fishermen are willing to engage in sustainability-enhancing contracts especially those that provide production facilities, minimize price risks through providing price information, bring them closer to international channels through transactions with large-scale processing factories, and allow private policy enforcement of sustainable practices.

These results open up new hope for building sustainable and all-inclusive international food chains. As some literature point to the increasing marginalization of small-scale primary producers in developing economies from international chains (Van der Meer 2006; Nissanke and Thorbecke, 2006), this study shows that contracts may help to fit them in. This is especially true as small-scale primary producers (fishermen in this case) are willing to improve quality and sustainability.

In order to facilitate the building of sustainable food chains and the inclusion of small-scale primary producers, the food chain needs to be restructured. From this study, it may require that buyers should provide market information to minimize price and income risks for small-scale primary producers and enforce both socially responsible buying and supplying practices (Maignan and Ferrell, 2003) by enforcing sustainable practices. In addition, downstream channel members (such as local processing factories) should also restructure

their sourcing practices and engage more into direct transactions with fishermen. Channel partners farther downstream such as importers and retailers; and other stakeholders like nature conservation and environmental labeling organizations may also help to restructure international food chains. They may create and/or support incentive structures to enable primary producers overcome the constraints that they face in their everyday welfare as well as economic activities. Crucial in these incentive structures would be enabling primary producers to access production facilities for both sustainable practices (such as good fishing gear to protect juvenile fish) and quality improvement facilities (such as cooling facilities or ice) to enable small-scale primary producers to be competitive in the international channels.

As international chains from developing economies are often pyramid shaped (Prahalad and Hart, 2002) i.e. with numerous small-scale primary producers at the primary stages, this raises the question of how contracts might be implemented. Consistent with this question is the finding (from fishermen segmentation) that fishermen have idiosyncratic preferences for the types of contracts they would engage in. However, these idiosyncratic preferences do not necessarily imply that contracts should be implemented and enforced on an individual basis. Contracts may very well be implemented at group level. This means that a portfolio of contracts can be crafted and fishermen select the ones that fit their individual preferences. This is consistent with the way some fishermen currently operate in some landing sites. They form local institutions locally known as Beach Management Units that help to enforce sustainability and quality among fishermen (i.e. members of the BMUs). These BMUs operate a revolving fund through which fishermen who are members access small loan facilities consistent with their contribution to the revolving fund. When such fishermen lose fishing gear or the gear gets worn out, they are able to use the loan to replace the fishing gears. In this way, the BMU enforce sustainable practices among the members. As the BMU face resource constraints to expand the implementation of sustainable practices, contracting fishermen through local institutions (such as the BMUs in this case) and meeting their idiosyncratic preferences for contracts would enhance the bottom-up approach to improve sustainability and quality among small-scale primary producers. More importantly, through group action, fishermen may benefit from price information, access to good fishing gear as well as price information to minimise price and income uncertainties. Fishermen may also amass bargaining power to negotiate better terms of contracts.

6.0 Future research

Despite the strong support for our conceptual framework, there are some limitations that present opportunities for further research. This study only considered main effects of the terms of contracts. This necessitates the need to establish whether the fishermen's willingness to engage in particular contracts might be explained by contextual factors such as relationship with buyers and environmental uncertainties such as catch and quality uncertainty. This is consistent with the argument that the effectiveness and choice of contracts depends in part on the context in which contracts are applied (Cannon, Achrol and Gundlach, 2000; FAO, 2001). Furthermore, whereas this study shows that small-scale fishermen are willing to engage in sustainability-enhancing contracts with buyers, it does not establish how these contracts would be implemented in other sectors and also if buyers of the channels would be willing to engage fishermen in such contracts. There is need therefore for future research to establish first if downstream channel partners such as processors or retailers both in domestic and international channels would be willing to engage in such contracts with fishermen. Further research to test the applicability of these results in other natural resources such as forestry products could be used useful. Further research may also be important to test these contracts in the artisanal fisheries in other developing countries such as in Asia or Latin America.

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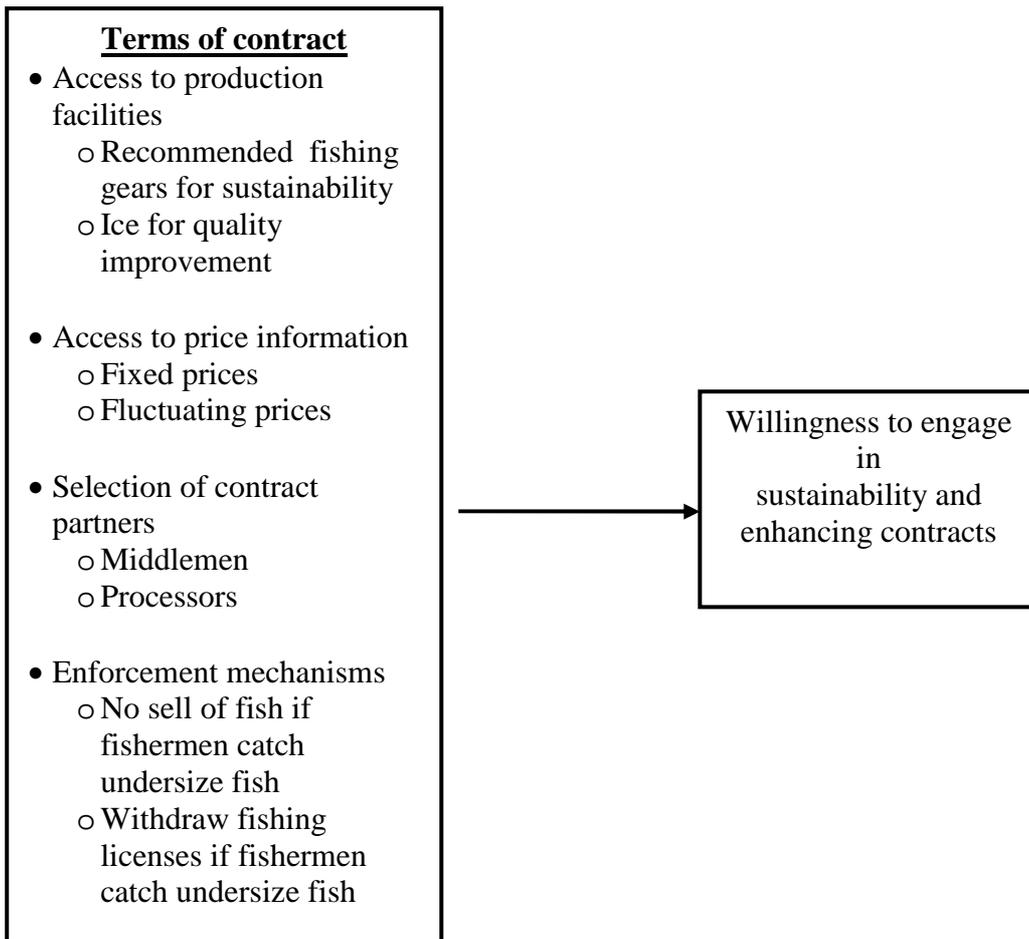


Figure 1.0; Conceptual framework

Table 1.1 Regression coefficients for the main effects of terms of contract on willingness to engage in sustainability enhancing contracts (N = 1936 contracts)

Independent variables (factor level dummies)	Dependent variable: Standardized preference scores
	Unstandardized Coefficients
Access to fishing gear	.374 ***
Fixed price	.279 ***
Contract with processors	.053 ***
No sale for fish if sustainable practices violated	.045 ***
Statistics R^2 (Adj. R^2)	.255 (.253)
F	139.52 ***

*** Significant ($p < .01$) (one - tailed)

Table 1.2; Mean (SD) utilities for clusters from K-means cluster analysis (N = 242 fishermen)

Factor	Production facilities	Selection of contract partner	Price information	Enforcement mechanisms	
Factor level	Recommended fishing gear	Processor	Fixed price	No sell of fish without compliance with sustainability	Cluster size (N, %)
Two-cluster solution					
1	.606 (.254)	.061 (.234) ^a	.342 (.338)	.060 (.237) [*]	174 (71.90)
2	-.243 (.334)	.033 (.449) ^a	.133 (.488)	-.008 (.308) [*]	68 (28.10)
Test statistics	F= 448.70; df = 1; <.01	F= .422; df = 1; p>.10	F= 14.29; df = 1; p<.01	F= 3.306; df = 1; p<.10	
Three cluster solution					
1	.543 (.266) ^b	.066 (.242) ^c	.485 (.220)	.043 (.234) ^d	141 (58.26)
2	-.408 (.286)	-.013 (.444) ^c	.277 (.373)	-.044 (.269) ^{d,y}	45 (18.60)
3	.549 (.363) ^b	.076 (.328) ^c	-.221 (.301)	.104 (.293) ^{d,x}	56 (23.14)
Test statistics	F= 191.63; df = 2, p<.01	F= 1.292; df = 2; p>.10	F= 133.41; df = 2; <.01	F= 4.172; df = 2; p<.05	
Five cluster solution					
1	-.253 (.348)	-.477 (.308)	-.182 (.277) ⁱ	-.101 (.401) ^j	12 (5.96)
2	-.552 (.215)	.008(.417) ^f	.379 (.239)	-.007 (.207) ^j	24 (9.92)
3	.749 (.161)	-.005 (.186) ^{f(g)}	.289 (.202)	.057 (.216) ^j	114 (47.11)
4	-.231 (.305) ^e	.317 (.345)	-.351 (.317) ⁱ	.049 (.342) ^j	33 (13.64)
5	.208 (.189) ^e	.144 (.252) ^{f(h)}	.681 (.205)	.053 (.268) ^j	59 (24.38)
Test statistics	F= 249.24; df = 4; p<.01	F= 23.760; df = 4; p<.01	F= 121.04; df = 4; <.01	F= 1.246; df = 4; p>.10	

Note: -Means bearing the same superscript are not significantly different (p>.10), for example, ^a = implies that mean utilities for contract with processors for cluster 1 and 2 are not significantly different; Means with different or no superscript are significantly different (p<.05);

* Means significantly different at 10%

Table 1.3; Demographic characteristics for the five clusters (242 fishermen)

Cluster	Age	Level of education	Monthly income (000 KSh)	Kinship relations with middlemen		Ownership of fishing gear		Other income generating activity		Cluster name
				Yes (n, %)	No (n, %)	Yes (n, %)	No (n, %)	Yes (n, %)	No (n, %)	
1	35.55	2.09	12.573	4 (33.3)	8 (66.7)	7 (58.3)	5 (41.7)	6 (50.0)	6 (50.0)	Clan Quality sensitive Green fishermen Opportunists Price risk-averse
2	27.05 ^a	2.33	10.071	5 (20.8)	19 (79.2)	15 (62.5)	9 (37.5)	13 (54.2)	11 (45.8)	
3	30.59	2.34	15.732	12 (10.5)	102 (89.5)	81 (71.7)	32 (28.3)	42 (37.2)	71 (62.8)	
4	27.84 ^b	2.19	12.390	7 (21.2)	26 (78.8)	23 (69.7)	10 (30.3)	20 (60.6)	13 (39.4)	
5	33.51 ^{ab}	2.22	11.878	16 (27.6)	42 (72.4)	44 (74.6)	15 (25.5)	37 (62.7)	22 (37.3)	
Test statistics	F= 3.31; df = 4; p<.05	F= 1.03; df = 4; p>.10	F= 1.77; df = 4; p>.10	$\chi^2 = 10.08$ df = 4; p<.05		$\chi^2 = 2.15$; df = 4 p>.10		$\chi^2 = 12.81$; df = 4 p<.05		

Note: The values for education are categorical where 1 equal no formal education and 4 some years of tertiary education.

Means bearing same superscript are significantly different (p<.10)