International Journal of Agricultural Research and Food Production
ISSN: 2536-7331 (Print): 2536-734x (Online)
Volume 6, Number 2, June 2021
http://www.casirmediapublishing.com

# FARMERS CONSTRAINTS TO QUALITY PROTEIN MAIZE (QPM) ADOPTION IN KADUNA STATE, NIGERIA.

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## ABSTRACT
The study analyzed farmers' constraints to Quality Protein Maize (QPM) adoption in Kaduna State, Nigeria. Multistage sampling technique was used in collecting primary data on 380 respondents from four Agricultural Zones using structured questionnaire through survey. Data collected were analyzed using descriptive and inferential statistics. The findings revealed that 67.63% were males with 81.84% married with an average household size of 8 people constituting 72.40%. Majority (63.40%) of the respondents were primarily farmers by occupation with 66.84% having a mean quality protein maize farming experience of 19 years cultivating a mean farm size of 2 hectares. About 60% acquired their farmland through inheritance and 79% attained one form of formal education or the other. The result also revealed that 98.95% and 92.38% of the respondents sourced labour from cooperative (Gaiya) and family respectively while 53.16% had access to credit facilities with 96.05% having accessed credit facilities from relatives. 92.63% had access to extension services and all (100.00%) were aware of quality protein maize and attested to obtaining information on quality protein maize from extension agents accounting for 59%. About 79% of the respondent confirmed being members of cooperative associations. Result of constraints faced by the respondents revealed that 81.84% of the respondents experienced constraints to Quality Protein Maize (QPM) adoption and the most severe constraints were high labour demand and unfavourable weather condition ($\bar{x}$ = 3.31) respectively, prevalence of pests and dieases ($\bar{x}$ = 3.14) and high inputs demand ($\bar{x}$ = 3.12). It was concluded that majority of the responded attested to facing constraints to the adoption of the QPM variety and the most severe constraints were high labour demand, unfavourable weather condition, prevalence of pests and dieases and non-availability of credit. The researchers recommended that farmers should be encouraged to organize themselves into viable cooperative associations, information on weather conditions should be made available to farmers and adoption of QPM should be encouraged among farmers given its' nutrition and economic values as the readily available and cheap alternative protein source compared to other sources.

**Keywords:** Quality Protein Maize, Adoption, KadunaState, Nigeria

## INTRODUCTION

The importance of protein for growth, maintenance and protection of the body need not be over emphasized. This is because both adequacy of protein quantity and quality in the diet are sure way to guarantee obtaining all the needed essential amino acids. Protein–energy malnutrition is widely present in developing countries such as Nigeria and might result in stunting and wasting if not averted. Studies (Ran *et al.* 2003; Stephenson *et al.* 2010; Omoyeni *et al.* 2015; Adegboge *et al.* 2016) revealed that in Nigeria, low-cost foods rich in good-quality protein are scant which makes it difficult to meet protein and amino acid requirements. To reduce malnutrition which can result in stunting and wasting among children and adult, the growing of quality protein maize (QPM) which produces 70% to 100% more lysine and tryptophan than ordinary modern and traditional varieties of tropical maize is of outmost importance (Liliane *et al.*, 2017). This can increase the protein content in maize to as high as 18% (close to double the quantity of protein in normal maize).

Quality protein maize (QPM) offers an equivalent of 90% of the nutritional value of skimmed milk, the standard for adequate nutrition value. It contains higher protein levels 14-15% as against 8% contained in the traditional maize varieties. Apart from that, it contains the average of 4.0g of lysine per 100g of protein, as against 2.96g of lysine per 100g of protein for normal maize. Tryptophan content also increased from 0.61g per 100g of protein for normal maize to 1.67g per 100g of protein in the QPM (Okolo, 2012; Kehinde *et al.* 2012). This is because millions of people in the world particularly in developing countries of Sub-Saharan Africa derive part of their protein and daily calorie requirements from maize. Traditionally in Nigeria, the crop was mostly grown in forest ecology but large scale production has moved to the savanna zone, especially the Northern Guinea Savanna, where yield potential is much higher (Mbuya *et al.* 2011). However, there has been lack of awareness particularly among smallholder farmers on nutritional value of the quality protein maize, which has long affected the

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livelihoods of smallholder farmers in Africa and Nigeria in particular. It is hoped that this constraint could be overcome through increased farmer awareness which will increase adoption and hence production of quality protein maize. It is against the above background that this study sought to analyze farmers' constraint to adoption of Quality Protein Maize (QPM) in Kaduna State, Nigeria.

## RESEARCH QUESTIONS

i. What are socio-economic characteristics of the Quality Protein Maize farmers in the study area?
ii. What are the farmers' sources of information on Quality Protein Maize?
iii. Do the farmers experience constraints when adopting Quality Protein Maize?
iv. How severe are these constraints to adopting Quality Protein Maize?

## OBJECTIVES OF THE STUDY

The main objectives of the study is to analyze farmers' constraints to adoption of Quality Protein Maize in Kaduna State, Nigeria with the following specific objectives:

i. to identify the socio-economic characteristics of the Quality Protein Maize farmers in the study area
ii. to examine the respondents' sources of information on Quality Protein Maize farmers in the study area
iii. to identify the respondents' constraints to adoption of Quality Protein Maize and
iv. to assess the severity of constraints experience by Quality Protein Maize farmers in the study area

## LITERATURE REVIEW

Millions of people in the world, and particularly in developing countries, derive a part of their protein and daily calorie requirements from maize

(Mbuya *et al.*, 2011). The crop is an important component of livestock feed, especially in developed nations where 78% of total maize production is used for livestock feed (Sofi *et al.*, 2009). In Africa, as reported by Krivannek *et al.* (2007), maize supplies at least one fifth of total daily calories and accounts for 17% to 60% of the total protein supply per day of individuals who are more susceptible to risk of protein or essential amino acid deficiencies. Unfortunately, maize (corn) has two significant flaws; it lacks the full range of amino acids, namely lysine and tryptophan, needed to produce proteins, and has its niacin (Vitamin B3) bound in an indigestible complex (Kpotor, 2012). In addition, diets high in corn produce a condition known as wet-malnutrition in which a person receives sufficient calories, but the body malfunctions due to lack of protein. This chronic lack of protein in the diet leads to kwashiorkor according to Wafula (2015).

Quality Protein Maize (QPM) was developed by Dr. Surinder Vasal and Dr. Evangelina Villegas at the International Maize and Wheat Improvement Center (CIMMYT) in the late 1990s (Nuss and Tanumihardjo, 2011). QPM contains nearly twice as much usable protein as other maize (or corn) grown in the tropics and yields 10 percent more grain than traditional varieties of maize. While its lysine and tryptophan levels were better than those of conventional maize, opaque-2 had lower yields and a soft, chalky kernel, which made it more susceptible to ear rot and insect damage. The taste and kernel appearance dissatisfied consumers, who ultimately rejected the enhanced-protein varieties in the market (Ubani, 2011). However, the lower yields of QPM versus non-QPM varieties, as well as the susceptibility of QPM varieties to stresses, such as ear rot, resulting in less tryptophan and lysine produced per unit area of land have been the focus of researchers over a number of years. Nowadays, despite the nutritional differences, some QPM varieties are as productive as non-QPM and sometimes it is difficult to visually distinguish between the two types of maize by the physical appearance of the plants or the ears (Liliane *et al.*, 2017). To reduce malnutrition, protein content in maize can be increased to as high as 18%

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(close to double the quantity of protein in normal maize) by increasing the prolamine (zein) fraction in the maize endosperm or cultivate Quality Protein Maize which produces 70% to 100%more lysine and tryptophan than ordinary modern and traditional varieties of tropical maize (Liliane *et al.*, 2017). Additionally, nutritional evaluation of QPM in various locations has proved the stability of lysine and tryptophan content within the prescribed range for QPM, in spite of quite diverse types of environmental conditions (Zaidi *et al.*, 2008).

## Theoretical Framework

There has been an assumption by the innovation diffusion model as posited by Mustafa and Al-Mothana (2013) that technically and culturally the technology is suitable, the problem associated with its adoption is one of information asymmetry and very high cost in terms of information search. The second paradigm on the other hand suggests that the perceived attributes of the technology and attitude of the farmers directly influence farmers' decision to adopt a new technology. This means that, farmers may have full information on their farm household and may still by themselves evaluate the technology differently by themselves compared to scientist Daloglu *et al.* (2014). Thus, how farmers perceive a given technology must be understood in the generation and diffusion of new technology and farm household information dissemination. The economic constraint model, such as access to credit, land, labour or other critical inputs limits production flexibility and conditions of the technology and adoption decisions relative to input fixity in the short run (Leopold, 2010). The use of these paradigms in modeling technology adoption improves the explanatory power of the model in relation to individual paradigm (Dawit *et al.*, 2010).

Reportedly, Mwangi and Kariuki (2015) opined that increasing agricultural productivity using improved agricultural technologies that enhances sustainable food and fiber production is critical for sustainable food security and economic development. Furthermore, Simtowe *et al.*, (2011) asserted

that in most developing countries, agricultural innovations are perceived as significant pathways out of poverty and therefore, according to Mignouna *et al.* (2011), new improved agricultural innovation/technology adoption has become an important way of boosting productivity. A new technology is assumed to offer a pathway to substantially boost production and income. Therefore, agricultural technology adoption study has many policy implications in agricultural development (Beshir and Wegary, 2014; Mignounu *et al.,* 2011). It serves as a tool for evaluating the distributional impacts of new innovations, for documenting the impact of an innovation or extension effort, for identifying and reducing the constraints to adoption, and as a research guide to focusing innovation priority (Mignounu *et al.*, 2011).

In Nigeria particularly, irrespective of gender, farmers are often faced with the constraint of inadequate modern extension information needed for their day to day farming activities. This invariably is traceable to the inadequate extension – farmer ratio experienced in the nation as reported by Haruna and Abdullahi (2013). Reportedly, Sisay *et al.* (2015); Ugwumba and Okechukwu (2014) found that the number of extension contacts has a positive association with IMVs adoption in South-Western Ethiopia, Nigeria and Central Tanzania respectively, and improved cassava (Ojo and Ogunyemi, 2014) in Nigeria. Extension service is an important source of technical information for farmers for increase adoption as well as access to credit and membership of a farmers' group/association increase access to information on improved technologies (Oluwande and Mathenge, 2012). In related studies, the paucity of funds and lack of credit access have been shown to constrain the adoption of improved technologies (Gyinadu *et al.*, 2015; Onumadu and Osahon 2014; Ogada *et al.,* 2014). According to Mamudu *et al.* (2012), the factors influencing the adoption of modern agricultural production technologies are broadly categorized into economic, social and institutional factors. The literature on factors associated with new technology adoption has three broad themes namely;

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characteristics of individuals/groups making adoption decisions; economic forces affecting the production decisions and the performance of the technology under local condition (Makarau, 2012). Various research findings carried out by many scholars has relate farmers' adoption of agricultural innovations and related practices to relevant farm, household, institutional and technology specific factors. Socio-economic characteristics of farmers and institutional factors such as gender, age, education of household head, family size, farm size, land tenure, membership of association, income level, cosmopoliteness, social status, credit constraints, availability of information and availability of extension services affect the adoption of innovations by farmers (Sale *et al.*, 2015 and Akinnabgbe and Olaolu, 2015). In Nigeria, it is believed that because the family/village structure in which the household head acts as both the legal and political spoke person on all matters, his decision often influences others to either adopt or reject an agricultural innovation (Idrisa *et al.*, 2012). Makarau (2013) reported that some factors that can affect the adoption of technology/innovation include: cost of the technology, visibility, complexity, divisibility, compatibility, utility, group action, the educational level of farmers, risk and uncertainty, conflicting information, loss of flexibility and physical and social infrastructure (farming subculture).

## METHODOLOGY

### The Study Area

The study was conducted in Kaduna State, Nigeria located between latitudes 9° 00′ and 11° 32′ North of the Equator and longitudes 6° 05′ and 8° 38′ East of the Greenwich Meridian. Kaduna State experiences a tropical continental climate with two distinct seasonal climates characterized by constant dry and rainy seasons. The average annual rainfall and humidity are 1,272.5 mm and 56.64%; respectively while minimum and maximum temperatures are 15.1$^0$ and 35.18$^0$ Celsius. Kaduna State projected population is 8,446,417 with a land mass of 48,473.2 Km$^2$ (NPC, 2006) with about 80% of the population engaged in peasant farming for food crops that includes

cowpeas, guinea corn, millet, yam, cocoyam and cash crops: ginger, cotton, tobacco, groundnut and soybeans. The state shares common borders with Zamfara, Katsina, Niger, Kano, Bauchi, Nasarawa, Plateau States, and the Federal Capital Territory (Figure 1).

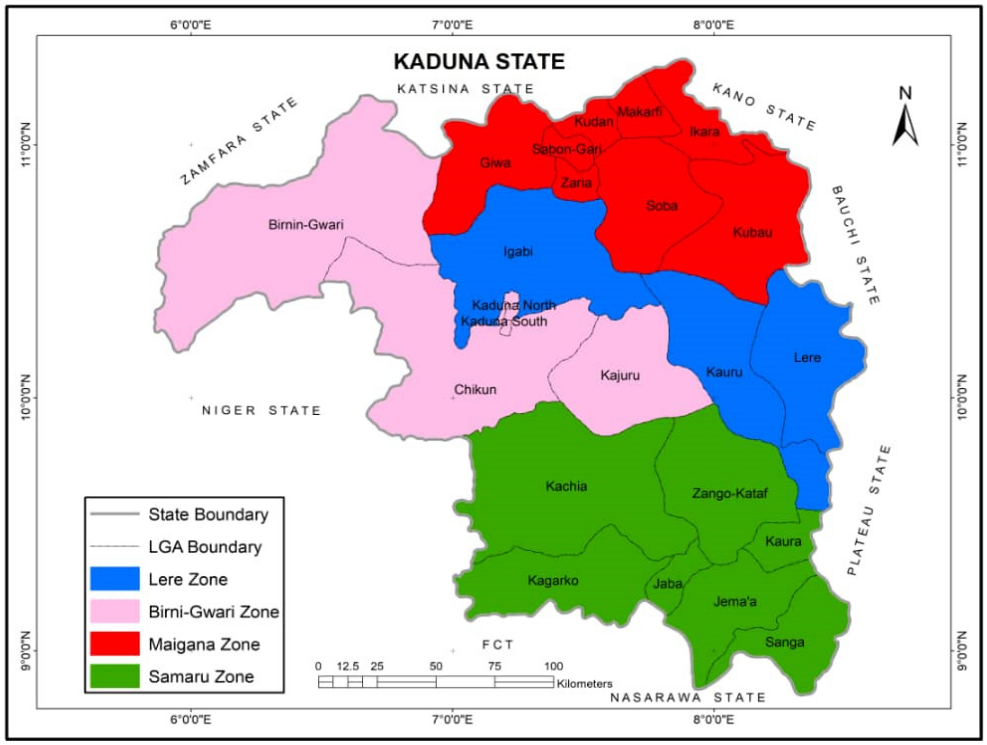


Figure 1: Map of Kaduna State showing the four agricultural zones. Source: Kaduna State Ministry of Land and Survey (KMLS, 2019)

## Method of Data Collection

Data for the study was generated from primary and secondary sources. The primary source was quantitatively driven through questionnaire administered to randomly and purposively selected QPM farmers with the help of village extension agents of the Kaduna State Agricultural Development Programme (KADP).

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## Sampling Technique and Sample Size

Multi-stage random sampling technique was employed to select respondents (QPM farmers). Four (4) Extension blocks were purposively selected from the Fourty (40) Extension blocks in the first stage based on the concentration of farmers who cultivate QPM varieties from the four Agricultural Development Agency in Kaduna State. In the second stage, Forty-three (43) cells were randomly selected from the two hundred and eighteen (218) cells in the four agricultural zones proportionately (representing 20% of cells in QPM producing extension blocks in the four agricultural zones). The respondents were selected at 14 percent from the sampling frame of those communities to get effective representation of the total population. The sampling frame was the list of QPM farmers compiled during the reconnaissance survey (Table 1). A total sample size of 380 QPM respondents were selected randomly from a sample frame of 2712 registered QPM farmers in the selected communities in the third stage to elicit farm level data for the analysis.

## Method of Data Analysis

The analytical tools employed for data analysis to achieve the objective of the study was descriptive statistics such as frequencies, percentages, means and likert type scale.

# RESULTS AND DISCUSSION

## Respondents' Socio-economic Characteristics

Table 1 summarizes some of the socio-economic characteristics of the quality protein maize farmers. The results showed that quality protein maize production was dominated by male producers constituting 67.63% and 58.16% of the respondent aged above 40 years with a mean age of 41 years indicating that the farmers were still active and dynamic enough to undertake farming. Their relative middle age goes to show that the respondents have the energy to cope with the rigors of QPM production and also willingness to experiment with newly introduced production practices.

The implication of the finding is that marital status determines household size since married farmers tend to have a larger household size and hence, the availability of family labour which constitute the cheapest form of labour in most rural areas of Nigeria. This finding supported the findings of Manza *et al.* (2015) who reported a mean household size of 8 persons per household for maize farmers in Zango-Kataf Local Government Area of Kaduna State. The findings imply that additional labour would be needed to work on the farm especially where the farm size is large hence a measure of labour availability. So also, household size determines adoption process because larger households have the capacity to relax labour constraints required for the introduction of new technology Mignouna *et al.* 2011).

The findings collaborate that of Mgnouna *et al.* (2011) who reported that gender affects technology adoption since the head of the household is the primary decision maker with men having more access to and control over key production resources than the women as a result of socio-cultural values and norms. This also agrees with the findings of Tata *et al.* (2018) who reported in their study that majority of the farmers were within the age range of 40years and above. So also Sani *et al.* (2015) in their study on the analysis of factors influencing maize farmers output using fertilizer in Bauchi reported that majority of the farmers were within the age bracket of 31-40 years. Likewise, Issa *et al.* (2016) in a study in Ikara Local Government Area of Kaduna State on the analysis of the socio-economic factors influencing farmers' adoption of improved maize production practices reported that most of the farmers were between the ages of 25 and 35years. A large percentage (81.84) were married with 72.40% having an average family size of 8 persons and 79.21% had one form of formal education. On average, the farmers had 19years of farming experience—an indication that they had enough farming experience to enhance quality protein maize production and its attendant risk. This suggests that the respondents had vast experience in maize farming and therefore will not have problem in adopting the recommended QPM production practices. The finding is supported by

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Yakubu *et al.* (2015) who reported that respondents in a study that determine the adoption of recommended maize production practices among men, women and youth had over 10 years of farming experience. This implies that there is significant level of specialization and expertise in maize production. This could be attributed to the tendency for younger people taking to farming as a vocation in recent years' due lack of employment.

The results also revealed that majority of the respondents were predominantly farmers constituting 63.40% by primary occupation. The implication is that agriculture is then proving to be a means of livelihood of the common man considering the high food insecurity challenges bedeviling the country and the failure of other sectors of the economy to meet the demand of the populace. This finding agrees with that of Yakubu *et al.* (2015) who in a study in Kaduna State, Nigeria, on the determinants of adoption of recommended maize production practices among men, women and youth reported that agriculture is the primary occupation of the respondents with over 10 years of farming experience. The result on table 1 further show that majority (52.63%) of the respondents cultivated a total farm size range of than 1-2 hectares while 22.12% had less than 1 hectare of their farm land used for quality protein maize production. The mean farm size of the respondent in the study area was 2ha. This implies that maize production in the study area was engaged by small-scale farmers. This finding is in agreement with that of Ugwuja *et al.* (2011) who in their study on socio-economic characteristics of farmers as correlates of fertilizer demand in Ekiti State, Southwest Nigeria: Implications for Agricultural Extension is that the small farm size warrant the adoption of innovations that can be tried on small size to avert risk.

The result in Table 1 revealed that most (98.95%) of the respondent used the cooperative labour for farming while the family labour accounted for 92.11% followed by hired labour (68.87%) and those who used both family

and hired labour constituted 39.47% of the respondents. The finding supported the findings of Audu *et al.* (2009) who reported in their study on the economic study of socio-economic characteristics and resource use in maize production among farmers in Nigeria that all the farmers used personal savings to run their farms and mostly use family labour as their farming activities. The implication of this finding is that in a typical rural Nigeria, due to inadequacy of capital in the form of credit farmers organized themselves into farming groups according to age to assist themselves in running the farming activities during the cropping seasons.

The result in Table 1 showed that over half of the sample (53.16%) had accessed credit Agricultural credit to a farmer is an empowerment tool for greater productivity particularly to resource poor farmers of rural Nigeria who are operating small scale farming. It is believed that respondents' access to credit assist them in reducing their risks, raise productivity, obtain high returns on investments, increase income and improve quality of their lives and that of their dependents. Amount of credit available to the farmers will lead to adoption of modern technology. This agrees with Sadiqq, (2012) who reported that credit is a vital element to agricultural transformation. It contributes to the farmers' social welfare, enhances production, and helps in capital formation and sustainability of income. Where credit is not available to the farmer, the resultant effects include, low productivity, inability to adopt recommended practices, poor marketing and distribution arrangement. The result in Table 1 shows that majority of the respondents were into cooperative association constituting 78.70%. The findings corroborate that of Ndaghu *et al.* (2015) who reported that majority of both adopters and non-adopters belong to farmers' cooperative society.

## Respondents Awareness of QPM Sources of Information

The result in Table 2 revealed that all (100%) the respondents were aware of the existence of QPM variety. Awareness is the first stage in any adoption process, without which the rest of stage in the adoption process cannot

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stand. The importance of awareness in technology adoption cannot be overemphasized. These finding corroborates that of Acheampong *et al.* (2018) who reported that majority of the respondents were aware of most technologies through extension workers. The result in Table2 further revealed that 59% of the respondents got their information on QPM from extension service The highest accessibility of QPM information from extension services could probably be due to favourable extension approaches used by the ADP personnel to extend proven agricultural technologies/innovations to farming households in the study area. This finding shared the same view with Uwandu *et al.* (2018) who in their study on utilization of agricultural information sources and adoption of animal and crop technologies among farming households in Imo State, Nigeria reported that respondents highly access agricultural information from ADP. It is therefore not out of place to conclude that extension service is an adequate means of transferring information to farmers. This is because access to extension services helps to spread information about new agricultural technology leading to adoption.

## Respondents' Constraints to QPM Adoption

The results in Table 3 that 81.84% of the respondents agreed that they have constraints This agrees with several studies (Kudi *et al.* 2011; Bose *et al.* 2012; Makarau, 2012; Ogunda, 2014; Onumadu, 2014; Wldegioges, 2014; Gyinadu, 2015; Yakubu *et al.*, 2015; Issa *et al.*., 2016) who reported that farmers face diverse constraints to adoption of technologies.

## Severity of Constraints to Adoption of QPM

The results in Table 4 revealed that the most severe constraints were high labour demand and unfavourable weather condition ($\bar{x}$ = 3.31) respectively, prevalence of pests and diseases ($\bar{x}$ = 3.14), high input demand ($\bar{x}$ = 3.12), non-availability of credit ($\bar{x}$ = 3.06), and low QPM market price ($\bar{x}$ = 3.01). High labour demand has been one of the constraints that affects most subsistence farmers who operate on moderate to large scale using the local

farm tools. The findings corroborate that of Kudi *et al.* (2011) who found that the major constraints to adoption were high cost of fertilizer and labour, lack of capital, lack of contact with extension agent and lack of favourable market price for the produce. Similarly, Makarau (2012) and Issa *et al.* (2016) reported that high cost of input, inadequate capital and high cost of labour, poor information and farmers' conservatism as major constraints to adoption of ginger production and improved maize production. To further support the findings of this study, Gyinadu *et al.* (2015); Onumadu and Osahon, (2014) reported the paucity of funds and lack of access to credit as constraints to the adoption of improved technologies among farmers.

## CONCLUSION

The study concluded that majority of the responded attested to facing constraints to the adoption of the QPM variety and the most severe constraints were high labour demand, unfavourable weather condition, non-availability of credit, prevalence of pests and diseases, high input demand and low QPM market price. Labour is required to carry out agronomic practices like weeding, fertilizer application among others while farming generally requires inputs like fertilizer, improved seeds, herbicides, etc. to improve on the farmers yield and these inputs are required in certain quantities to obtain minimum yield.

## RECOMMENDATIONS

Based on the findings, it is recommended that farmers in the study area should be in formed through extension services how to mitigate these constraints to QPM adoption so that they will take them into consideration in their production decision-making process particularly, when new technologies are introduced.

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International Journal of Agricultural Research and Food Production
ISSN: 2536-7331 (Print): 2536-734x (Online)
Volume 6, Number 2, June 2021
http://www.casirmediapublishing.com

Table 1: Socio-economic characteristics of respondents

| Variable | Frequency | Percentage | Mean | Rank |
|---|---|---|---|---|
| **Gender** | | | | |
| Male | 257 | 67.63 | | |
| Female | 123 | 32.37 | | |
| **Age** | | | | |
| 1-20 | 3 | .79 | | |
| 21-40 | 156 | 41.05 | 41 | |
| Above 41 | 221 | 58.16 | | |
| **Educational Level** | | | | |
| No School | 79 | 20.79 | | |
| Primary School | 80 | 21.05 | | |
| Secondary School | 113 | 29.74 | | |
| Tertiary Institution | 108 | 28.42 | | |
| **Marital status** | | | | |
| Single | 33 | 8.68 | | |
| Married | 311 | 81.84 | | |
| Divorce | 15 | 3.95 | | |
| Separated | 5 | 1.32 | | |
| Widow/Widower | 16 | 4.21 | | |
| **Occupation** | | | | |
| Farming | 241 | 63.40 | | |
| Civil Servant | 70 | 18.40 | | |
| Business | 35 | 9.20 | | |
| Handwork | 34 | 8.90 | | |
| **Household Size** | | | | |
| 1-10 | 275 | 72.40 | | |
| 11-20 | 96 | 25.30 | 8 | |
| Above 21 | 9 | 2.40 | | |
| **Farming Experience** | | | | |
| 1-20years | 246 | 64.70 | 19 | |
| 21-40years | 74 | 19.50 | | |
| Above 40years | 60 | 15.80 | | |
| **Farm Size(Ha)** | | | | |
| <1 | 84 | 22.12 | | |
| 1-2 | 200 | 52.63 | 2 | |
| 3-4 | 76 | 20.00 | | |
| >4 | 20 | 5.26 | | |

| | | | |
|---|---|---|---|
| **Cooperative Membership** | | | |
| Yes | 299 | 78.80 | |
| No | 81 | 21.30 | |
| **Labour Source** | | | |
| Cooperative (Gaiya) | 376 | 98.95 | 1st |
| Family labour | 350 | 92.11 | 2nd |
| Hired labour | 261 | 68.68 | 3rd |
| Family and Hired labour | 150 | 39.47 | 4th |
| **Credit Source** | | | |
| Relations | 365 | 96.05 | 1st |
| Government Loan | 357 | 93.95 | 2nd |
| Friends | 355 | 93.42 | 3rd |
| Bank loan | 340 | 89.47 | 4th |
| Cooperative society | 339 | 89.21 | 5th |
| Savings from previous harvest | 286 | 75.26 | 6th |
| **Total** | **380** | **100.00** | |

** Multiple Responses. Source: Field survey, 2019

Table 2: Respondents QPM Awareness and sources of information on QPM

| Variable | Frequency | Percentage |
|---|---|---|
| **Awarenes** | | |
| Yes | 380 | 100.00 |
| No | 0 | 0.00 |
| **Sources of information** | | |
| Extension agents | 123 | 32.37 |
| NGO | 5 | 1.32 |
| Research institutes | 40 | 10.53 |
| Media (Radio/TV) | 24 | 6.32 |
| Fellow QPM farmer | 60 | 15.80 |
| Field days | 100 | 26.32 |
| Friends | 28 | 7.40 |
| **Total** | **380** | **100.00** |

Source: Field Survey (2019)

International Journal of Agricultural Research and Food Production
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Table 3: Distribution of Respondents according to constraints (N=380)

| Constraint | Frequency | Percentage (%) |
|---|---|---|
| Yes | 311 | 81.84 |
| No | 69 | 18.16 |
| **Total** | **380** | **100.00** |

Table 4: Respondents distribution by Severity of constraints in adoption of QPM variety

| Constraints | Most Severe (4) | Severe (3) | Moderately Severe(2) | Not Severe (1) | Total Score | Mean ($\bar{x}$) |
|---|---|---|---|---|---|---|
| Too technical in the production | 15(4.82%) | 22(7.07%) | 42(13.51%) | 232(74.60%) | 442 | 1.42 |
| Low yield of QPM | 13(4.18) | 37(11.90) | 104(33.44) | 157(50.48) | 518 | 1.67 |
| High labour demand | 195(62.70) | 25(8.04) | 82(26.37) | 9(2.90) | 1028 | 3.31* |
| High input demand | 169(54.34) | 30(9.65) | 91(29.26) | 21(6.75) | 969 | 3.12* |
| Non-availability of QPM seeds | 20(6.43) | 61(19.61) | 75(24.12) | 155(49.84) | 568 | 1.83 |
| Unfavourable weather condition | 197(63.34) | 31(9.97) | 75(24.12) | 8(2.57) | 1028 | 3.31* |
| Poor soil fertility | 24(7.72) | 50(16.08) | 80(25.72) | 157(50.48) | 563 | 1.81 |
| Prevalence of pests and diseases | 154(49..52) | 54(17.36) | 83(26.69) | 20(6.43) | 1270 | 3.14* |
| Land Tenancy | 8(2.57) | 28(9.00) | 66(21.22) | 209(67.20) | 457 | 1.47 |
| Non-availability of credit | 173(55.63) | 78(25.08) | 34(10.93) | 26(8.36) | 952 | 3.06* |
| Poor extension services | 20(6.43) | 43(13.83) | 45(14.47) | 203(74.21) | 502 | 1.61 |
| Low price of QPM in the market | 139(44.69) | 94(30.21) | 20(6.43) | 58(18.65) | 936 | 3.01* |

Source: Field Survey, 2019

**Multiple choice exist.** (*) = Servere constraint = ≥ 2.50  Not servere constraint= < 2.50