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ARTICLES

Full Length Research Paper

Impact of formal credit on agricultural output: Evidence from Pakistan

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In the current study, we have analyzed the impact of formal credit on agricultural output : Evidence from Pakistan. by using secondary data from 1996 to 2015. Augmented Dickey Fuller (ADF) test was applied to check the stationarity of the data. Contrarily, the Johansen Co-integration test (Trace Statistic) was used to find out whether there exists a long run relationship between formal credit and agricultural output. The method of (OLS) was used to estimate the impact of formal credit on agricultural output. The empirical regression results indicate that the explanatory variable (formal credit) was statistically with coefficient of 0.860350. This means 1% increase in credit will increase the agricultural output by 0.86%. It is clear that impact of formal credit on agricultural output has positive and significant. Therefore, our study suggests that the procedure of credit should be made simple and flexible and financial institutions should launch crop insurance scheme in case of crop failure by flood, draught, pest attack, and heavy rains. Also Government of Pakistan should support small farmers through credit schemes on affordable interest rate. It will helpful in raising farm productivity and the standard of living of the small farmers.

Key words: Formal credit, agricultural output (value added), Pakistan.

INTRODUCTION

Agriculture sector is the backbone of Pakistan's economy. It accounts for 20.9% of the GDP and absorb 43.7% of labour force (GOP, 2014-15). This sector provides raw materials to agro-based industries and it is also source of country's export earnings. In Pakistan, the agriculture sector growth rate was 2.7% in 2013-2014 which was slightly increased to 2.9% in the year of 2014-15 as given in Table 1 (at constant factor cost), (Statistical Supplement, and 2014-15). The growth of agriculture sector in Pakistan always was poor in all

aspects such as productivity, production, consumption and exports compared to developed countries. However, the agricultural growth of Pakistan is facing several problems like severe water shortage, along with soil erosion, lack of mechanization, natural calamities and rising price of inputs such as seeds fertilizers, pesticides etc. Therefore, this growth has required the use of fertilizers, improved seed varieties, better irrigation, and modern equipment, which in turn has required the credit availability to the farmers. 68% population living in rural

Table 1. Agriculture growth rate (%) at constant FC.

Years	Growth percent	Years	Growth percent	Years	Growth percent
1995-96	11.7	2002-03	4.1	2009-10	0.2
1996-97	0.1	2003-04	2.4	2010-11	2.0
1997-98	4.5	2004-05	6.5	2011-12	3.9
1998-99	1.9	2005-06	6.3	2012-13	2.9
1999-00	6.1	2006-07	3.4	2013-14	2.7
2000-01	-2.2	2007-08	1.8	2014-15	2.9
2001-02	0.1	2008-09	3.5	-	-

Source: Economic Survey of Pakistan (Statistical supplement, 2007-08, 2014-15).

areas and mostly rural population is engaged in agricultural activities.Agricultural farming requires capital like other business for its farm operations. Timely availability of credit leads to adoption of improved seeds, fertilizers and modern technologies which increase the agricultural productivity and the growth rate. Therefore, agriculture credit is an essential element for modernization in agriculture. In the past few decades, the need of credit in agriculture sector rapidly increased because of rise in use of fertilizer, pesticides, high yield variety seeds and mechanization and rise in their prices. In Pakistan, there are two sources of credit: informal and formal. Informal sources of credit include friends, relatives, commission agent, input supplier, shopkeeper, landlords, employer, traders and private money lenders and the formal credit sources consists of financial institutions like Zarai Taraqiati Bank limited, (ZTBL) previously known as Agricultural Development Bank of Pakistan (ADBP), However, ZTBL was established in 1961 through merger of Development Finance Corporation and Agricultural Development Bank of Pakistan. ZTBL is an important source for supply of credit to agriculture sector in Pakistan. ZTBL provides short - term, medium- term and long-term credits for farm and non-farm activities. The bank provides five types of loan such as Development loan, Production Loan, Agri-business loans, and off farm income to farmers generating activities loans (Chandio et al., 2015). On the other hand, Commercial banks such as National Bank Limited (NBP), United Bank Limited (UBL), Allied Bank Limited (ABL), Muslim Commercial Bank (MCB), Habib Bank Limited (HBL), and co-operative societies. However, all financial institutions have been playing vital role in the provision of agriculture credit for the last two decades. These sources provide loans for the production and development purposes for increasing the production and productivity of this sector. The share of these institutions is increasing day-by-day as described in Table 2. Therefore, the share of commercial banks has increased over time and they are the largest contribution in this sector followed by ZTBL (GOP, 2013-14). In Pakistan, Small farmers, landlord farmers and non-farm population

in agriculture sector they are facing rigorous problem of lacking in capital. After green revolution, and technological changes in agriculture sector, the requirement of credit has rapidly increased to purchase inputs. However, small farmers and share croppers usually face complicate procedure and collateral problems in availing credit. These impediments had hardly hit the tenants and share croppers who did not own land. Despite these problems, financial institutions have been playing positive and significant role to enhance technological change in agriculture sector. After considering the importance of agricultural credit the study focused on the impact of formal credit on agricultural output (value added) of Pakistan: an econometric analysis. Furthermore, the layout of the study is as follows: First is the literature review followed by the methodology. Thereafter, the results and discussion are presented followed by the conclusion and recommendations.

LITERATURE REVIEW

In Pakistan not a lot of work has been done in past to see the impact of credit on agricultural output. Few studies in this regard are documented by Malik et al. (1989), Zuberi (1989), Sarfraz and Akhtar (1992), Iqbal et al. (2003) and Afzal (2005). The role of institutional credit in agriculture sector is significant. However, modern agriculture is essential for economic development of the country. Employing modern agricultural technologies is possible when farmers are provided credit for purchasing modern inputs (Schultz, 1964; Zuberi, 1989). Many developed countries had recognized the benefits of using modern farm technology. But application of farm technology to increase agricultural output had increased financing needs of farmers (Mellor, 1966). The impact of institutional credit, fertilizers, seeds, and irrigation on agricultural production was found positive and significant (Zuberi, 1983, 1990; Malik et al., 1991; Iqbal et al., 2001; Waqar et al., 2008).

Abedullah (2009) states that easy and cheap credit the quickest way for boosting agricultural production use of

modern agricultural technology increased demand for credit and resulted in increase in agricultural yield of small farmers.

Zuberi (1989) examined the production function in the agriculture sector in Pakistan. The study used the time series data from 1956 to 1986 and developed the strategy for the agricultural development in Pakistan. It is concluded that agricultural development depends on the maximum utilization of better and low cost technology. It is suggested that government should provide the institutional credit in a simple and easy procedure to make possible for farmers to purchase modern imple-ments and use the modern methods of production. It is also concluded that the use of modern agricultural technology and additional inputs are necessary for rising productivity.

Siebel (2000) reported that agriculture farming is seasonal activity. The agricultural credit institutions should increase the credit supply during the sowing season. Researcher suggested that agricultural credit should provide for only agricultural purpose, especially for crop production.

Ansari (2001) reported that agricultural productivity could be increased through the introduction and promotion of innovative agricultural technology. Farmers are looking towards financial sources for taking loans on easy terms and conditions so as to increase their agricultural productivity.

Iqbal et al. (2003) suggested that the formal financial institution should be encouraged to expand the agriculture loans for farming sector especially small poor farmers. The study also indicated that the institution should expend the loan for consumption farmers in case of emergencies (flood and drought etc). In addition to a crop insurance, other schemes should also be launched to provide protection to the farmer against the pest attack, drought, heavy rains and flood) on payment of minimum premium.

Chachar (2007) found that credit is the need of both subsistence and economic land holders for production and development. 95% farmers have less than 25 acres land. Mostly in rural areas, where the institutional finance is neglected except ZTBL. The small farmers are hesitating to avail credit facilities from formal institutions due to complicated and lengthy procedure. They prefer to purchase the input on double prices payable after the marketing of their produce.

METHODLOGY

Data source

This study was designed to cover a period of 20 years (1996-2015). A time series data was used for this study. Data used in this study were collected from Economic survey of Pakistan (2014-15). The main objective of this study is to investigate the impact of formal credit on agricultural output (value added.) through econometric analysis.

Model specification

Conventionally, agricultural output function depends upon the inputs such as land, labour, capital and other inputs like as water, fertilizer, pesticides etc. However, in this study agricultural output (value added) was used as dependent variable and output was assumed to be a function of availability of credit and all those inputs which were purchased with the help of credit such as seeds, fertilizers, tractors and tube wells. But, instead of taking seeds, fertilizers, tractors and tube wells, only credit was taken as this was used to purchase all these inputs.

Model estimation

The study was conducted in the year 2015 by using an econometric analysis to assess the impact of formal credit on agricultural value added in Pakistan .Secondary data ranging from 1996 to 2015 on the above variables has been taken from Economic Survey of Pakistan (Statistical Supplement, 2014-15) .In modern approach Augmented Dickey Fuller test (Dickey and Fuller, 1979, 1981) and Phillips-Perron (PP,1988) test was applied to check the stationarity of the data and the Akaike Information Criterion (AIC) was used to select the optimum ADF lag. Variables, which were non-stationary at level, were again checked to assure the stationary after taking first difference and second difference. Furthermore, to empirically estimate the long run relationship we employed the multivariate co integration technique (Johansen-Juselius). To investigate the impact of credit on agricultural output (value added), the method of Ordinary Least Square (OLS) was used and the following model was estimated inducting agricultural credit as explanatory variable while agricultural output as dependent variable.

$$Lnagriop = \beta_0 + \beta_1 Lncr + \mu \qquad (1)$$

Where, Lnagriop = Natural logarithm agricultural output (value added) measured in terms of million rupees;
Lncr = Natural logarithm of credit disbursement from all institutions in million rupees;
μ= error term

The problem of autocorrelation has been solved by using Durbin two-step methods. At first step, the following model was estimated to find out the value of $\rho^{\wedge}$ (that is, coefficient of Lnagriop-1, which is β_1 here).

$$Lnagri = \beta_0 + \beta_1 Lnagriop\text{-}1 + \beta_2 Lncr + \beta_3 Lncr\text{-}1 \qquad (2)$$

At second step, Lnagriop* has been regressed on Lncr*

Where
Lnagri* = Lnagriop - $\rho^{\wedge}$ Lnagriop-1
Lncr* = Lncr - $\rho^{\wedge}$ Lncr-1

A statistical package Eview has been used for deriving the results.

RESULTS AND DISCUSSION

Table 3 presents the results of the ADF and PP unit-root test for dependent variable (Agricultural output (value added) and independent variable (Formal credit) in the levels and first difference including both intercept and trend. The results showed that the series were stationary at first difference, I (1) and non-stationary at their levels.

Table 3. Augmented Dickey-Fuller (ADF) and Phillips-Perron unit root tests results (including both intercept and trend).

ADF test				
Variables	Test type (C.T.K)	ADF-Statistic	5% Critical value	conclusion
Ln agrop	(C,T,0)	-1.922226	-3.673616	Non-Stationary
LnCr	(C,T,1)	-1.258743	-3.690814	Non-Stationary
I(1) Lnagrop	(C,T,0)	-4.763593	-3.690814	Stationary
I(1) Lncr	(C,T,0)	-3.856378	-3.690814	Stationary
Phillips-Perron test				
Variables	Test Type (C.T.K)	t-Statistic	5% Critical value	Conclusion
Ln agrop	(C,T,2)	-1.828119	-3.673616	Non-Stationary
LnCr	(C,T,2)	--0.797751	-3.673616	Non-Stationary
I(1) Lnagrop	(C,T,11)	-7.925343	-3.690814	Stationary
I(1) Lncr	(C,T,0)	-3.919269	--3.690814	Stationary

Source: Author's own calculation using Eviews 9. Note: C denote for Constant, T denotes for Trend and K represent optimum lags selected using the maximum AIC value.

Table 4. Johansen-Jueslius Co-integration.

Hypothesized No. of CE(s)	Eigen value	Trace Statistic	0.05 critical value	Prob.**
None *	0.545298	19.10456	15.49471	0.0136
At most 1 *	0.239098	4.918522	3.841466	0.0266

Source: Author's own calculation using Eviews 9. Trace test indicates 2 co integrating eqn(s) at the 0.05 level; * denotes rejection of the hypothesis is at the 0.05 level; *** Mackinnon-Haug-Michelis (1999) p-values. Trend assumption: Linear deterministic trend. Series: Lnagrop Lncr Lags interval (in first difference): 1 to 1. Unrestricted Co integration Rank Test (Trace).

Since all the series were at the same order, the dataset was appropriate for further analysis. The dependent and independent variables are stationary at the first difference. The results from the Johansen Co-integration analysis were present in Table 4 where the Eigen value and trace statistics examine the null hypothesis of no co-integration against the alternative of co-integration. Therefore, analysis of annual data from 1996 to 2015 appears to support the proposition that there exists a stable long run relationship among the dependent variable agricultural output (value added) and independent variable formal Credit. The values of the trace statistic were greater than relevant critical values which showed that the existence of 2 co-integration equation (s) at 5% statistically significant level.

Regression analysis

Table 5 presents the result of the regression analysis using Ordinary Least Square (OLS) method. The empirical regression results indicate that formal credit is statistically significant at both 1 and 5% probability level. However, the coefficient value of formal credit showed that 1% increase in credit, agricultural output (value added) will increase at 0.86%. These results are in line with the earlier studies by Feder et al. (1991), Khander and Faruqee (1999), Nazli (2001), Olagunj (2007), Bashir et al.(2008,2009) and Chandio et al.(2015).The high value of R^2 was 0.77 which indicated that about 77% of total change in agricultural output (value added) by independent variable formal credit.

Durbin-Watson value (0.96) suggests positive serial autocorrelation. To take away the autocorrelation, Durbin-two step method is estimated. The results of Durbin-two step method are given in Tables 6 and 7. In the first step, the estimated value of $\rho\^$ is 0.588329. In the second step, putting this value in the transformed model, gave the Durbin-Watson value equal to 1.92, which is closer to 2 showing no problem of autocorrelation.

Conclusions

The main purpose of this study was to investigate the impact of formal credit on agriculture output (value added) in Pakistan for the period of 1996 to 2015. Data was collected from Economic Survey of Pakistan. Augmented Dickey Fuller (ADF) and Phillips-Perron test was applied for check the stationary of data. In order to

Table 5. Regression results of relationship between AGR OUTPUT AND CREDIT.

Variable	Coefficient	Std. Error	t-statistic	P- value
Constant	3.777113	1.258650	3.000924	0.0077
Lncr	0.860350	0.108566	7.924649	0.0000

D-W=0.96; R^2= 0.77; Prob(F-statistic) 0.0000. Source: Author's own calculation using Eviews 9.

Table 6. Regression results applying Durbin first step.

Variable	Coefficient	Std.Error	t-Statistic	P- Value
Constant	3.085159	1.219022	2.530848	0.0231
LNAGR(-1)	0.588329	0.177538	3.313821	0.0047
LNCR	-0.822661	0.577132	-1.425430	0.1745
LNCR(-1)	1.066905	0.544924	1.957896	0.0691

D-W=2.00; Prob (F-statistic) 0.000. Source**:** Author's own calculation using Eviews 9.

Table 7. Regression results applying Durbin second step.

Variable	Coefficient	Std. Error	t-statistic	P- value
Constant	2.908394	1.224472	2.375223	0.0296
Lncr*	0.586262	0.250201	2.343166	0.0315

D-W=1.92; Prob (F-statistic) 0.031.Source**:** Author's own calculation using Eviews 9.

analyze the data Ordinary Least Square (OLS) method was performed to show the impact of formal credit on agriculture output (value added). From the facts and figures it was clear that impact of formal credit on agricultural output was positively and significantly. The coefficient of credit was 0.860350; this means 1% increase in credit will increase the agricultural output by 0.86%. The explanatory variable (formal credit) was statistically significant at both 1 and 5% probability level of significance. However, credit is an important component which is used indirectly in agricultural production systems.

RECOMMENDATIONS

On the basis of above study it can be concluded that credit itself cannot play any direct role in increasing the agricultural output rather indirectly supports in the growth and development of agriculture sector through purchasing modern inputs. Therefore, the following recommendations are suggested:

1. The procedure of credit should be make simple and easy it could be a good opportunity for small farmers and credit should be provided in kinds as compare to cash.

2. Small farmers and small tenant usually facing the financial problems and they are not able to purchase high yield variety seed, sufficient fertilizer, pesticide and modern equipment, therefore specially ZTBL and Commercial banks should supply credit on flexible terms and conditions to small framers and small tenant.

3. Financial institution should provide information through electronic media and print media about agricultural credit in farming communities so they have an easy way to access to the financial services.

4. The government of Pakistan through the ministry of Agriculture should collaborate with financial institutions and other stakeholders, should lunch crop insurance scheme for farmers as compensation in case of crop failure by flood, draught, pest attack, and heavy rains because during 2010-11 and 2015 small farmers and tenant faced this kind of problems, thereby will help the farmers to sustain their livelihood

5. Government of Pakistan should support small farmers through credit schemes on affordable interest rate and subsidize on agricultural inputs such as fertilizers, seeds and pesticide. It will help in raising farm productivity and the standard of living of the small farmers.

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Conflicts of Interests

The authors have not declared any conflict of interest.

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Appendix
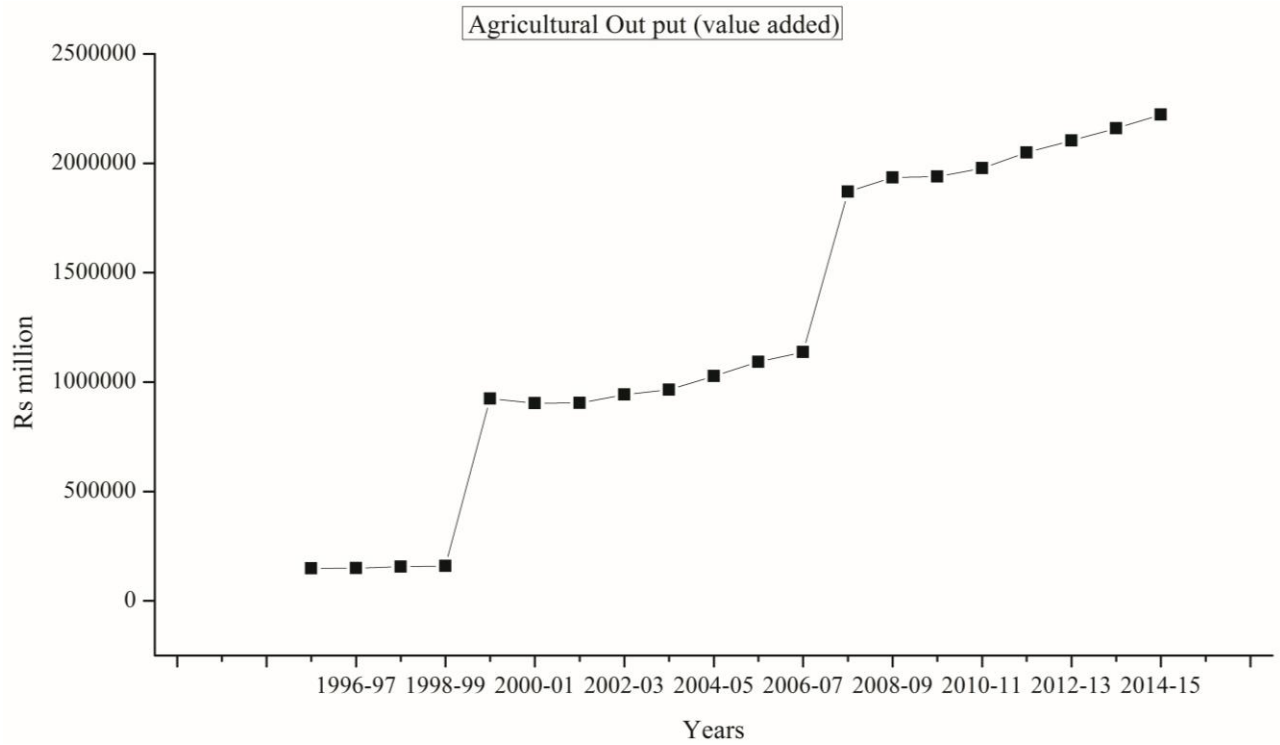
Figure 1. Agricultural Output (value added) Rs million during the period of 1995-96 to 2014-15. Source: Pakistan Economic Survey 2014-15.
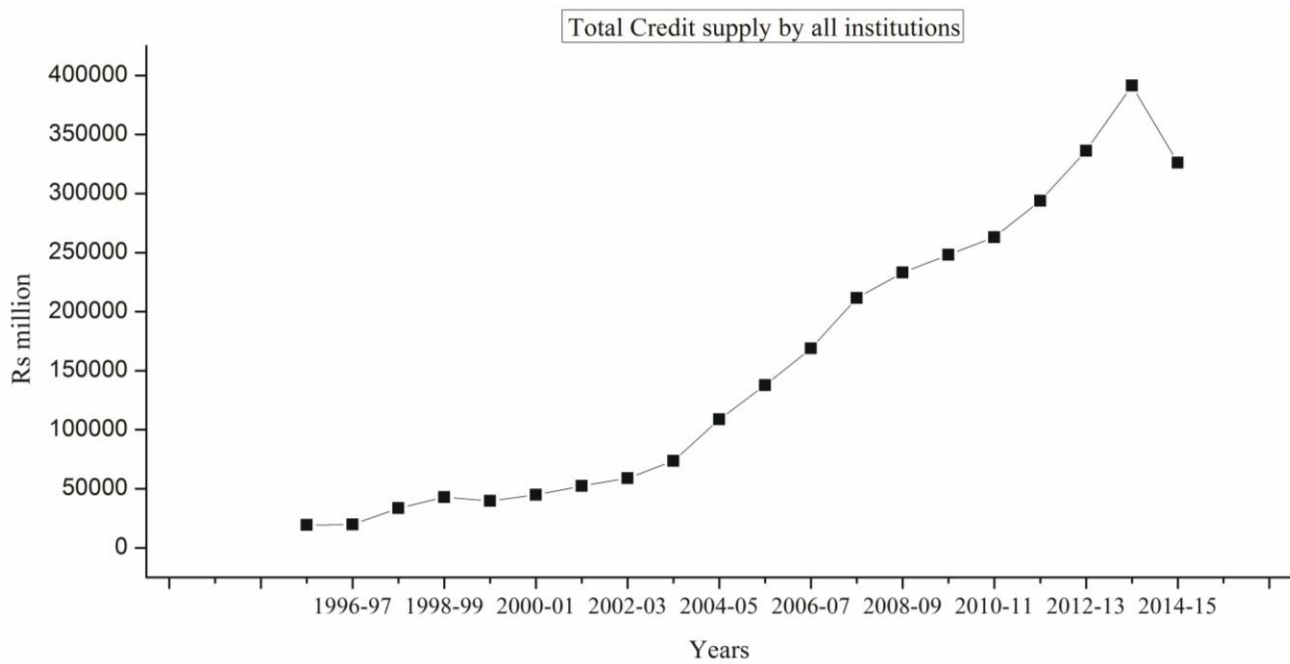
Figure 2. Disbursement of agricultural credit by all institutions from 1995-96 to 2014-15 (In million Rs). Source: Pakistan Economic Survey 2014-15.

Full Length Research Paper

Evaluating the impact of government subsidies on traceable pork market share based on market simulation: The case of Wuxi, China

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In this study, choice-based conjoint (CBC) analysis combined with multivariate logistic regression model was used to investigate the Chinese consumers' willingness to pay (WTP) for traceable pork hindquarters with different levels of attributes. High, medium and low-level traceable pork profiles were constructed, and the market share of traceable pork hindquarters was simulated under different types of government subsidies. The results showed that traceability information was the most preferred attribute for consumers. With increased government subsidies, the market share of the different levels of traceable pork hindquarters all increased accordingly. A government subsidy percentage of 3% was concluded to be the best choice for traceable pork hindquarters considering government subsidies and market share elasticity.

Key words: Consumers' willingness to pay, the traceable pork, choice-based conjoint, market simulation, government subsidies.

INTRODUCTION

Food safety risks have been further highlighted by the occurrence of emerging food safety incidents in China in the 21st century, with the rapid economic development, especially with the deterioration of the agro-ecological environment and increased industrial pollution. A total of 227,386 food safety incidents, that occurred in 31 provincial-level administrative regions in mainland China, were reported from 2005 to 2014, with an average of approximately 62.3 incidents per day, which has seriously affected social stability (Wu et al., 2015). It is urgent to take some measures like implementing food traceability systems to reduce food safety risks, which are essentially caused by asymmetric information (Sarig et al., 2003). Food traceability systems are able to monitor the process of food production and distribution by generating a reliable continuous flow of safety information in the supply chain, and to identify the root cause as well as recall related products through traceability (Regattieri et

al., 2007). It is therefore considered to be one of the effective measures for fundamental prevention of food safety risks (van Rijswijk et al., 2008). Moreover, market failure that usually arises from asymmetric information may be improved by food labels of traceability, safety information, quality certification, and other credence attributes that were sufficiently and effectively disclosed to consumers through a delivery mechanism (Ortega et al., 2013). To learn from international experience, China began to construct pork and vegetable-focused food traceability systems since 2000 (Liu, 2015). However, to date, little progress has been made in developing the traceable food market in China.

Based on the theory of co-governance, food safety is characterized by inseparable utility, non-rivalrous consumption, and non-excludable benefits. Therefore, food safety possesses the characteristics of public goods (Edwards, 2001; Skelcher et al., 2004). The occurrence of food quality and safety incidents can cause public health damage, and even pose a huge threat to social and political stability; therefore, food safety risks are a public crisis (Grøn, 2007; Krueathep, 2008). Preventing food safety risks is, therefore, an obligatory fundamental responsibility of the government. In fact, it has been pointed out that information asymmetry of the food safety between producers and consumers often leads to "market failure" (Antle, 1996).

Thus, government intervention is required to effectively solve the "market failure". In this context, the aim of this study was to investigate the Chinese consumers' willingness to pay (WTP) for traceable pork hindquarters with different levels of attributes and to examine differences in the marginal utility of traceable food consumption and market share of traceable food with different government subsidy percentages. The results of this study may offer useful reference for the government to promote the construction of traceable food market in China.

LITERATURE REVIEW

The major methods used to estimate consumers' WTP are contingent valuation method (CVM), experimental auction, and conjoint analysis. CVM was the first method used to estimate consumers' WTP. It is simple and flexible in operation and low-cost (Boccaletti and Nardella, 2000). CVM is also commonly used in research on consumers' WTP for traceable food (Hobbs et al., 2005; Angulo et al., 2005). However, CVM can only examine the impact of changes in a single attribute on consumer preferences (Reddy and Bush, 1998). Hence, its design procedure is not able to provide consumers with complete details of relevant alternatives, making it difficult for consumers to make an accurate choice in comparison (Stevens et al., 2000), and thus resulting in bias (Boxall et al., 1996). The experimental auction is the

current tool of choice for investigating consumer preferences. It directly obtains consumers' WTP for different types of food with different safety attributes or different attribute combinations based on consumers' bids for such attributes or combinations by setting different types of food with different safety attributes or different attribute combinations and simulating a real purchase environment (Lee et al., 2011). However, the experimental auction is complicated to operate, difficult to explain to the participants, and high-cost, and requires different auction mechanisms for different experimental environments (Jaeger et al., 2004). In particular, the experimental design is demanding and complex due to the need to avoid possible endowment, learning, and anchoring effects during the experiment. Therefore, very few studies have analyzed consumer preferences for traceable food in China using the experimental auction.

Joint analysis allows consumers to score, rank, or select from a series of product profiles by decomposition, and thereby calculates consumers' part-worth utilities (Green and Srinivasan, 1978), which solves the difficulty in CVM. Product profiles are formed by random combinations of different levels of product attributes, among which, product attributes are used to define product characteristics from the perspective of meeting consumer demand (Becker, 2000), and levels refer to the different values of the product attribute (Kotler, 2001). With the continuous development of joint analysis software, CBC analysis allows consumers to directly select from product profiles with different combinations of different levels of product attributes, which is superior to the rating and scoring in traditional conjoint analysis. Therefore, CBC can reduce the judgment errors of respondents, and can more accurately elicit consumers' real purchase intention (Huber, 2005). Thereby, CBC analysis has become the most popular joint analysis method. In addition, CBC analysis is based on the random utility theory and has a mature microeconomic foundation (Ben-Akiva and Lerman, 1985). It also allows estimation of consumers' part-worth utilities for different attribute levels, and effective market simulation (Johnson and Orme, 1996).

The scientificity of the CBC analysis has also been confirmed by existing studies (Lusk et al., 2004; Ubilava and Foster, 2009; Ortega et al., 2011), and thus is widely used by researchers. Recent typical studies that examined consumer preferences using the CBC analysis are summarized below. Loureiro and Umberger (2007) investigated US consumers' WTP for selected attributes of beef, including price, quality and safety certification, country of origin labeling, traceability information, and found that consumers were most concerned about quality and safety certification in the purchase of beef. Abidoye et al. (2011) estimated US consumers' WTP for traceable beef with 10 different attributes, and reported the highest WTP for grass-fed and US-origin beef with traceability information. In the investigation of Georgia consumers'

WTP for selected attributes of pork, including traceability information, quality certification and appearance, Ubilava and Foster (2009) found that consumers had the highest WTP for appearance, followed by traceability information and quality certification. These researchers suggested a substitutional relationship between traceability information and quality certification. Ortega et al. (2011) assessed Chinese consumers' WTP for selected attributes of pork, including price, government certification, third-party certification, traceability information, and product labeling, and suggested the highest WTP for government certification, followed by third-party certification, traceability information, and product labeling. In estimating Chinese consumers' WTP for selected attributes of pork, including price, certification, brand, and farm quality and safety assurance, Zhang et al. (2013) reported the highest WTP for government certification, followed by corporate brand, farm quality and safety assurance, and third-party certification, and that consumers with higher risk perception had a higher WTP for the above safety attributes.

Compared with ordinary food, the production of traceable food containing multi-attribute safety information must be associated with additional costs, which will be ultimately transferred through the market mechanism and reflected in the market price of traceable food (Buhr, 2003; Bechini et al., 2008). Based on existing research, consumers' incomes and the relatively high price of food with safety attributes are the main factors restricting their purchases under budgetary constraints. Zhao et al. (2010) suggested that consumers' WTP for traceable food was mainly affected by the price. They reported that 95% of consumers were willing to buy traceable food without consideration of price, while the number of consumers who were willing to buy traceable food was substantially decreased if the higher price was taken into account. For consumers who were not willing to buy traceable food, distrust in traceability information and higher price were the main factors affecting consumer behavior. These consumers believed that it was the responsibility of food producers and suppliers to implement traceability, and were thus unwilling to pay a premium. Similar conclusions were also reached by Lichtenberg et al. (2008) and Hou (2011). Zhang et al. (2012) assessed consumers' WTP for traceability in Nanjing, China, and found that income was the most important factor affecting consumers' WTP for traceable food. The study found that the higher the income, the more likely the consumer was to buy traceable food, and the greater WTP for traceability. This finding of Zhang et al. (2012) was supported by Giraud and Amblard (2003). Zhou and Wu (2008) suggested that, compared with ordinary food, the higher market price of traceable food may be beyond the paying capacity of a considerable part of low-income consumer groups in China, which curbed consumer demand. Here arises the problem. If most consumers have insufficient WTP for traceable

food, it will be difficult to form an effective market demand for traceable food, and producers are therefore unlikely to provide necessary and sufficient traceable food due to consideration of their own economic interests (Shang et al., 2012). An important way to change this situation is to increase consumers' income in order to promote the improvement of consumers' WTP (Jehle and Reny, 2011; Wu et al., 2012). However, there is a large wealth gap in China. The national Gini coefficient was 0.469 in 2014 in China, and it has gone beyond the international warning line for 10 successive years. Moreover, the Gini coefficient of China has actually been underestimated which may be not lower than 0.5. In fact, China should be one of the highly unequal countries in the world and one of the 17 countries with a Gini coefficient higher than 0.5 among the 111 countries around the world (Li, 2015). Income distribution reform has become an area of difficulty in future reform for China, and will be a long process. In particular, it is difficult to quickly improve the income of a large, low-income population in the short term. In essence, income determines consumption, and the traceable food market share, in turn, depends on consumer demand. Without the market demand of the large, low-income population, traceable food is difficult to spread in the Chinese food market. Therefore, the major question is: can the government reduce the market price of traceable food through subsidy policy instruments in order to gradually spread traceable food in China?

Indeed, numerous studies have been conducted on developing the traceable food market by the government through subsidy policy instruments. Golan et al. (2004) indicated that financial and technical support from the government helped reduce enterprise costs and motivated enterprises to invest in implementing food traceability systems. Tonsor and Schroeder (2006) investigated the traceability system in the Australian beef industry and found that an important reason for the successful implementation of food traceability systems was the financial support of the state government.

Schulz and Tonsor (2010) suggested that the willingness and behavior of cow producers to invest in implementing food traceability systems in the United States were greatly affected by government support and other policy instruments. Based on dynamic modeling for the implementation of food traceability systems in multiple food enterprises under government intervention, Wu et al. (2015) determined the stability conditions for implementing government-expected food traceability systems in multiple food enterprises using the discrete-time linear stability theory and algebraic graph theory. The study results suggested that selective direct government subsidies to traceable food manufacturers would play a significant role in reducing the traceable food market price and fostering the traceable food market.

Therefore, in view of the higher market price of traceable food compared with ordinary food, Chinese

consumers' relatively low WTP for traceable food, and the difficulty to substantially increase individual and family income of consumers in the short term, a reasonable mechanism for sharing the additional production costs of traceable food should be explored and developed. This mechanism should be based on the functional positioning of government, enterprises, and consumers in the traceable food systems. Subsidy should undoubtedly be an important policy choice for the Chinese government in developing traceable food market. The government should reduce the additional production costs of traceable food by subsidizing food manufacturers or through other appropriate subsidy methods, in order to motivate the production of traceable food with different levels and combinations of safety attributes. On the other hand, the government can provide direct subsidies to consumers to reduce the market price of traceable food, thereby increasing consumers' WTP. Unfortunately, few studies have been conducted to investigate government subsidies and consumers' WTP for traceable food based on current situation in China. Although Wu et al. (2015) investigated the policy instrument of providing direct government subsidies to traceable food manufacturers, the scientificity of their findings remains to be further verified, as simulation research, rather than empirical research, was performed.

The goal of this study was to investigate the impact of government subsidies on the traceable food market based on the current situation of Chinese traceable food market, in order to provide decision-making references for the government to implement proactive policies on traceable food production and consumption.

METHODOLOGY

Theoretical modeling

The CBC analysis is based on Lancaster's consumer demand theory and random utility theory (Ben-Akiva and Lerman, 1985). Lancaster (1966) held the opinion that the utility that consumers obtained from a good was not derived from the good itself, but from intrinsic attributes of the good, and that consumers would choose an attribute combination to maximize utility under given budgetary constraints. Make Unik the utility obtained by consumer in choosing traceable pork profile from subset m in task C under choice situation k, and then Unik includes two parts: the deterministic part Vnik and the stochastic part εnik, that is,

$$U_{\text{nik}} = V_{\text{nik}} + \varepsilon_{\text{nik}} \tag{1}$$

Only when $U_{\text{nik}} > U_{\text{njk}}$, that is, $V_{\text{nik}} - V_{\text{njk}} > \varepsilon_{\text{njk}} - \varepsilon_{\text{nik}}$ is true for any $j \neq i$, consumer n will choose traceable pork profile i. The probability for consumer n choosing traceable pork profile i is as follows:

$$P_{\text{nik}} = prob(V_{\text{nik}} - V_{\text{njk}} > \varepsilon_{\text{njk}} - \varepsilon_{\text{nik}}; \forall j \neq i) \tag{2}$$

In this study, V_{nik} is the linear function of pork traceability information, appearance, price, and government subsidies:

$$V_{nik} = \beta_n' X_{ni} \tag{3}$$

where β_n' is the part-worth vector for consumer n, and X_{ni} is the attribute vector of traceable pork profile i.

If it is assumed that ε_{nik} follows type I extreme value distribution, then the probability for consumer n choosing attribute i under condition k is as follows:

$$P_{nik} = \frac{e^{V_{nik}}}{\sum_{j \in C} P_{nik}} \tag{4}$$

A multivariate logistic regression was performed on Equation (4).

Subjects

The main reasons for taking traceable pork as an example are explained as follows. Meat is a globally consumed basic food, with global consumption increasing more than 13% over the past decade. As one of the most popular meats, the consumption of pork also increased by 10.71%. In fact, China is a large consumer and producer of pork. Pork production was 56.71 million tons in 2014 in China, accounting for 66.4% of the national meat production. At the same time, 92,000 tons of pork was exported from China in 2014, with a value of approximately USD 425 million. Therefore, pork safety in China not only relates to the health and safety of Chinese consumers, but also affects the safety of pork markets worldwide to some extent. Moreover, pork is the most commonly consumed meat in China.

Wu et al. (2015) reported that meat and meat products were a food category that caused the largest number of food safety incidents over the past decade in China (Figure 1). Besides, the earliest pilot implementation of traceability system in China was for pork. Beginning in 2010, the Chinese Ministry of Commerce and Ministry of Finance implemented a pork traceability system in 58 pilot cities in five batches. However, the construction of government-led food traceability systems has been ineffective as revealed by years of practice. Therefore, in this study, consumer preferences and demands for traceable food with different levels of safety information were examined as a starting point, taking traceable pork as a typical example, by using a choice-based conjoint (CBC) analysis combined with a multivariate logistic regression model for market simulation. On this basis, the acceptable traceable food market plans for different groups of consumers under different government subsidies were evaluated by introducing government subsidies as a variable, and the solutions to "market failure" and "government failure" in the traceable food market were discussed, in order to provide effective policy advices for promoting the construction of traceable food market systems in China.

For data collection in the present study, a random sampling method was employed. The questionnaire survey was conducted in large supermarkets in Wuxi, Jiangsu Province, China, including Qingqi Road Outlet of RT-Mart in Binhu District, Zhenghe Outlet of Tesco in Huishan District, Xinguang Outlet of Vanguard in New
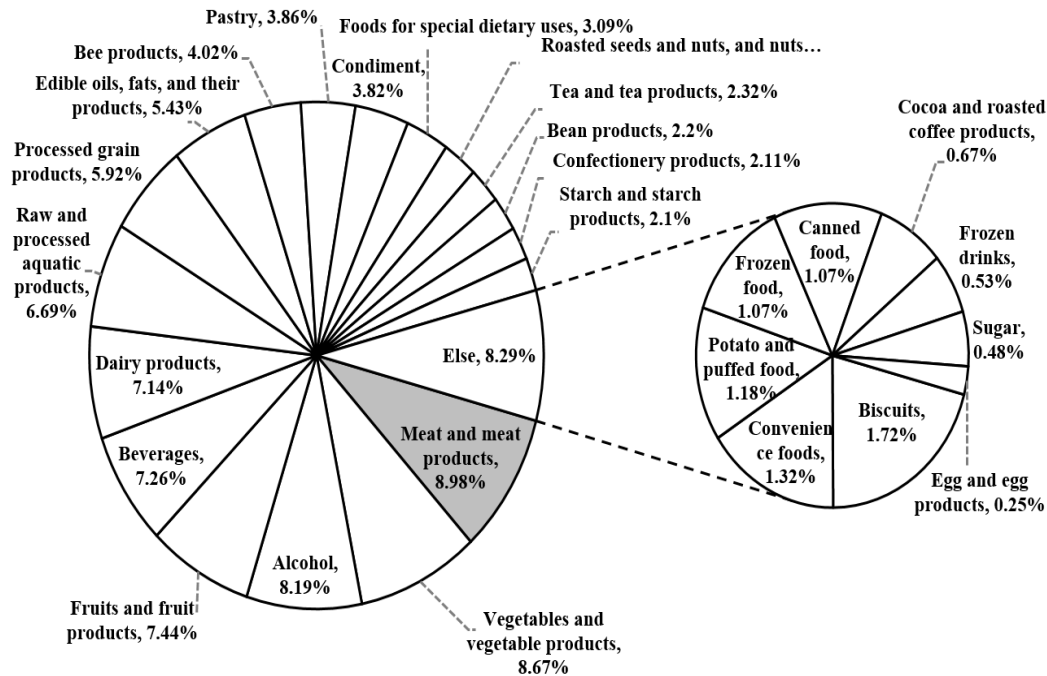
Figure 1. Food categories involved in food safety incidents in mainland China from 2005 to 2014. Note: A total of 227,386 food safety incidents, that occurred in 31 provincial-level administrative regions in mainland China, were reported from 2005 to 2014. Figure 1 shows the percentages of the total food safety incidents for different food categories. Source: own.

District, and Columbus Outlet of Carrefour in Chong'an District, mainly during 8:00 to 10:00 am and 16:00 to 18:00 pm (shopping rush hour for household food) every day in July, 2013. The trained interviewers chose the third consumer coming into their view as the respondent, in order to ensure the randomness of the survey sample (Wu et al., 2012b). The respondents were interviewed face-to-face by the interviewers. The sample was composed of 462 consumers, and the sampling distribution of this study basically matched the distribution of the population. In total, 426 questionnaires were collected, including 410 (96.24%) valid questionnaires, providing a total of 4,100 valid observations. It should be noted that the instrument used in the survey was adopted from proven results of the author's previous research with some necessary modifications (Wu et al., 2012a).

Setting of different attributes and levels for traceable pork

Firstly, Golan et al. (2004) and Pouliot and Sumner (2012) suggested that traceable food safety information was reflected in three dimensions, including total amount of information records (breadth), stages covered by forward or backward traceability (depth), and accuracy of food identification (precision). Mature traceability systems have been established in developed countries, with clear technical requirements for the three dimensions. At present, related Chinese research is more focused on the depth of supply chain stages of the food traceability system. In this study, the traceability information attribute was set at three levels: farming information, slaughter information, and transportation information, based on existing research worldwide and the analyses of major safety risks throughout the Chinese pork supply chain system (Lin et al., 2008; Jiang et al., 2009; Trienekens and Wognum, 2013).

Secondly, in order to effectively eliminate the influence of other pork quality characteristics on consumer choice, and considering the fact that pork hindquarters are commonly consumed in China (Wang et al., 2011), traceable pork hindquarters were selected in this study and prices were set accordingly. Wu et al. (2013) assessed the WTP for traceable pork with different levels of safety information in 2121 consumers from Liaoning, Hebei, Jiangsu, Gansu, and Yunnan provinces in China using a full-profile joint analysis and found that a premium of 20 - 30% was acceptable to consumers. According to a field survey in China Resources Vanguard, Tianhui, and other supermarkets in Wuxi City, Jiangsu Province, China, the price of ordinary pork hindquarters was set at 13 yuan/500 g. Based on the findings of Wu et al. (2012) on the market price of pork hindquarters with different levels of traceability information, four price levels were set as shown in Table 1.

Thirdly, and most importantly, additional production costs that arise from the production of traceable pork should not be completely covered by government subsidies. As beneficiaries of improved pork quality and safety, consumers should bear part of the additional costs. Government subsidies for the additional production costs were reflected by subsidizing the traceable pork market price in this study, as it was difficult to accurately calculate the additional costs. The maximum limit for the government subsidies on traceable pork market price was set at 7%. This is because when a subsidy of over 7% is provided, the market price of the same level of traceable pork will be lower than that of the same type of ordinary pork, which is obviously unreasonable. In other words, the traceable pork market price with government subsidies (X) must be higher than the ordinary pork price, that is, $14 \times (1-X) > 13$. Moreover, in order to further investigate the impact of government subsidies on consumers' WTP and the market share of traceable pork, comparisons were made with a government subsidy

Table 1. Attribute and level settings of the traceable pork hindquarters.

Attributes	Levels (Abbreviation)
Traceability information	1. No traceability information (NOTRACE) 2. Traceability information covering farming (LOTRACE) 3. Traceability information covering farming and slaughter (METRACE) 4. Traceability information covering farming, slaughter, and transportation (HITRACE)
Price	1. 13 yuan/500 g (PRICE1) 2. 14 yuan/500 g (PRICE2) 3. 15 yuan/500 g (PRICE3) 4. 16 yuan/500 g (PRICE4)
Subsidy	1. No subsidy (NOSUBSIDY) 2. A subsidy of over 3% (LOSUBSIDY) 3. A subsidy of over 7% (HISUBSIDY)
Appearance	1. Fresh-looking (FRESH1) 2. Passable-looking (FRESH2) 3. Bad-looking but edible (FRESH3)

Task 1: Which one of the following options you prefer?

Farming, slaughter, and transportation information

Moderate appearance
16 yuan/500 g
A government subsidy of 7%

Total price: **14.88** yuan/500 g

Farming information

Bad-looking but edible
13 yuan/500 g
A government subsidy of 3%

Total price: **12.61** yuan/500 g

None of them
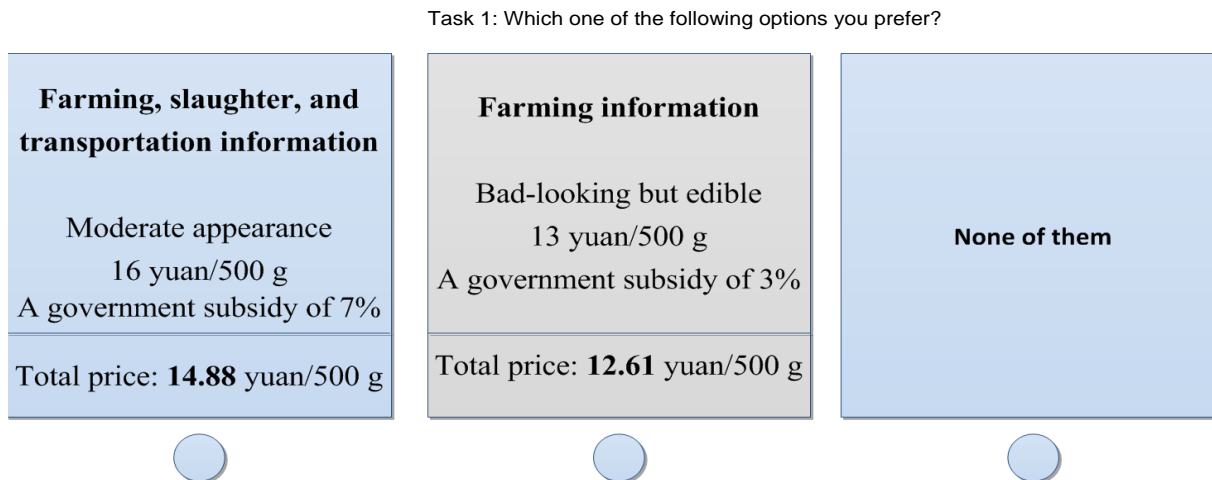
Figure 2. A sample CBC task card.

of 3%.

In addition, appearance is an intuitive criterion for consumers in judging pork quality, and is also an important factor influencing consumers' WTP (Hartmann et al., 2013). Therefore, appearance was included as an attribute to investigate WTP for traceable pork, and three levels, i.e., fresh-looking, moderate, and bad-looking but edible, were set. Based on the earlier considerations, the attributes and levels of traceable pork hindquarters were finally set as shown in Table 1.

The earlier mentioned attributes and levels of traceable pork safety could constitute a total of 4×3×4×3=144 possible product profiles. After removing the profiles with government subsidies but no traceability information (3×4×2=24), consumers would need to make choice for 120×119=14,280 sets of product profiles. In general, consumers will become fatigued after making 15 to 20 choices (Rossi et al., 1996). In view of this, 20 questionnaires were designed using the CBC module of the Sawtooth software and the Balanced Overlap method. Each questionnaire included 10 choice sets, and each choice set included two traceable pork profiles and an "opt-out" option (Figure 2), thus reducing the number of choice sets while ensuring the balanced distribution of attribute levels.

RESULTS AND DISCUSSION

Sample characteristics

Sample characteristics analyzed from the 410 valid questionnaires were shown in Table 2. Most respondents were female (61.95%), which is consistent with the fact that women are the major family food buyer in China. Of

Table 2. Characteristics of respondents.

Statistical characteristics	Group	Frequency	%
Gender	Male	156	38.05
	Female	254	61.95
Age	≤25	80	19.51
	26-40	192	46.83
	≥41	138	33.66
Education	Middle school or lower	106	25.85
	High school	124	30.25
	College or above	180	43.90
Household annual income (RMB)	60, 000	218	53.18
	60, 000-150,000	150	36.59
	>150, 000	42	10.23
Child(ren) under the age of 18	Yes	196	47.80
	No	214	52.20
The first consideration when you purchase food	Price	48	11.71
	Appearance	54	13.17
	Safety	268	65.36
	Nutrition	40	9.76
The most important traceability information you think	Farming information	234	57.07
	Slaughter information	110	26.83
	Transportation information	66	16.10
Whether you agree with direct government subsidies to traceable food market	Agree	276	67.31
	Do not care	112	27.32
	Disagree	22	5.37

the respondents, 46.83% were aged 26 to 40 years. Most respondents were junior college graduates (43.90%) or senior or vocational high school graduates (30.25%). In total, 53.18% of respondents had a household income of 60,000 yuan or less. Overall, 65.36% of respondents first considered safety when purchasing pork. With regard to traceability information, 57.07% of respondents believed that farming information was the most important, which is mainly because most safety problems have occurred during the farming stage of the pork supply chain. Interestingly, 67.31% of respondents agreed that direct government subsidies should be provided for the traceable pork market price.

CBC estimation

The results about utility value of different levels of attributes and the relative importance of attributes are shown in Table 3. Traceability information was the most important attribute for consumers when purchasing traceable pork, with an importance of 40.80%. As to the four different levels of traceability information, the maximum marginal utility of consumer purchase was 0.7500, when information of farming, slaughter, and transportation was displayed on the label; it was 0.4026 when only farming and slaughter information was displayed and -1.1132 and -0.0394, respectively, when no traceability information and only farming information was displayed. Obviously, the marginal utility of consumer purchase increased with higher level of traceability information. In other words, consumers were more willing to buy pork with a higher level of traceability information, which is consistent with the conclusion of Wu et al. (2014) that consumers had a higher WTP for pork hindquarters with complete traceability information. The relative importance of appearance accounted for 34.79%, second only to traceability information. The marginal utilities of consumer purchase for the three levels, fresh-looking, moderate, and bad-looking but edible, were

Table 3. Utility value of different levels of attributes and the relative importance of attributes.

S/N	Attributes	Levels	Utility value	Standard deviation	T value	Relative importance (%)
1	Traceability information	NOTRACE	− 1.1132***	0.1295	-8.5953	
		LOTRACE	− 0.0394	0.0751	-0.5242	
		MITRACE	0.4026 ***	0.0751	5.3629	40.80
		HITRACE	0.7500 ***	0.0936	8.0167	
2	Price	PRICE4	− 0.1796*	0.0993	-1.8095	
		PRICE3	− 0.1474 **	0.0735	-2.0069	
		PRICE2	0.1073	0.0697	1.5388	8.74
		PRICE1	0.2197**	0.0983	2.2357	
3	Government subsidy	NOSUBSIDY	− 0.3802***	0.0798	-4.7667	
		LOSUBSIDY	0.0447	0.0634	0.7048	15.67
		HISUBSIDY	0.3355***	0.0578	5.8017	
4	appearance	FRESH3	− 0.7707 ***	0.0623	-12.3749	
		FRESH2	− 0.0472	0.0521	-0.9062	34.79
		FRESH1	0.8179***	0.0537	15.2376	

The importance I_i of the attribute i was calculated as the range defined by the difference between the lowest and highest part-worth utilities of all levels of attribute i: $I_i = \{\max(a_{ij}) - \min(a_{ij})\}$. The greater the difference, the more importance the attribute had in the overall profile, and vice versa. The relative importance of an attribute is generally expressed as a percentage: $W_i = \dfrac{I_i}{\sum\limits_{i=1}^{m} I_i} \times 100\%$, where $\sum\limits_{i=1}^{m} I_i$ is the sum of the differences between the highest and lowest utilities of the different levels of all attributes. ***, **, and * denotes significance at the 1%, 5%, and 10% levels, respectively.

0.8179, -0.0472 and -0.7707, respectively. The better the appearance, the greater the marginal utility of consumer purchase. It might be that pork with a better appearance was more highly rated by consumers, as appearance is an intuitive criterion for consumer in judging pork quality. This is consistent with the conclusion of Grunert (1997) that the freshness of meat was an important attribute affecting consumers' evaluation of beef quality. The importance of government subsidies relative to consumer purchase was 15.67%. The marginal utility of consumer purchase was negative without government subsidies, and it was 0.0447 and 0.0578, respectively, with a government subsidy of 3 and 7%. The marginal utility of consumer purchase increased with the increase of government subsidy. This may be because government subsidies reduced the cost paid by consumers of pork with a better appearance. The higher the government subsidy, the lower the cost paid by consumers, and the higher the marginal utility of consumer purchase. Among the four key attributes of traceable pork, price had the lowest importance of 8.74%. The marginal utility of consumer purchase increased with the decrease of price, which is consistent with the theory of demand.

Simulation of traceable pork market share with different government subsidies

In related studies that employed the choice experiment, WTP was often calculated after the marginal effects of different levels of each attribute were estimated. Indeed, it is difficult for policy makers to develop a pricing strategy for a new product based on consumers' WTP for the attributes, as the price of the new product is not a simple sum of the WTP for each attribute. Moreover, this study relates to government subsidy. As this attribute also has a price effect, the conventional method to estimate WTP (the ratio of attribute marginal utility to price marginal utility) does not apply to this study. For these reasons, a market simulation was performed instead of a WTP estimation.

As there is no profile of traceable pork hindquarters universally accepted by manufacturers in China, possible profiles of traceable pork hindquarters were set based on ordinary pork hindquarters without traceability information, and presented to manufacturers to choose from. The changes in traceable pork hindquarters market share with different government subsidies were thereby assessed.

As shown in Table 4, the ordinary and traceable pork hindquarters were classified into low, medium, and high levels based on the different levels of traceability information, appearance, and price in the absence of government subsidies. For example, the traceable pork hindquarters profile with HITRACE, FRESH1 and PRICE4 was classified as the high-level traceable pork hindquarters.

Since all three levels of ordinary pork hindquarters already exist in the market, while the traceable pork hindquarters are virtual, the virtual traceable pork hindquarters profiles were added to the ordinary pork hindquarters to create seven different market scenarios of pork hindquarters. Based on the previously estimated marginal utility of the different levels of each attribute, market shares of the seven scenarios were estimated using the randomized first choice method of Huber et al. (1999), and the results are shown in Table 5.

As shown in Table 5, when all the earlier mentioned different types of pork hindquarters were sold in the market, the three levels of traceable pork hindquarters had the largest market share of 90.3%. The six other market scenarios in descending order of total market share of traceable pork hindquarters were as follows: marketing of high- and medium-level traceable pork hindquarters, with a total share of 87.83%; marketing of high- and low-level traceable pork hindquarters, with a total share of 87.02%; marketing of medium- and low-level traceable pork hindquarters, with a total share of 84.38%; and separate marketing of high-, medium-, and low-level traceable pork hindquarters, with a share of 81.37, 75.35 and 71.34%, respectively.

The estimated market shares of traceable pork hindquarters in the different market scenarios with government subsidies of 3 and 7% are shown in Tables 6 and 7. Comparison of Tables 5, 6, and 7 revealed that the ranking of market scenarios in order of the market share of traceable pork hindquarters was not affected by the offer of government subsidies. However, compared with ordinary pork, the market shares of traceable pork hindquarters in all scenarios were increased with the increase of government subsidies. Obviously, this is because share of consumer spending on traceable pork hindquarters was increased due to substitution and income effects, as the relative price of traceable pork hindquarters was decreased by government subsidies.

Undoubtedly, the higher government subsidies the better, from the mere perspective of promoting traceability systems to improve food safety. However, as government spending also faces resource constraints, the efficiency of government spending cannot be ignored. In this regard, the ratio of the market share increment of level-i traceable pork hindquarters to government subsidy increment was regarded as government subsidy and market share elasticity, and was used to judge the efficiency of government subsidies. The results of government subsidy and market share elasticity are shown in Table 8.

As shown in Table 8 for example, when a government subsidy of 3% was provided, the market shares of low-level, medium-level, high-level, and all levels of traceable pork was increased by -0.16, 0.08, 0.70 and 0.62%, respectively, with an increase of 1% in government subsidies. Comparison of changes in the overall market share of traceable pork between government subsidies of 3 and 7% indicated higher elasticity with a government subsidy of 3% in all scenarios. Therefore, a government subsidy of 3% is a better choice when considering the efficiency of government spending. This may be related to the small price elasticity of pork demand.

Conclusion

In this study, four attributes, that is, traceability information, price, government subsidy, and appearance, were set at different levels for pork hindquarters, and consumer preferences for traceable pork hindquarters were examined using a CBC analysis combined with a multivariate logistic regression model. On this basis, high, medium- and low-level traceable pork profiles were created. Furthermore, the impact of different government subsidies on the market share of traceable pork hindquarters in different market scenarios was thereby simulated. Major conclusions are summarized below:

1. Among the four traceable pork attributes, traceability information was the most important attribute to consumers which is in a good accordance with the research of Hobbs et al. (2005). Consumers' preferred appearance was the second important attribute, which is consistent with the research conclusion of Grunert (1997), Loureiro and Umberger (2007) and Ortega et al. (2011). Among the four levels of traceability information, the inclusion of farming, slaughter, and transportation information had the highest marginal utility. The marginal utility decreased with lower level of traceability information, in full accord with random utility theory (Lancaster, 1966).

2. The marketing of all there levels traceable pork yielded the largest overall market share of traceable pork with different government subsidies. Moreover, the ranking of market scenarios in order of the overall market share of traceable pork hindquarters was not affected by the offer of government subsidies. However, compared with ordinary pork, the market shares of traceable pork hindquarters in all scenarios were increased with the increase of government subsidies, consistent with the long tail theory (Anderson, 2007).

3. A government subsidy of 3% was more efficient than that of 7% based on government subsidies and market share elasticity. This is because an increase of 1% in government subsidy led to a higher increase in the overall market share of traceable pork hindquarters when a government subsidy of 3% was provided.

Table 4. Product profiles of ordinary pork and traceable pork without government subsidies.

Attribute level	Low-level ordinary pork	Medium-level ordinary pork	High-level ordinary pork	Low-level traceable pork	Medium-level traceable pork	High-level traceable pork
HITRACE	-	-	-	-	-	√
MITRACE	-	-	-	-	√	-
LOTRACE	-	-	-	√	-	-
NOTRACE	√	√	√	-	-	-
PRICE1	√	√	√	-	-	-
PRICE2	-	-	-	√	-	-
PRICE3	-	-	-	-	√	-
PRICE4	-	-	-	-	-	√
FRESH1	-	-	√	√	√	√
FRESH2	-	√	-	-	-	-
FRESH3	√	-	-	-	-	-

"√" refers to inclusion of specific attribute levels in a certain type of pork.

Table 5. The estimated market shares in the different market scenarios without government subsidies.

Scheme*	Low- level ordinary pork	Medium- level ordinary pork	High- level ordinary pork	Low- level traceable pork	Medium- level traceable pork	High- level traceable pork	Total traceable pork market share
1	0.97	3.16	5.51	22.48	28.03	39.85	90.36
2	1.16	3.72	7.28	-	36.20	51.63	87.83
3	1.23	3.97	7.78	31.50	-	55.53	87.02
4	1.44	4.60	9.57	37.78	46.60	-	84.38
5	1.55	5.22	11.86	-	-	81.37	81.37
6	1.91	6.41	16.33	-	75.35	-	75.35
7	2.16	7.33	19.17	71.34	-	-	71.34

* Government subsidies are not provided to ordinary pork.

Although only pork hindquarters were investigated as an example, the earlier mentioned conclusions provide definite policy implications on the construction of food traceability systems in China. First, the time is right for the establishment of food traceability systems in China, considering the huge potential market demand for traceable food. In practice, efforts should be focused on the establishment of multi-level traceable food market systems, thereby gradually promoting traceable food and developing emerging food markets, while meeting the different levels of consumer demand. Second, government subsidies help promote the construction of traceability systems in the early stage. However, a higher government subsidy is not necessarily better from the perspective of efficiency. The optimal level of government subsidies should be identified based

Table 6. The estimated market shares in the different market scenarios with a government subsidy of 3%.

Scheme *	Low- level ordinary pork	Medium - level ordinary pork	High- level ordinary pork	Low- level traceable pork	Medium - level traceable pork	High- level traceable pork	Total traceable pork market share
1	0.54	2.10	5.15	22.00	28.27	41.94	92.21
2	0.65	2.41	6.37	-	36.36	54.21	90.57
3	0.68	2.57	6.81	31.03	-	58.91	89.94
4	0.81	2.99	8.36	38.71	49.14	-	87.85
5	0.82	3.14	9.39	-	-	86.65	86.65
6	1.01	3.99	12.85	-	82.15	-	82.15
7	1.17	4.61	15.22	79.00	-	-	79.00

* Government subsidies are not provided to ordinary pork.

Table 7. The estimated market shares in the different market scenarios with a government subsidy of 7%.

Scheme *	Low-level ordinary pork	Medium- level ordinary pork	High- level ordinary pork	Low- level traceable pork	Medium - level traceable pork	High- level traceable pork	Total traceable pork market share
1	0.42	1.63	3.74	22.48	28.90	42.84	94.21
2	0.50	1.85	4.54	-	37.41	55.71	93.11
3	0.54	1.98	4.88	31.97	-	60.63	92.60
4	0.62	2.28	5.89	34.69	56.52	-	91.22
5	0.64	2.48	6.93	-	-	89.95	89.95
6	0.86	3.17	9.72	-	86.26	-	86.26
7	0.97	3.75	11.60	83.68	-	-	83.68

* Government subsidies are not provided to ordinary pork.

Table 8. The results of government subsidy and market share elasticity.

Scheme	Government subsidy of 0-3%				Government subsidy of 0-7%			
	Low- level traceable pork	Medium - level traceable pork	High- level traceable pork	Total	Low- level traceable pork	Medium - level traceable pork	High - level traceable pork	Total
1	-0.16	0.08	0.70	0.62	0.00	0.12	0.43	0.55
2	-	0.05	0.86	0.91	-	0.17	0.58	0.75
3	-0.16	-	1.13	0.97	0.07	-	0.73	0.80
4	0.31	0.85	-	1.16	-0.44	1.42	-	0.98
5	-	-	1.76	1.76	-	-	1.23	1.23
6	-	2.27	-	2.27	-	1.56	-	1.56
7	2.55	-	-	2.55	1.76	-	-	1.76

on government subsidy and market share elasticity, consistent with the long tail theory as well (Anderson, 2007).

This study may be limited in that the survey sample consisted of consumers from a single city in China. The earlier mentioned conclusions are inevitably subject to further verification because of the vast territory and many different types of cities in China. In future studies, multi-regional, multi-sample surveys covering different types of cities and villages should be conducted to investigate the impact of government subsidies on traceable food market, in order to provide a more accurate decision-making scheme for the Chinese government.

Conflict of Interests

The authors have not declared any conflict of interests.

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Full Length Research Paper

Stakeholder participation: An empirical investigation

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Studies point to the fact that most stakeholders in health projects implemented by non-governmental organisations (NGOs) in Uganda have in some one way or another, not been optimally involved in their implementation. This has led to various projects failing to provide anticipated benefits on a sustainable basis. This study therefore aimed at examining the level of stakeholder participation on health projects in Uganda. Methodologically, this study adopted quantitative research design. The results indicated that some key project stakeholders are neither involved in the consultative meeting for the projects, nor in design of the project. The study findings showed that the level of stakeholder participation in health projects among NGOs in Uganda is still low. The implication is that if stakeholders are not actively involved in the project by being consulted, taking up roles and making decisions concerning the health interventions which impact them; this is likely to negatively affect the sustainability of the project. It was thus recommended that stakeholders should be consulted as regards the project before it is implemented and that this participation should be encouraged throughout the project life. This may be in form of letting stakeholders air out their views in the consultative meetings for the project, consulting them on the needs identification for the project, and carrying out leadership roles for the project.

Key words: Stakeholder participation, project management, health projects, Uganda.

INTRODUCTION

Regardless of the type of project, decisions regarding the degree of participation from various stakeholders are a significant issue that project management should consider (Usadolo and Caldwe, 2016, Nalweyiso et al., 2015; Arca and Prado, 2008). Within the Health projects in Uganda, there is a shared assumption that participation of the usersimproves the sustainability of these projects. Within the realm of the studied projects, this assumption has been largely based on anecdotal evidence hence the

need to undertake a robust examination of the assumption as it directly has implications on the sustainability of captioned projects. Similar studies, like those by Xiaojin (2006) which have been conducted outside Uganda may provide an indication but not an actual- conclusive view of the state of stakeholder participation in Uganda due to differences in cultures, social practices and contextualized needs usually observed across nations. Bakenegura (2003) considers participation as a process through which

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stakeholders influence and share control over development initiatives, decisions and resources which affect them. This conceptualization of stakeholder participation is closely compared to that by Tammer (2009).

Also, Luyet et al. (2012) has also shown that Stakeholder Participation is regarded as axiomatic in community development approaches and that it is both a necessary condition for change and also valued for empowerment and partnering based on the specific interest of the stakeholder to the project. Stakeholder participation literally means to take part or become actively involved or share in. The Department for Foreign and International Development (DFID, 1995) gives the levels of participation as Consultation, Decision making and Role participation.

Arnstein (1969) points to seven (7) levels of stakeholder participation which ranges from passive collaboration to active role participation by the beneficiaries or the community members. For purposes of this study, the researcher adopted the three measures of stakeholder participation on part of active role participation which involved consultation, decision making and active role participation in examining the level of stakeholder participation on selected health projects in Uganda. The following sections of this paper present the theoretical underpinning of the study, the methods used in the study, the detailed findings and their discussion, the conclusion and recommendations, and suggested areas for further research.

THEORETICAL UNDERPINNING

A stakeholder is an individual, group, or organization who may affect, be affected by, or perceive it's self to be affected by a decision, activity, or outcome of a project (PMI, 2013; Freeman 1984). Stakeholder theory has become so popular especially in livelihood projects aimed at empowering the less privileged (Savage et al., 1991; Nalweyiso et al., 2015). Health Projects have various stakeholders whose expectations are diverse in nature and therefore the management of these project stakeholders is an issue of concern. Stakeholder theory thus holds that when those who have a stake in the projects take part in shaping decisions through participation, their interests are likely to be addressed (Vermoolen, and Hermans, 2015).

This leads to perceived success of the project by the different stakeholders in terms of service delivery and the quality of service. This argument is underpinned by the normative and descriptive form of stakeholder theory as propounded by Donaldson and Preston (1995) and further supported by Phillips (2003). It thus seeks to define the specific stakeholders of the project (the normative form of stakeholder theory), and then examines the conditions under which managers treat these parties as stakeholders (the descriptive form).

METHODOLOGY

The study used quantitative research methods. In the Past, Scholars like Hempe et al. (2015) have also used similar approach in investigating stakeholder participation in health related studies. A self-administered questionnaire was used to collect data from a sample of 86 health projects conducted by 110 non-governmental organizations (NGOs) in Uganda. The sampling frame was sourced from the NGO network. The unit of inquiry was sampled using simple random sampling. The unit of inquiry comprised of the community representatives and the end users (beneficiaries) who were/had ever taken part in the sampled projects. From each selected project, 1 community representative and 1 beneficiary was sampled which added up to a total of 172 target respondents. The inclusion and exclusion criteria was that where a person was picked and found not to have participated in the selected projects, he/she was discarded and replaced with the next convenient person. The responses returned were 71% of what was targeted. Stakeholder participation was measured using an abridged version of the stakeholder involvement questionnaire developed by Kanungo (1982) and Schaeffer (1994) and Arnstein (1969). The final instrument used to collect data had a reliable and valid instrument with both Cronbach Alpha Value and Content Validity Index showing coefficients of above 0.7. The collected data was sorted and cleaned to remove inconsistencies. The data was then analyzed using statisitical package for the social sciences (SPSS) descriptive statistics.

FINDINGS

Respondents' level of education

Data on respondents' level of education was collected and analyzed using descriptive frequencies and percentages. Table 1 shows the results. Findings indicate that most respondents were below diploma level (certificate, secondary, primary and non formal) as their highest education attained (36.4%), 30.1% of respondents attained diploma as their highest education level, 15% degree level, 10% other professional courses like ACCA CPA CIPS and others, and 8% had attained a masters level and 4%. This would imply that most people who participate in health projects either as community representatives and end users are those with little or no knowledge regarding the execution of health projects.

The level of stakeholder participation in health projects among NGOs in Uganda

To examine the level of stakeholder participation in health projects among NGOs in Uganda, descriptives were presented as shown in the table that follows. Participation was measured using a scale of 1 to 5. Where 1 reflected strongly disagree, 2 Disagree, 3 Uncertain, 4 Agree and 5 Strongly agree. Results were interpreted using mean score such that the mean that the mean scores of either 1 or 2 reflect low level of participation, 3 represents moderate level of participation while those means that are close to 4 or 5 show high level of stakeholder participation. Table 2 presents the results. The results in

Table 1. Level of education.

Variable		Count	Valid Percent	Cumulative Percent
Highest academic qualification attained	Diploma	43	35.0	35.0
	Degree	26	21.1	56.1
	Professional	22	17.9	74.0
	Masters	15	12.2	81.2
	Others	17	13.8	100.0
	Total	123	100.0	-

Source: Primary data.

Table 2 imply that the level of stakeholder participation in health projects is still low (mean=2.53, SD= 0.73) and so are its components of role participation (Mean =2.47) consultation (Mean=2.60) and decision making (Mean=2.48), which are which all had mean scores less than 4.00 a clear indication of the low levels of stakeholder participation among NGOs in Uganda.

These results in the Table 2 indicated that the beneficiaries were not really involved in the consultative meeting for the projects (Mean = 2.18) and neither were they involved in project design (Mean = 2.40). Further, the beneficiaries are hardly engaged in the needs identification for the project and thus as end users, they cannot carry out leadership roles for the projects (Mean ≈ 2.58). When it comes to role participation, the results revealed that Stakeholders do not feel detached from the work they do in the project (Mean = 2.13), are not perfectionists about the work they do (Mean= 2.22) and are not very much involved in the activities they carryout for the project (Mean= 2.32).

DISCUSSION

Stakeholder participation was found to comprise of role participation, decision making and consultation. This was in agreement with the studies of Arnestein (1996). It was further found out that the inclusion of beneficiaries in decision making was vital in increasing the level of stakeholder participation. This is in line with studies of Bourne (2008). The results also agree with the earlier studies of Diallo and Thuillier (2004) and Bryde (2010) to the effect that when people participate in joint decision making, it leads to action plans and the formation of new local institutions or the strengthening of existing ones. These groups should take control over project decisions especially those which impact on them. It was also found out that role participation was another important measure of stakeholder participation.

Note should however be taken that consultation as a measure of participation was the least participatory domain (7.2%), and therefore was not the best in measuring stakeholder participation. The study findings are in agreement with the findings of Anstein (1996),

to the effect that involving stakeholders by only consulting them offers no assurance that people's ideas and concerns would be taken into account by the project implementers. The findings also indicated that the level of stakeholder participation is still low (mean =2.47). This confirms to the studies of UNDP as cited by Narayana (2002) that participation is a time consuming process which if equated in monetary terms, the approach would not be justifiable given the high expenditures involved and the degree of donor dependency least the project would experience time and cost over runs. This also explains why stakeholder participation in health projects among NGOs is still low.

CONCLUSION

The study findings showed that the level of stakeholder participation in health projects among NGOs in Uganda is still low (mean=2.47). This therefore implies that if stakeholders are not actively involved in the project by being consulted, taking up roles and making decisions concerning the health interventions which impact them; this is likely to negatively affect the sustainability of the project. It is also recommended that stakeholders should be consulted as regards the project before it is implemented. This can be in form of letting them air out their views in the consultative meetings for the project, consulting them on the needs identification for the project, and carrying out leadership roles for the project.

SUGGESTION

Further research should be undertaken to test the levels of project stakeholder participation, in health projects in other sectors other than NGOs like in the different Ministries say Agriculture, to mention. This is because such sectors tend to receive a lot of funding for their projects and results from such sectors can widen the objective basis upon which a more applicable policy can be crafted to enable cross-cutting promotion of stakeholder participation. Future researchers can explore the same concept with a wider sample involving other

Table 2. Level of stakeholder participation.

Consultation	N	Min	Max	Mean	SD
I was involved in the consultative meeting for this project	55	1.00	5.00	2.18	1.24
As a beneficiary, I was involved in project design	55	1.00	5.00	2.40	1.32
I was involved in needs identification for this project	55	1.00	5.00	2.52	1.32
The Community has clearly defined roles and responsibilities in this project	55	1.00	5.00	2.73	1.40
As an end user, I carryout leadership roles for this project	55	1.00	5.00	2.57	1.35
I participated in the Financing of the project	55	1.00	5.00	2.23	1.22
I was involved in the meeting for deigning the budget for this project	55	1.00	5.00	2.67	1.45
I am aware of the goals and objectives of this project	55	1.00	5.00	3.34	1.56
The project team actively sought out the views of women, to provide a more complete picture of potential risks, impacts, and opportunities relating to an engagement process	55	1.00	5.00	2.40	1.07
The project was just brought to us by the organization without our knowledge	55	1.00	5.00	2.18	1.13
I greatly supported the project to proceed	55	2.00	5.00	3.34	1.51
I was satisfied with the level of consultation and participation as far as my input is concerned towards the success of this project	55	1.00	5.00	2.62	1.47
Often when not in a meeting, I would receive communication from other members about the project progress	55	1.00	5.00	2.66	1.35
-	55	2.60		0.75	

Role participation	N	Min	Max	Mean	SD
Am willing to work overtime to accomplish unfinished tasks	55	1.00	5.00	2.66	1.44
Often when I was not engaged in project work, I would find myself thinking about things that I have done or things that need to be done in the project	55	1.00	5.00	2.49	1.23
Generally, I feel detached from the type of work that I do in this project	55	1.00	5.00	2.13	1.19
I am absorbed in the activities that I carry out in this project	55	1.00	5.00	2.47	1.14
I am really a perfectionist about the work that I do in this project	55	1.00	5.00	2.22	1.09
I do only what am required of, no more no less	55	1.00	5.00	2.36	1.21
I am really interested in my project work	55	1.00	5.00	3.00	1.54
I am very much involved personally in the activities I do in this project	55	1.00	5.00	2.32	1.24
In this project, I often do extra work beyond what is expected of me	55	1.00	5.00	2.58	1.42
I am very much involved personally in the activities I do in this project	*55;55*	*1.00*	*5.00*	*2.51; 2.47*	*1.31; 0.79*

Decision making	N	Min	Max	Mean	SD
I participated in selecting this project on behalf of the community	55	1.00	5.00	2.40	1.46
I decided on the community labor contribution for this project	55	1.00	5.00	2.17	1.15
I decided on the wages to be paid for community labor in this project	55	1.00	5.00	2.12	1.27
I decided on the compensation for non-labor community resources in this project	55	1.00	5.00	2.10	1.16
I participated in deciding the sanction measures for the project misuse	55	1.00	5.00	2.40	1.37
I decided on the distribution of project benefits for this project	55	1.00	5.00	2.18	1.24
I decided on the sanctions imposed for not participating in project maintenance	55	1.00	5.00	2.36	1.31
I decided on the project site	55	1.00	5.00	2.00	1.11
I decided on the project scale (Length, Capacity)	55	1.00	5.00	2.22	1.30
I decided on the time frame for this project	55; 55	1.00	5.00	2.16; 2.48	1.13; 0.72
Grand mean (Stakeholder participation)	55	-	2.53; 0.73	-	-

stakeholders like the project staff, Donors, Project managers among others. This is so because the study only captured the perceptions of project beneficiaries and Community coordinators that had taken part in executing health projects and yet accommodation of various stakeholders could give a different view. There is need to

investigate whether same results could be obtained should the variables be subjected to a longitudinal study.

Conflict of Interests

The authors have not declared any conflict of interests.

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