SOCIOLOGICAL ANALYSIS OF FARMERS ATTITUDE TOWARDS AGRICULTURAL INNOVATIONS AND ITS INFLUENCE ON SUGARCANE PRODUCTIVITY

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Original Article

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Abstract

The foremost aim of the current research was to investigate whether attitudinal factors towards modern agricultural technologies have a positive impact on productivity or not. The study was designed and carried out in the Central Valley of Khyber Pakhtunkhwa, Pakistan, with a sample size of 384 farmers chosen using a multistage random sampling technique. The data were collected using an interview schedule and evaluated into bi-variate and multivariate results, while chi-square test and Kendall's Tau-c statistics were used to determine the relationship between attitudes toward agricultural innovation and sugarcane productivity. At the multivariate level, the association was checked between variables while controlling the family socioeconomic status of the respondents. Findings of the study revealed that the sugarcane productivity decreased when the farmers use old traditional means of farming, do not take the risk of new technologies and other inputs, the influence and opinion lead inside the communities do not make the favorable attitude of the farmers towards innovations, and or due to illiteracy and lack of knowledge they cannot operate modern technology on their fields. Through educating, imparting technical skills, and through influential community leaders, the favorable attitude of farmers towards innovative agricultural technologies can be formed which can solve the solution of food crises in the country.

Keywords: Attitude, Agricultural innovations, Sugarcane productivity, Socio-economic Status, Farmers

Introduction

With the changing climatic conditions, there is a need to adopt improved agriculture technologies (Matata et al., 2010), because it has introduced uncertainties to the livelihoods of farming communities (Al-Hassan and Poulton, 2009; Athula and Scarborough, 2011). It is becoming a serious threat to the world through the rise in temperature, frequent droughts, reduced precipitations, and water scarcity (Adger et al., 2003; IPCC, 2007). That is why farmers are modifying their agricultural practices to cope with the changing environmental and climatic conditions. The traditional farming methods are not enough to tackle these issues (FAO, 2010). So, modern technological innovations are required to confront the problems of climate change (Clements et al., 2011). There are certain factors responsible for adopting or rejecting these innovations such as personal, cultural, social, and economic factors (Pannell et al., 2006, Adesina and Zinnah, 1993), risk, complexity, and investment

(Batz et al, 1999), geography (Rogers, 2003; Diamond, 1999), farmers' values, motivations, and objectives (Rehman et al., 2007) and age, education, and literacy levels (Feder and Slade, 1984). Adaption to changing circumstances is the key to survival, however, such adaption is not uniform as conspicuous from the attitude of farmers towards innovations.

Agricultural production depends on the input used by the farmers. In modern societies, there are a lot of inventions and innovations have been taking place in the agriculture sector. Farmers usually make choices among these innovations according to their social and geographical contexts. Mostly there are certainly personal, cultural, and attitudinal factors that are responsible for the acceptance or rejection of these agricultural innovations as explained by the innovation of diffusion theory. In a society where social structure is conducive to manipulating such attitudinal factors, the innovations diffused there easily which affectsagricultural production positively.

Innovation adoption-related decisions are made by individuals or communities in three distinct ways termed as optional decisions, collective decisions, and authority decisions. to reach such decisions, a whole set of background processes is active in attitude formation that is exhibited in decision-making behavior. Collective and authority decisions are framed by someone outside and implemented by individuals. But the social scientists have found connected links between the external influences that shape a favorable or unfavorable attitude towards some very private and optional decisions. The attitudinal factors domain, because of its significance in the current study, is limited to the variable of attitude towards agricultural innovations and discussed in this section.

Agricultural scientists are deploying high inputs and efforts to develop favorable technologies that are high yielding, socially acceptable, and environment friendly. The development of such technologies is one aspect of agricultural development. However, the development of a favorable attitude towards these technologies and their adoption by farming communities require the understanding of technologies adoption-related human behavior.

It is safe to conclude that a positive attitude formation towards agricultural innovation is rooted in the sound knowledge of innovation, the risk-taking behavior of the farmers, and the positive outlook of the opinion leaders in a farming community. A combination of sound sources of information and elevated socioeconomic status encourages the farmers to form a favorable attitude toward innovation for its adoption. The opinion leaders facilitate this process of adoption. Conversely, isolated farmers depend on their traditional knowledge and skills due to their non-exposure to communication channels and are reluctant to take the risk due to their low socioeconomic and literacy status. When such farmers are exposed to conflicting messages from opinion leaders about innovation, they are stuck into the paddies with insufficient skills and technologies and resulting in their low agricultural production as a whole.

Literature review

Perviaz et al. (2013) investigated the usage of novel agricultural technology in Khyber Pakhtunkhwa province of Pakistan. They discovered that the majority of farmers were uneducated, impoverished, and used conventional farming methods of cultivation, with extension workers playing a marginal role in the spread and acceptance of new technology. However, Ahmad et al. (2012) found that agricultural producers in the Sargodha and Jhang areas of Pakistan do not often rely on their information. The extension agents performed their jobs while providing information on modern agricultural methods and recommended doses of inputs to the farmers due to which they increased their per acre productivity.

According to Reza (2016), the main reasons for low productivity and profitability among Bangladeshi farmers include outdated and antiquated production technology and procedures, poor seed quality, and inefficient labour.

Adil et al. (2014) revealed that better management practices like better quality of inputs, machinery, water, fertilizer etc. significantly affect agricultural productivity. Abbas et al. (2003) observed that the farming communities in Toba Take Singh, Pakistan adopted modern inputs for agricultural production. They adopted new varieties, improved fertilizers, sowing methods, irrigation methods, and eradication of weeds etc. which increased their productivity compared to other areas. The development of improved agricultural inputs and trained human resources have contributed largely to agriculture production (MoF, 2016).

Understanding and adoption of new agricultural technologies within rural communities can best be diffused through social networks of influential members who can better promote the adoption of such technologies (Barahona and Pentland, 2007). By selecting influential members as the injection points of new information into community social networks, faster-paced diffusion can be achieved (Aral, Muchnik, & Sundararajan, 2013). Influential members are connected in a cluster with each other which can work as prime targets as entry points for increasing adoption rates of innovations and reaching thresholds of mass adoption (Aral and Walker, 2012). Farmers belong to a social group that enhances social capital allowing trust, information exchange, and ideas through influential members (Mignouna et al., 2011) where they learn the use and benefits of new technology.

Muhammad et al. (2001) stated that in Pakistan more than 60 percent of the farmers rely on their skills and cultivate crops on traditional methods and don't know the recommended seed weights which is the main reason for decreasing agricultural productivity. A vast majority of of the population rely on agriculture for their food, income. However, in many poor countries, farmers cannot adopt modern technologies due to financial constraints that's why they face food shortages (Yesuf&Kohlin, 2008).

Perviaz et al. (2013) revealed that the majority of the farmers in Khyber Pakhtunkhwa Pakistan were poor, illiterate, consisted of small sizes of landholding, and rely on their traditional methods of farming. Extension workers did not play their role in diffusion, education, and adoption of modern technologies due to which the per acre yield of crops was decreasing. That's why the government needs to assist new technologies to these farmers to increase their productivity (Khan, 2012).

The influence of family, peers and trusted advisors are very commonly noted in various studies. Numerous studies found that the opinion of family, friends, peers and trusted advisors were highly influential on farmers' decision-making behavior. Bell et al. (2016) studied the influence of such social pressure on the pest management decision-making in Cambodia and found that social pressure had a significant role in the attitude and behavior formation of the farmers. Similarly, Martínez-García et al. (2013) in a Mexican study found that social pressure from fathers on dairy farmers were found to be the main factor in the adaptation of improved grassland management techniques. Similar results were found by Kauppinen et al. (2013) in Finland where social pressure has a significant role in the decision-making of the farmers regarding animal welfare. Mills et al. (2017) found that social pressure influenced farmers' willingness to engage in pro-environmental management in the UK, Dijk et al. (2015) found bird management in the Netherlands, and Borges et al. (2016), Meijer et al. (2016), and Prager and Curfs (2016) found improved grassland management

among small cattle farmers in Brazil, Malawi, and Spain, respectively. Kuhfuss et al. (2016) conducted an intriguing research of winegrowers in France and discovered that farmers would be more ready to join a management scheme if they anticipated that a large number of their peers would do the same.

Nazir et al. (2013) stated that in Pakistan most of the farmers are traditionalists. They cultivate crops through the methods that are transferred to them from their ancestors. Farmers fallow to their traditional farming system and do not want to change it because of the norms to which they stick. Such methods are expensive and unproductive which leads to a decrease in agricultural productivity. In this regard education of the farmers can play a better role in changing their minds from traditional farming to modern one by adopting new technologies. Education of the farmers increases their ability to obtain and use the information regarding new agriculturetechnology (Namara et al., 2013; Lavison, 2013). For example, Okunlola et al. (2011) observed that the level of education had a positive and substantial impact on the adoption of new technology by fish farmers, while Ajewole (2010) discovered that the level of education had a positive and significant influence on the adoption of organic fertilisers. Higher education has an impact on respondents' attitudes and thinking, making them more open, reasonable, and capable of analysing the benefits of new technologies (Waller et al., 1998).

Research Methodology

Study design

The study was carried out under the cross-sectional design method, as it gives a comprehensive picture of the problem at a particular time (Babie, 1989).

Universe of the study

The study was conducted in Mardan and Charsadda districts of the Central Valley of Khyber Pakhtunkhwa, Pakistan.

Sampling procedure and sample size

Respondents were chosen using a multistage random sampling approach. The overall population of the study universe (12 chosen Union Councils) was 3720 farmers, as determined by a pilot survey conducted by the researcher. The sample size was calculated using the formula presented by Chaudhry (2009), as shown below.

$$n = \frac{N\hat{p}\hat{q}Z^2}{\hat{p}\hat{q}Z^2+Ne^2-e^2} \quad \text{..... Equation-1}$$

Based on the aforementioned formula, 384 farmers were required as a sample size. Using the formula presented by, the resulting sample size was proportionately assigned to each Union Council (Bowly, 1926).

$$ni = n.Ni/N \quad \text{..... Equation-2}$$

Nature of the respondents

Those respondents were included in the study who was farmers, living in Mardan & Charsadda, and mentally sound to respond to questions.

Tool of data collection

The data were collected with the help of interview schedule covering all aspects of the study. Further, to avoid any double-barred and any difficulty, the tool was pre-tested to know its validity and reliability (Kothari, 2004).

Table 1: Conceptual framework of the study

Background Variable	Independent Variable	Dependent Variable
Socio-economic status of the farmers	Attitude towards agricultural innovations	Sugarcane productivity

Indexation & Reliability analysis

Cronbach's alpha test was used to assess the research scale's reliability. The test findings suggest that both variables; attitude toward agricultural innovations (independent) & sugarcane productivity (dependent), were more than 0.6 as shown in Table.2, and met the indexation conditions.

Table 2: Results of Reliability Analysis

Variables	Cronbach's alpha
Attitude towards agricultural innovations	.70
Sugarcane productivity	.87

Data analysis

Using SPSS, the data were analsed into) in bi-variate and multi-variate results, as shown below.

Bi-variate analysis

The relationship between independent and dependent variables was investigated using bivariate analysis. As indicated by Tai (1978), sugarcane productivity was divided into three categories (below average, average & above average) and cross-tabulated with the independent variable (attitude toward agricultural innovation).

$$\mathbf{x^2} = \sum_{\mathbf{i=1}}^{\mathbf{r}} \cdot \sum_{\mathbf{j=1}}^{\mathbf{c}} \cdot \frac{(\mathbf{Oij} - \mathbf{eij})^2}{\mathbf{eij}}$$

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Multivariate analysis by contingency tables

Multivariate analysis was done to see if the control factors could explain the variance in sugarcane productivity produced by the independent variable. The independent variable (attitude toward agricultural innovation) was indexed and cross-tabulated at the multivariate level with dependent variable (sugarcane productivity) while controlling respondents' family socioeconomic status. The Chi-Square/exact Fisher's test was used to check whether variation in study variables is impacted by control factors or not, and the Kendall tau-c (T^c) test was used to analyse whether variation in study variables is affected by control variables or not.

Kendall $T^c = \frac{2\,(n_c - n_d)}{n^2 \frac{(m-1)}{m}}$ ……..Equation-4

Limitations of the study

This research study was commenced within the following limitations:

- Due to cultural restrictions, it was not possible to directly contact women and to collect the required data from them. However, to overcome this problem, the most senior and oldest women were contacted on behalf of other women.

- Most of the farmers did not keep the exact record of expenditures and income of crops which created problems.
- Some farmers refused to participate in the survey as they thought that the researcher was collecting data to impose a tax on the farmers.

Results and discussions

Associationbetween attitude towards agricultural innovations and sugarcane productivity

Results in table 3 show that for all those farmers that rely on their information for agricultural production, 21.4% earned above-average net income from the sale of sugarcane production compared to 76.2% of those who did not rely only on their information for sugarcane production and 42.1% of those who were uncertain. Limiting to own level of information for sugarcane production and not consulting sources of modern agricultural information, significantly decreased the sugarcane production (p=0.000; T^c= -0.188). Similarly, of all those farmers who did not take the risk by trying new agricultural inputs, 21.7% earned above-average net income from the sale of sugarcane production compared to 47% of those who took a risk by adopting innovative inputs and 23% of those who were not certain to it. Reluctance to take the risk to adopt innovative technologies like good quality seeds and fertilizers led to a significant decrease in sugarcane production among farmers as visible from the highly significant and negative association (p=0.000; T^c= -0.142). Some eminent models on the diffusion of agricultural technologies have devised a stepwise procedure in the formation of a favorable or unfavorable innovation-related attitude. Therefore, Roger (2003) proposed that knowledge is the first stage in the diffusion of innovation, as the farmers are first informed of the existence of innovation. Those farmers who are illiterate and have low connectivity with the communicative network rely on conventional agricultural practices as they do not know about the agricultural technologies, which resultsin their low sugarcanel productivity. A well-informed farmer, generally from a high socioeconomic group in terms of literacy, income, and landholding, is in a better position to access innovative technologies related knowledge. Thus, the knowledge of innovation helps the farmers to develop a favorable or unfavorable tendency towards innovation. However, mere information of innovation is not sufficient to make the decision. The farmer first has to make a mental comparison of socioeconomic cost and benefits of innovation, the ease of its use, its compatibility to the cultural norms, its tribality on a limited scale, and observability of results to take a risk for the adoption of technology. Furthermore, the risk-taking tendencies of the farmers once again depend upon their economic soundness, educational level, and social status, as poor illiterate farmers are reluctant to take the risk by adopting innovative technologies to which they are uncertain. Therefore, only those farmers that are well-informed and eager to adopt new technologies, show promising results in terms of their enhanced agricultural production. Singh et al. (2011) and Saadi et al. (2008) also agreed that farmers isolated from the rest of the communities exhibited low agricultural production due to limited knowledge with respect to innovative technologies, agricultural inputs, and practices etc. Thus, the local and personally acceptable inputs technologies and knowledge related to agriculture are the main sources of agricultural production for such farmers (Hassan, 2000). Perviaz et al. (2013) analyzed the characteristics of the farmers that were reluctant to adopt modern technologies. Such farmers, according to the authors, were low literate, less cosmopolitan, out of communication channels with low socioeconomic standings. Ahmad et al. (2012) added that it is very difficult for a change agent, like extension workers, to motivate these reluctant farmers towards positive favorable change. According to Habib et al., (2014) the literacy level, the economic status, and the information level of the farmers are fundamental for farmers to make rational judgments for adoption or rejection of innovation, as it enables the farmers to make a rational choice and take the risk associated with the adoption of innovative technologies (Reza, 2016). According to Nazir et al.

(2013), the high cost of modern agricultural technologies is a significant barrier that is difficult for poor farmers to overcome. However, an observable difference in agricultural production due to the adoption of modern technologies provides farmers with the confidence to opt for a technological change (Adil et al., 2014; Abbas et al., 2003; MoF, 2016).

Furthermore, for all those farmers whose opinion leaders did not promote change, 23.2% earned above-average net income from the sale of sugarcane production compared to 37.7% of those whose opinion leaders promoted a change in agricultural technologies and 17.9% of those who were uncertain. Opinion leaders not favoring agricultural technological improvement at the village level was a likely source of low sugarcane production as shown by the significant and negative association (p=0.022; T^c= -0.061). Moreover, for all those farmers, perceiving possession of sufficient skills of farming, 39.8% earned above-average net income from the sale of sugarcane production compared to 17.4% of those who considered themselves lacking sufficient skills of farming and 18.6% of those who were uncertain. A satisfactory level of farming skills enhanced the sugarcane production as viewed from highly significant and positive association (p=0.000; T^c= 0.157). The attitude formation process in favor or disfavor of innovation is also influenced by some important role players within a village termed as opinion leaders. The opinion leaders are the people that, because of their technical knowledge, skills and achievements are consulted by the majority of farmers for advice. When a community is favoring a change, the opinion leaders are not only responsive to innovative technologies but also favor their adoption by the other farmers. Conversely, in a resistance to change community, the opinion leaders resist any change that is in favor of technological advancement. Furthermore, the adoption of innovative technologies is also linked to the desire of the farmers to enhance their agricultural-related skills for which, once again, they consult the opinion leaders. Thus, opinion leaders are the informal group of persons that lead and shape the opinion of their followers in favor or disfavor of the adoption of agricultural technologies. The motivation of such opinion leaders in favor of the adoption of agricultural technologies simplify the diffusion process as it becomes easy for extension agents to focus their efforts on opinion leaders and use them as mobilizers for change (Barahona and Pentland, 2007) or speed up the diffusion process (Aral, Muchnik, & Sundararajan, 2013; Centola & Macy, 2007; Valente, 1995; Valente & Davis, 1999). These opinion leaders catalyze organized efforts and promote mass adoption (Valente and Davis, 1999; Aral and Walker, 2012; Mignouna et al., 2011). The opinion leaders, being Hemophilus to the farming community and regularly interacting with their clients are a source of bringing positive knowledge and skill related change among the most reluctant farmers of the country (Muhammad et al., 2001) and therefore, an important source of improved agricultural production in traditional societies (IRIN, 2013; Yesuf & Kohlin, 2008; Perviaz et al., 2013). Khan (2012) further added that the opinion leaders prove a successful source of bringing positive social change when the external agents failed to bring improvement in knowledge and skills of the farmers.

Conversely, the association between the non-acquisition of modern knowledge because of its complexity and sugarcane productivity was found non-significant (p=0.728; T^c= 0.013). A similar non-significant association was found between sugarcane productivity and the influence of family members, friends, and trusted advisors in the decision-making process in the adoption of modern agricultural inputs (p=0.734; T^c= 0.032). Likewise, the association between the restriction imposed by village norms on the adoption of modern agricultural technologies and sugarcane productivity was found non-significant (p=0.224; T^c= 0.037). Characteristics of innovation in terms of simplicity or complexity of their application is an adding factor to form a positive or negative attitude toward innovation. Simple production technology is more readily adopted than a complex one. In addition to the characteristics of innovation, the prevailing family and societal norms, favoring or disfavoring are additional factors in the attitude formation of an innovation. In the current study, these aspects of

innovation and society are non-significant in attitude formation that favor the adoption of agricultural technologies and enhance sugarcane production. These results, however, are in contrast to the findings of Gilbert (1990) who found a consistent decrease in agricultural production with every unit increase in complexity in agricultural technologies. Thus, all those machinery that was different to understand and operate were refused by the farmers and were found inefficient to enhance agricultural production (Pervaiz et al., 2013; Khan et al., 2012). The fear of uncertainties associated with innovative technologies is high in traditional low-literate families that retard the diffusion of innovation (Bell et al., 2016; Martínez-García et al., 2013; Kauppinen et al, 2013; Mills et al; 2017). Furthermore, whatsoever the efficiency level of the innovative technology is touching, if it is contrary to the dominant culture or against the religious norms of a society, the technology is rejected without the fear of compromise that the community makes in terms of production loss (Mignouna et al., 2011; Lavison 2013; Namara et al., 2013; Okunlola et al., 2011; Ajewole, 2010; Borges et al., 2016; Meijer et al., 2016; Prager and Curfs, 2016).

Table 3: Association between attitude towards agricultural innovations and sugarcane productivity of the respondents

Attributes	**Attitude**	**Sugarcane productivity (in terms of net income)**				**Statistics x^2 (P-Value) T[c]**
		Above-average net income	**Average net income**	**Below average net income**	**Total**	
Farmers rely on their own information for agricultural production	Yes	69 (21.4)	129 (39.9)	125 (38.7)	323 (100)	x^2 =58.046 (0.000) T[c]=-0.188
	No	32 (76.2)	8 (19)	2 (4.8)	42 (100)	
	Uncertain	8 (42.1)	6 (31.6)	5 (26.3)	19 (100)	
Farmers do not take risk to try new inputs (seeds, fertilizers etc)	Yes	56 (21.7)	102 (39.5)	100 (38.8)	258 (100)	x^2 =24.735 (0.000) T[c]=-0.142
	No	47 (47)	28 (28)	25 (25)	100 (100)	
	Uncertain	6 (23.1)	13 (50)	7 (26.9)	26 (100)	
The opinion leaders inside village don't promote change	Yes	45 (23.2)	76 (39.2)	73 (37.6)	194 (100)	x^2 =11.460 (0.022) T[c]=-0.061
	No	57 (37.7)	51 (33.8)	43 (28.5)	151 (100)	
	Uncertain	7 (17.9)	16 (40)	16 (41)	39 (100)	
Farmer's perceptions that they possess sufficient skills of farming	Yes	74 (39.8)	58 (31.2)	54 (29)	186 (100)	x^2 =23.594 (0.000) T[c]=0.157
	No	27 (17.4)	65 (41.9)	63 (40.6)	155 (100)	
	Uncertain	8 (18.6)	20 (46.5)	15 (34.9)	43 (100)	
Modern technical knowledge is highly complex to acquire	Yes	67 (30.5)	76 (34.5)	77 (35)	220 (100)	x^2 =2.040 (0.728) T[c]=0.013
	No	31 (24.8)	52 (41.6)	42 (33.6)	125 (100)	
	Uncertain	11 (28.2)	15 (38.5)	13 (33.3)	39 (100)	
Opinion of family, friends and trusted advisors are influential in farmers decision making process	Yes	90 (28.8)	120 (38.3)	103 (32.9)	313 (100)	x^2 =2.008 (0.734) T[c]=0.032
	No	14 (28.6)	15 (30.6)	20 (40.8)	49 (100)	
	Uncertain	5 (22.7)	8 (36.4)	9 (40.9)	22 (100)	
Village norms restrict adoption of modern technology	Yes	57 (27.3)	88 (42.1)	64 (30.6)	209 (100)	x^2 =5.680 (0.224) T[c]=0.037
	No	47 (30.1)	50 (32.1)	59 (37.8)	156 (100)	
	Uncertain	5 (26.3)	5 (26.3)	9 (47.4)	19 (100)	

(Percentages are given in parenthesis)

Multivariate analysis

Association between attitude towards agricultural innovations and sugarcane productivity (controlling the socioeconomic status of the respondents)

Results in table 4 show that for high socio-economic status respondents who had a highly positive attitude towards agricultural innovations, 54.8% of them earned above-average net income from the sale of sugarcane products as compared to 45.8% of those who had a low positive attitude and 19% that were indifferent in attitude towards agricultural innovations. Similarly, from middle socioeconomic status respondents who had a highly positive attitude towards agricultural innovations, 30.1% earned above-average net income from the sale of sugarcane products as compared to 17.8% of those who had a low positive attitude and 16.7% who were indifferent in attitude towards agricultural innovations. Moreover, from low socio-economic status respondents who had a highly positive attitude towards agricultural innovations, 25% earned above-average net income from the slae of sugarcane products compared to 27.8% of those who had a low positive attitude and 21.7% who were indifferent in attitude towards agricultural innovations. For the high socio-economic group, the relationship between attitude toward agricultural innovations and net income from the sale pf sugarcane production was found to be significant and Positive (p=0.014; T^c= 0.286). For the medium socioeconomic group, the relationship between these factors was extremely positive (T^c= 0.277) & significant (P=0.000). however, for the low socioeconomic level group, the association of the aforementioned factors were non-significant (P=0.450) but positive (T^c= 0.136). For all three socio-economic categories, the degree of significance and Tc for the full table demonstrate a very significant and positive (P=0.000 & T^c= 0.246) relationship between attitude toward agricultural innovations and sugarcane productivity. The variation in chi-square & Kendal T^c significant values for the three socio-economic groups suggested that the relationship between attitude toward agricultural innovations and sugarcane productivity is spurious, regardless of the respondents' socio-economic level. Because of their positive attitude toward agricultural advances, middle and high socioeconomic level group respondents had a minor advantage over low socioeconomic status group respondents in sugarcane output and earnings. Attitude formation towards any sort of agricultural innovation is a gradual process starting from the knowledge of an innovation to reaching an innate motivational level in favor or disfavor of such innovation. Moreover, the attitude formation process is facilitated or retarded by the role played by opinion leaders and change agents. It is a common observation that literate, and well-off farmers are better exposed to communication messages related to innovation. Such high socioeconomic status farmers are more resistant to shocks in case of failure of innovative technologies adopted by them. Moreover, they can easily overcome the cultural constraints that resist a positive change in agricultural innovation. A combination of these characteristics was found in farmers from high and moderate socioeconomic status groups in the study area that positively influenced their sugarcane production. Conversely, the low socioeconomic status farmers were unable to develop a favorable attitude towards an innovation due to their low literacy level, poor economic standing, and high attachment with cultural norms and values that resist adoption of agricultural technologies with an obvious outcome in the shape of low sugarcane production and its subsequent income. Nmadu et al. (2015) found a strong correlation between the socioeconomic status of the farmers and their tendencies to adopt innovative agricultural technologies. Moreover, the authors reported the rapid diffusion of such technologies in high and middle socioeconomic status farmers than the low socioeconomic status farmers. Ezeano (2010) added that the low socioeconomic status farmer resisted the diffusion of innovative agricultural technologies due tothe low educational level and poor economic standing of the farmers. Lawal and Oluyole (2008) further added that low socioeconomic status farmers find it difficult to understand the relative advantage,

compatibility, and observability of results obtained from innovative technologies and are, therefore, almost always delayed in adopting innovative technologies that are their main source of reduced agricultural production (Zulu et al., 2019; Ahmad et al., 2012; Habib et al., 2014; Reza, 2016; Prager and Curfs, 2016).

Table 4: Association between attitude towards agricultural innovations and sugarcane productivity (controlling socio-economic status of the respondents)

Socio-economic status	Relationship with attitude towards agricultural innovation	Net Income				Statistics x^2 (P-Value) T^c=	Level of significance for the entire table
		Above-average net income	Average net income	Below average net income	Total		
High socioeconomic status	Highly positive attitude	23 (54.8)	13 (31)	6 (14.3)	42 (100)	x^2 =12.500 (0.014) T^c=0.286	x^2 =41.139 (0.000) T^c=0.246
	Low positive attitude	11 (45.8)	8 (33.3)	5 (20.8)	24 (100)		
	Indifferent attitude	4 (19)	6 (28.6)	11 (52.4)	21 (100)		
	Total	38 (43.7)	27 (31)	22 (25.3)	87 (100)		
Middle socioeconomic status	Highly positive attitude	34 (30.1)	60 (53.1)	19 (16.8)	113 (100)	x^2 =34.309 (0.000) T^c=0.277	
	Low positive attitude	13 (17.8)	21 (28.8)	39 53.4)	73 (100)		
	Indifferent attitude	7 (16.7)	12 (28.6)	23 (54.8)	42 (100)		
	Total	54 (23.7)	93 (40.8)	81 (35.5)	228 (100)		
Low socioeconomic status	Highly positive attitude	7 (25)	12 (42.9)	9 (32.1)	28 (100)	x^2 =3.684 (0.450) T^c=0.136	
	Low positive attitude	5 (27.8)	6 (33.3)	7 (38.9)	18 (100)		
	Indifferent attitude	5 (21.7)	5 (21.7)	13 (56.5)	23 (100)		
	Total	17 (24.6)	23 (33.3)	29 (42)	69 (100)		

Percentages are given in parenthesis

Conclusions and recommendations

The study portrayed that opinion leaders played a pivotal role in framing a favorable attitude towards agricultural innovation that has a vital role in sugarcane production. In communities where farmers were educated, had high socioeconomic status, and where opinion leaders played a significant role in forming significant attitudes towards the adoption of new technologies, the sugarcane productivity of these farmers was higher than those who were pessimistic, narrow-minded, and were reluctant to accept new changes in the field of agriculture. The study recommended that the extension workers-opinion leaders' ventures can further speedup the process of educating and creating awareness among farmers, especially the marginalized ones. Moreover, special training to the farmers in the use of modern communication technologies and bringing them into the farmers'

social networks through internet technologies can help bring a marginalized group of farmers into the loop of communication structure and help them to decide the adoption of innovation.

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