**SOCIAL TRUST AND CONSUMPTION DECISIONS OF FARM-BASED BIOFORTIFIED FOODS IN SELECTED DISTRICTS OF MALAWI**

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**Abstract**

To reverse malnutrition and enhance human capital development, countries continue to invest in programs that support scaling up nutrition-sensitive agriculture, like biofortification of farm-based crops. Despite the stipulated benefits, the uptake of orange fresh sweet potato (OSFP) and quality protein maize (QPM) biofortified crops remains low in Africa. To contribute to the literature on improving the uptake of OFSP and QPM, this study assesses the associated effect of social or interpersonal trust on consumption and expenditure decisions. We use the Berg, Dickhaut, and McCabe (BDM) investment game to elicit social trust. Using data from three selected districts in Malawi and different econometrics tools, we observe mixed effects of different categories of social trust. People who are more likely to trust other people within their circle (in-group) are more likely to consume more of QPM. Generalised trust (either trust in people within their circle – ingroup, or trust in people outside their circle – outgroup) is associated with households consuming more of OFSP. Contrary, the decision to consume either OFSP or QPM is not significantly associated with social trust, but nutritional knowledge, and access to education on healthy cooking practices. To support household consumption decisions of biofortified foods, we recommend enhanced government and public interventions in disseminating nutritional information on the benefits of best practices of biofortified foods to influence change among rural households. To promote increased consumption, interventions should use more of social networks that build trust, which should influence increased uptake of OFSP and QPM among rural households.

**Keywords:** Social Trust, Orange Fresh Sweet Potato, Quality Protein Maize, Malawi

**1.0 Introduction**

Social trust is one form of social capital that is important for influencing decisions (Coleman, 1988; Wang et al., 2021). Social capital refers to the social connections, networks, and interpersonal trust or social trust that occur in communities (Keele, 2007). The social capital theory explains that different individuals attain social trust in one another through networking, civic engagement, and socializing with friends (Coleman, 1988). Furthermore, the theory posits that persons with high social trust are optimistic about the future and confident in society, and they can trust what other people are saying for their benefit (Coleman, 1988; Tamilina & Tamilina, 2018). Day and Settersten Jr (2018) showed that social trust may enhance people’s perceptions, consumption decisions and the ability to solve social and environmental problems. This literature shows that social trust is a key personal characteristic that is important for personal and community development decisions.

Literature mainly presents social trust from an aspect of in-group and out-group social trust. Kwon (2019) defined in-group social trust as trust in family members, friends or members of the same group or association, while defining out-group social trust as the general trust towards strangers or people outside the associated group boundaries. With in-group trust, members develop norms and values that influence behaviour compared to out-group or generalized trust. As such, understanding the individual in-group and out-group social trust could be important for assessing the personal decisions towards developmental interventions promoted across countries. The social trust could also be associated with individual and personal decisions, like consumption and expenditure. Although consumption studies often look at trust in the physical or food product (Vega-Zamora et al., 2019), the factors and the system that build such product trust remain an empirical question, especially in developing countries within Africa. Since social trust is founded on beliefs of honesty, integrity and reliability of others or “having faith in people” (Taylor et al., 2007), this study aims to understand the associated impact of social trust on consumption decisions of rural households in selected districts within Malawi, a country in sub-Saharan Africa. We focus on locally available farm-based and nutrition-sensitive agriculture products, with society perceptions on safety and human health, produced and consumed in the country.

As the world strives to achieve the Sustainable Development Goals (SDGs) by 2030, there are growing concerns about rising global hunger measured by the prevalence of undernourishment (PoU) (UNICEF, 2024). The 2024 State of Food Security and Nutrition in the World report (UNICEF, 2024) has put a spotlight on the reversed trends towards achieving zero hunger and undernutrition, particularly in Africa. Against other continents, the PoU for Africa continues to rise, estimated at 20.4 percent in 2023 compared to 19.9 percent in 2022. The statistics within sub-Saharan Africa are also on the rise, which is related to the persistent malnutrition problems of stunting, wasting and underweight that are affecting human capital development in the continent. Despite the reverse in global trends on malnutrition (UNICEF, 2024), most of the Least Developed Countries (LDCs), like Malawi, remain stagnant. According to the 2024 Demographic and Household Survey for Malawi, 38% of children under age 5 are stunted compared to 37% in 2017. Additionally, of the under-five children, 2% are wasted, 10% are underweight, and 6% are overweight. With these trends, the malnutrition burden of undernutrition, micronutrient deficiencies, and overnutrition remains a concerning issue in Malawi. The last Malawi Micronutrient Survey (MNS) showed that over 56% of reproductive-age women in Malawi suffered from Vitamin A deficiency (National Statistics Office, 2017). This is exacerbated by the poor quality of diets, with only 17% of Malawians meeting the minimum dietary diversity in 2020, a reduction from 25% in 2014 (UNICEF, 2023).

Considering the need to reverse the malnutrition challenges and enhance human capital development, countries continue to invest in programs that support scaling up nutrition-sensitive agriculture while aligning actions throughout agrifood systems to ensure that diverse, nutritious foods are available to all people, including vulnerable populations, through the value chain. The objective of these programs is to promote diversified food production and consumption (particularly among poor households living in remote areas with little access to markets) and enhance the food supply chain from farm to table. One such intervention is the biofortification of agricultural-based food products that rural households produce or buy in local markets for household consumption. Biofortification generally refers to the biological enrichment of food crops with either macro or micronutrients using agronomic practices, conventional plant breeding, or genetic engineering (Bouis & Saltzman, 2017). Biofortification has proved to be a cost-effective means of delivering micronutrients to populations that may have limited access to diverse diets and other micronutrient interventions (ibid, 2017). Despite the indicated benefits, societies remain sceptical about the safety and human health effects of biofortified foods (Ofori et al., 2022).

The Orange-Fleshed Sweet Potato (OFSP) and Quality Protein Maize (QPM, often referred to as yellow maize) are two of the biofortified farm-based crops being promoted across Africa, including in Malawi. The OFSP is a sweet potato dosed with vitamin A, while QPM is a mutant maize with elevated levels of lysine and tryptophan (Kaphaika et al., 2023; Nyakurwa et al., 2017). The biofortification of these crops aligns with high consumption associated with maize being a staple food across Africa, with sweet potato as the alternative starch food crop to maize. Evidence shows that consumption of OFSP and QPM can potentially improve human nutrition (Kaphaika et al., 2023; Nyakurwa et al., 2017; Ofori et al., 2022). However, uptake is affected by the acceptance of biofortified crops by farmers and consumers (Ofori et al., 2022; Talsma et al., 2017). Studies have assessed how factors associated with breeding, agronomy, socio-economic, institutional, psychological and cognitive have contributed to this low uptake to produce and consume biofortified crops like OFSP and QPM in Malawi and across Africa (Chambukira et al., 2025; Nyakurwa et al., 2017; Ofori et al., 2022; Samuel et al., 2024).

From the above evidence, more research has been done on OFSP compared to QPM, which could be related to the consumption patterns, variety release time and availability of the crops. To our knowledge, the papers we have reviewed on psychological and cognitive factors are more related to individual perceptions of biofortified food product trust (Samuel et al., 2024). Furthermore, studies on institutional factors have mainly assessed governance structures like policies, seed systems and extension channels that facilitate the availability of biofortified foods at the household level (Chambukira et al., 2025; Nyakurwa et al., 2017). No study was observed to have assessed how social or interpersonal trust – which is key for forming perceptions based on interpersonal connections – influences the production or consumption of biofortified foods, especially on farm-based crops like OFSP and QPM. This paper aims to fill that empirical gap, using data from three purposively selected districts in Malawi. The objective is to determine the effect of social trust on household consumer decisions of OFSP and QPM. To achieve this objective, we hypothesize that (H1) higher social trust (ingroup or outgroup trust) of household decision-makers increases the likelihood of households consuming OFSP and QPM, and (H2) higher social trust (ingroup or outgroup trust) of household decision-makers increases the amount of OFSP and QPM that households consume.

The contribution of our study is two-fold. Firstly, we contribute to the limited literature on the uptake of QPM, assessed together with OFSP uptake, the highly promoted biofortified farm products that are commonly used for breakfast and main meals among rural households. Secondly, we integrate the understanding of the effect of elicited social or interpersonal trust in rural household consumption decisions, an important behavioural factor in determining development decisions. The study uses the Berg, Dickhaut, and McCabe Investment game (BDM, 1995) to elicit individual social trust (Johnson & Mislin, 2011). We categorise social trust as in-group, out-group and generalised trust from the random outcome in the BDM investment game (Holden & Tilahun, 2021).

The rest of the paper is organized as follows: Section 2 presents the key concepts of social trust and the conceptual framework, Section 3 outlines the methodology and briefly presents the incentive investment experiment used in this study. Section 4 outlines the descriptive statistics and analytical results before discussing them in Section 5. The paper is concluded in Section 6, which also provides policy recommendations.

**2.0 Conceptual and Theoretical Framework**

**2.1 Conceptual Framework**

We draw our conceptual framework from the social capital theory (Coleman, 1988). We define social trust in line with Kwon (2019), who defines interpersonal trust as “individuals’ expectations of other members of society to act and behave in a way that is beneficial to these individuals or at least not detrimental to them”. These are subjective perceptions of how reliable or trustworthy other people can be without legal commitment, which is associated with the ability to expose oneself to risk and uncertainty (Holden & Tilahun, 2021; Kwon, 2019). Szreter and Woolcock (2004) categorize social trust into “bonding” and “bridging” social trust compared to “linking” social trust, which is trust in institutions. The authors define “bonding social trust” as “trusting and cooperative relations between members of a network who see themselves as being similar in terms of their shared social identity”. This is in line with the in-group trust. On the other side, the authors define “bridging social trust” as relations of respect and mutuality between people who know that they are not alike in some socio-demographic (social identity) sense (differing by location, age, ethnic group, class, etc). This is in line with the out-group trust. The extent to which in-group and out-group trust correlate remains a context-specific empirical question.

For this paper, we conceptualize the impact pathways of social trust in line with Kwon (2019) and Holden and Tilahun (2021). Figure 1 shows the conceptual framework adapted to the school of thought that trust is based on individual characteristics and societal factors. From the figure, social trust is a factor of moral values that people learn from their parents and are passed on across generations. In Larzelere and Huston (1980), as presented by Kwon (2019), morally based trust is associated with optimism, honesty, cooperation, reciprocation, respect, and benevolence, personal characteristics. The second theory is based on experience or societal factors. As one grows up, people encounter and experience different economic, social and environmental, and governance factors. Therefore, the intrinsic social trust shapes the way people trust those within their circles (in-group) and strangers (out-group).

**Morality Theory** or **Individual characteristics**

(Age, gender, education)

**Experience theory** or **Society factors**

(economic, social, environmental and governance factors)

Social trust

In-group trust

Out-group trust

Economic preferences (Risk)

Individual or household decision

Figure 1: Social trust and individual or household decisions

Source: Adapted from (Kwon, 2019) and (Holden & Tilahun, 2021)

The in-group and out-group trust, thus, influences the observed individual or household decisions. Related to the experience theory, people also develop economic preferences like risk that relate to social preferences like social trust, which also influence individual or household decisions (Holden & Tilahun, 2021). In this paper, our focus is on the consumption expenditure decisions of OFSP and QPM among rural households in selected districts of Malawi. We elicit the individual social trust of the household head or spouse to assess how such in-group and out-group trust affects consumption decisions. The respondent was also asked to respond to some questions on the willingness to pay.

**2.2 Theoretical Framework**

Consumption is a household decision made from the constrained production of budget resources. Our paper applies the household utility maximization theory (Sadoulet & de Janvry, 1995). The household theory describes a farm household as an institution that integrates production, consumption, and marketing decisions over time. As a farm household, they produce own food using own labour and sell the surplus produce and/or labour. The income from the sales, the farm households partly use that to buy other food and non-food products. This makes them net buyers of food since production is partly for consumption and partly for income. When all markets work well, farm households can make separate production from consumption decisions. However, if markets fail or are incomplete in most countries across the globe, household production and consumption decisions are now non-separable (Sadoulet & de Janvry, 1995). The non-separability of the production and consumption decisions implies that one can assess both consumption and production decisions among farm households to understand price decisions, risk behaviour, and on and off-farm agricultural decisions. We, therefore, assess farm household consumption decisions that are non-separable from production decisions in Malawi. Our target group are farm households who can produce OFSP and QPM for consumption and sell to generate income. When the households run out of own production stock and if they have income from other sources, they can buy OFSP and QPM for household consumption. Overall, the households aim to maximise utility from their consumption decisions. These are the decisions that can be influenced by social trust and other intrinsic variables in societies where they produce or trade OFSP and QPM.

1. **Methodology** 
   1. **Sampling and Data**

The study used a multi-stage sampling technique. Primary household data were collected from three purposively selected districts in Malawi. The study used a semi-structured questionnaire programmed in Survey Solution to collect data from Dowa, Mchinji, and Kasungu districts, within the central region of Malawi. These districts were selected because they are among the highest producers of both OFSP and QPM while also being net buyers of food crops. Although QPM is not widely produced like OFSP, NGOs have been implementing projects to support the production of QPM in the selected districts. Within the districts, we randomly selected Traditional Authority (TA) areas, a localized governance structure that groups blocked villages. Furthermore, we randomly selected villages. Probability Proportional Sampling (PPS) was used to allocate the number of individuals interviewed per village. The total household sample was 421, with 37, 27, and 36 percent from Kasungu, Mchinji and Dowa districts. The data was collected in June 2024. May to July is the harvest for most crops in Malawi, hence the time people should give true value to the product without thinking of constrained supply.

To elicit social trust, we used the simple Berg, Dickhaut, and McCabe (BDM) investment game (Hamukwala et al., 2019), as detailed in the annexe. The game involves two participants playing the game as a sender (trustor) and receiver(trustee). As a sender, a person was given money amounting to MK1000 (USD0.58) in an envelope to decide on how much they are willing to send to an anonymous person (receiver) categorised as either ingroup (if the person stays in their village) or outgroup (if the person is not from their village. The person holding the money has an option of sending either the whole amount (MK1000) or MK800, or MK600, or MK400, or MK200, or nothing (see the annexe). The choice of the amount was based on the 20 percent cut off point and the use of an MK200 note in Malawi. Out of the given options, the amount selected is called the trust amount. For any trust amount that the one selects, the sender was informed that the amount will be tripled before being handed over to the anonymous person (receiver), in either the ingroup or the outgroup. For instance, if a sender decides that the trust amount is MK600, the amount to be given to the receiver, in either the ingroup or the outgroup, will be MK1800. Upon receipt of the trust money, the receiver has to decide how much, out of the trust money, to send back to the sender. The defined options are at a 20 percent cut-off point based on the MK200 notes in Malawi. As presented in the annexe, the receiver of MK3000 would have 10 return options from the whole amount to nothing. The amount returned is called the trustworthiness amount. Thus, this game is called an investment game because those sending money make an investment decision in an anonymous person who will make an independent decision on how much they want to return out of the tripled amount.

To elicit trust, all the respondents in the study played as a sender (decided on how much to send out of MK1000), so we could observe the trust amount from all participants. Each person played two choices: how much to send to an anonymous member within their village (ingroup) and an anonymous member from outside the village (outgroup). All the participants also played as a receiver. Since the decision to send back an amount was made before receiving the money, the game design allowed participants to play all the possible outcomes (see the annexe). Once all decisions had been made, the researchers tossed a six-sided die with outcomes 1 to 3 for the ingroup and 4 to 6 for the outgroup. Based on the outcome, participants within the village were grouped as either ingroup or outgroup. Then the research team redistributed the ingroup enveloped marked with a unique code for confidentiality. Based on the trustworthy amount, the participants were told how much money would remain in the envelope to be returned to the sender. These returned amounts were given back to the owners of the envelopes at the end of the day. Those in the outgroup, the envelopes were taken to the next village for an anonymous outgroup member to decide. Eventually, every participant played as both a sender and receiver. With this game, one can assess the level of trust using the trust amount or the level of trustworthiness using the trustworthy amount. Our paper focuses on the trust amount, which answers the question of how trust influences consumption decisions. We use the share of the amount (trust amount/1000) in the analysis. Thus, values close to zero (200/1000) imply low trust, while values close to one imply high trust (1000/1000).

Apart from using ingroup and outgroup trust categories, we also construct generalised trust defined as the real played decision based on a lottery. For the ingroup and outgroup, our paper used the decisions made before the lottery, where the generalised trust is the actual paid decision, which is either with an ingroup or outgroup member. This is called the real game outcome decision.

On the consumption variable, the participants responded to a 7-day recall question that asked whether they had consumed OFSP and QPM in the past 7 days. The follow-up question was to ask those who consumed to give the amount consumed in kilograms. The consumption was defined as cooked OFSP, cooked or roasted QMP, or a meal from flour out of OFSP or QMP. The use of the 7-day recall as opposed to the 24-hour recall, in our study, was to accommodate the frequency of consumption, knowing that these are commodities that are not consumed daily. The use of a 24-hour recall would have biased our observations with zeros. Our data also include household characteristics, perceptions related to OFSP and QPM, but willingness to pay for a certain amount.

**3.2 Empirical Strategy**

The study used the Maximum Likelihood Bivariate Probit Model to observe the decision to consume OFSP and QPM. By asking the same household if they have consumed one or both (yes/no), the bivariate probit model assesses the effect of social trust on the decision to consume as stated in hypothesis one. To understand how social trust affects the amount households consume, we use a Tobit estimation model for OFSP and QPM separately. A Tobit is used to account for those with zero consumption in the 7-day recall period. As a censored model, a Tobit does not drop non-consuming households while accounting for the level of consumption (Wooldridge, 2010). The idea is that household decisions to consume (yes/no) are correlated within the household. However, the level of or extent of consumption for either OFSP or QPM can be made independently based on prevailing production and market decisions. We run two Tobit models.

The model will be specified as follows:

(1)

Where and represent Consumption decisions for QPM and OFSP, respectively, as the dependent variables in a bivariate model; ST represents social trust and for control variables. The Tobit models are in models (2) and (3), where and represent volumes in Kilograms.

(2)

(3)

In both bivariate and Tobit models, we assess social trust as generalised trust (real game outcome) in one model and combined ingroup and outgroup social trust in another model. With this, our model specification changes to models 4 and 5 for bivariate models.

(4)

(5)

From models (4) and (5), we use a recursive process of introducing the control variables to assess the main effect of the social trust variables. The first estimation is with social trust variables only, followed by introducing household characteristics. Following the discussion by Díaz-Gómez et al. (2017), food processing is crucial for maximizing the nutritional benefits of biofortified crops, especially the vitamin A in OFSP. Our analysis includes the variables related to enhancing food processing to ensure nutritional benefits. The first variable is access to general nutritional education captured as a dummy. The second and third variables are based on the specific type of nutritional education, which includes access to education on healthy diets and access to education on healthy cooking practices. These are also captured as a dummy. In the recursive models, we first include the variable on nutritional knowledge as an enabler of consumption decisions and introduce the access to knowledge on healthy cooking practices variable in the final model specification. The recursive process helps to observe the effect of social trust with and without the control variables. This is part of a robust check on our results. The Tobit models follow the recursive approach to estimating the effect of generalised trust, ingroup and outgroup trust. In the paper, we present the main output model with a visual presentation of the recursive results. The detailed tables from the recursive models are in the annexe.

**4.0 Results and Discussion**

**4.1 Descriptive Statistics**

This section presents the descriptive statistics from the variables used in the analysis to show distribution across the sampled districts and between male and female households (Table 1). On household characteristics, the completed education level is primary school for most household heads, which is at 60 percent for the whole sample (Table 1). Despite higher observation of those who attended primary school, the p-value (0.62) shows no statistical difference in the sample distribution across the districts. The distribution is the same across the districts. The total sample has 74 percent of adult male-headed households compared to 25 female-headed households, which is similar across the districts, with a p-value of 0.73. The average age of the household head is 44 years, with variations across the districts and a p-value of 0.00.

Table 1: Household characteristics

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Variable name | Total | Kasungu | Mchinji | Dowa | p-value |
| Gender of Household Head |  |  |  |  | 0.73 |
| Gender HH (Female) | 109 (26%) | 42 (27%) | 26 (23%) | 41 (27%) |  |
| Gender HH (Male) | 310 (74%) | 112 (73%) | 86 (77%) | 112 (73%) |  |
| Education of Household Head |  |  |  |  | 0.62 |
| No formal education / pre-primary education | 38 (9%) | 13 (8%) | 13 (12%) | 12 (8%) |  |
| Primary school | 253 (60%) | 94 (61%) | 63 (56%) | 96 (63%) |  |
| Secondary school | 126 (30%) | 47 (31%) | 35 (31%) | 44 (29%) |  |
| Technical or vocational school | 1 (0%) | 0 (0%) | 0 (0%) | 1 (1%) |  |
| College or university | 1 (0%) | 0 (0%) | 1 (1%) | 0 (0%) |  |
| Age HH Head | 44.32 (13.00) | 42.26 (12.42) | 42.51 (12.06) | 47.73 (13.59) | 0.00 |
| Marital status |  |  |  |  | 0.42 |
| Married | 338 (81%) | 130 (84%) | 89 (79%) | 119 (78%) |  |
| Single | 2 (0%) | 1 (1%) | 1 (1%) | 0 (0%) |  |
| Divorced | 43 (10%) | 13 (8%) | 14 (13%) | 16 (10%) |  |
| Widowed | 36 (9%) | 10 (6%) | 8 (7%) | 18 (12%) |  |
| Access to reproductive health services for under-five children | | |  |  | 0.21 |
| No | 20 (5%) | 5 (3%) | 4 (4%) | 11 (7%) |  |
| Yes | 401 (95%) | 150 (97%) | 109 (96%) | 142 (93%) |  |
| Access to nutrition education |  |  |  |  | 0.01 |
| No | 137 (33%) | 53 (34%) | 47 (42%) | 37 (24%) |  |
| Yes | 284 (67%) | 102 (66%) | 66 (58%) | 116 (76%) |  |
| Access to education on healthy diets | |  |  |  | 0.33 |
| No | 66 (16%) | 23 (15%) | 14 (12%) | 29 (19%) |  |
| Yes | 355 (84%) | 132 (85%) | 99 (88%) | 124 (81%) |  |
| Access to education on healthy cooking practices | | |  |  | 0.33 |
| No | 72 (17%) | 21 (14%) | 22 (19%) | 29 (19%) |  |
| Yes | 349 (83%) | 134 (86%) | 91 (81%) | 124 (81%) |  |

Overall, 67 percent of the sampled households had access to nutrition education, with almost 83 percent getting specific education on healthy diets and healthy cooking practices. Among the districts, 76 percent of respondents in Dowa had received general nutrition education compared to 66 percent and 58 percent in Kasungu and Mchinji districts. There were no significant differences in access to specific nutrition education across the districts. Additionally, almost all households indicated having access to under-five clinic services where there is a need (Table 1).

Based on the seven-day recall binary response, an average of 25 percent of the sampled households consumed QPM, while 48 percent consumed OFSP (Table 2). We observed a high consumption rate in Dowa district, followed by Kasungu and Mchinji. On average, households consumed 2.2Kgs of QPM and 3.0Kgs of OFSP based on the 7-day recall response to the amount consumed (Table 2). In the full sample, the average accounts for zero consumption amount since the Tobit model uses the full sample. To specifically look at those with non-zero consumption, the average amounts in the past 7 days were 9Kgs for QPM and 6.2Kgs for OFSP (Table 2).

Table 2: Consumption of QPM and OFSP: (7-day recall -June 2024) by District

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | Full sample | | | | | Sample with a positive consumption level | | | |
| District | QPM grain and flour | OFSP | QPM grain and flour | Quantity OFSP | HH | QPM grain and flour | | OFSP | |
|  | Percent | Percent | Kg | Kg | No | Kg | HH No | Kg | HH No |
| 1. Kasungu | 24% | 41% | 1.6 | 3.0 | 155 | 6.8 | 37 | 7.4 | 64 |
| 2. Mchinji | 19% | 55% | 1.5 | 3.4 | 113 | 7.7 | 22 | 6.2 | 62 |
| 3. Dowa | 30% | 50% | 3.4 | 2.6 | 153 | 11.4 | 46 | 5.2 | 76 |
| Total | 25% | 48% | 2.2 | 3.0 | 421 | 9.0 | 105 | 6.2 | 202 |
|  | | | | | | | | | |
| Adult Male Headed HH | 27% | 52% | 2.5 | 3.3 | 308 | 9.2 | 84 | 6.4 | 160 |
| Adult Female Headed HH | 19% | 37% | 1.5 | 2.0 | 113 | 8.2 | 21 | 5.5 | 42 |
| Total | 25% | 48% | 2.2 | 3.0 | 421 | 9.0 | 105 | 6.2 | 202 |

Using the sex of the household head, the descriptive statistics show that out of the sample, 27 percent of male-headed households and 19 percent of female-headed households consumed QPM (Table 1). From the sample, 52 percent of male-headed households and 37 percent of female-headed households consumed OFSP in the 7-day recall (Table 2). The consumed amounts were higher among adult male households compared to adult female households (Table 2). We assess the significance of these differences in the analysis section.

The descriptive statistics on social trust are presented in Table 3. The table presents an average trust amount out of MK1000 on the right-hand side, while presenting the share of the trust money (trust amount/MK1000) on the left-hand side. Recall that a higher share implies high social trust and that the share is between 0 and 1. The statistics in Table 3 show that the average trust amount is MK534.44 for an anonymous ingroup member, with the trust amount of MK469.44 for an anonymous outgroup member. The generalised trust amount based on the real game outcome is MK514.01. This distribution is similar across the districts and between male and female-headed households. Following the distribution of the trust amount, we present the share of the trust amount on the left-hand side of Table 3. Among the districts, Dowa has relatively higher trust amounts, which translate into a higher share of trust amounts compared to Kasungu and Mchinji districts. The differences between households headed by male and female members were minimal, with a 0.54 share of trust amount for ingroup among male-headed households compared to 0.51 for female-headed households (Table 3).

Table 3: Generalized trust elicited from the Trust game by district

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| District | Ingroup trust amount (MK) | Outgroup trust amount (MK) | Generalised trust amount (MK) | Share of generalised trust | Share of outgroup trust | Share of ingroup trust | HH No |
| 1. Kasungu | 525.16 | 476.13 | 492.90 | 0.50 | 0.48 | 0.53 | 155 |
| 2. Mchinji | 515.04 | 438.94 | 495.58 | 0.50 | 0.44 | 0.52 | 113 |
| 3. Dowa | 558.17 | 486.27 | 549.02 | 0.55 | 0.49 | 0.56 | 153 |
| Total | 534.44 | 469.83 | 514.01 | 0.51 | 0.47 | 0.53 | 421 |
|  | | | |  | | | |
| Adult Male Headed HH | 544.16 | 470.78 | 513.64 | 0.51 | 0.47 | 0.54 | 308 |
| Adult Female Headed HH | 507.96 | 467.26 | 515.04 | 0.52 | 0.47 | 0.51 | 113 |
| Total | 534.44 | 469.83 | 514.01 | 0.51 | 0.47 | 0.53 | 421 |

**4.2 Analytical Results**

This section presents the model results from the bivariate probit model that combined the decisions to consume OFSP and QPM (Table 4). To respond to our objectives, the first column in the results Table 4 presents the share of generalised trust in OFSP. The second column in Table 4 presents the share of ingroup and outgroup trust variables in the OFSP model. Column three presents QPM results from the generalised trust variable, while the fourth column has ingroup and outgroup trust variables. The results from the Tobit model are in kilograms consumed in the past 7 days using the full sample (Table 5). The Table has four columns. The column presentation follows the order discussed above.

Table 4: Bivariate Probit Model Margins of Factors Affecting Household Consumption Decision (Yes/No) of QPM and OFSP (7-day recall)

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | **OFSP Consumption** | | **QPM Consumption** | |
| **Variable name** | **Generalised Bprobit** | **Ingroup and Outgroup Bprobit** | **Generalised Bprobit** | **Ingroup and Outgroup Bprobit** |
| Share of generalized trust | 0.028 |  | 0.064 |  |
|  | (0.08) |  | (0.07) |  |
| Share of ingroup trust |  | 0.108 |  | 0.069 |
|  |  | (0.10) |  | (0.08) |
| Share of Outgroup trust |  | -0.009 |  | 0.024 |
|  |  | (0.10) |  | (0.09) |
| Age of Household head (years) | -0.000 | -0.000 | -0.000 | -0.001 |
|  | (0.00) | (0.00) | (0.00) | (0.00) |
| Education of Household head (level completed) | 0.034 | 0.036 | 0.043 | 0.043 |
|  | (0.04) | (0.04) | (0.03) | (0.03) |
| Household size | -0.011 | -0.011 | -0.007 | -0.007 |
|  | (0.01) | (0.01) | (0.01) | (0.01) |
| **Household type (1=Headed by Adult Male)** | **-0.115\*\*** | **-0.111\*\*** | -0.043 | -0.041 |
|  | **(0.06)** | **(0.06)** | (0.05) | (0.05) |
| **Access to nutrition education (1=Yes)** | **0.186\*\*\*\*** | **0.184\*\*\*** | **0.251\*\*\*\*** | **0.250\*\*\*\*** |
|  | **(0.06)** | **(0.06)** | **(0.05)** | **(0.05)** |
| Access to education on healthy diets (1=Yes) | -0.071 | -0.074 | -0.041 | -0.008 |
|  | (0.07) | (0.07) | (0.06) | (0.05) |
| **Access to education on healthy cooking practices (1=Yes)** | **0.173\*\*\*** | **0.179\*\*\*** | **0.138\*\*** | **0.142\*\*** |
|  | **(0.07)** | **(0.07)** | **(0.06)** | **(0.06)** |
| District (1=Kasungu) |  |  |  |  |
| **2. Mchinji** | **0.144\*\*** | **0.144\*\*** | -0.024 | -0.023 |
|  | **(0.06)** | **(0.06)** | (0.05) | (0.05) |
| 3.Dowa | 0.064 | 0.062 | 0.034 | 0.035 |
|  | (0.06) | (0.06) | (0.05) | (0.05) |
| N | 419 | 419 | 419 | 419 |

The results show that the household decision to consume OFSP and QPM is significantly influenced by social trust. That is for generalised, ingroups and outgroup trust. We observe that the decision to consume is significantly influenced by the sex of the household head, access to nutrition education and access to education on healthy cooking practices. If the household is headed by a female, the likelihood of consuming OFSP reduces by 11 percentage points. Access to nutrition education increases the likelihood of consuming OFSP by 18 percentage points while increasing the likelihood of consuming QPM by 25 percentage points. The knowledge on healthy cooking practices increases consumption of OFSP by 17 percentage points while increasing the likelihood of consuming QPM by 14 percentage points. Looking at the district distribution, households in Mchinji district are more likely to consume more of OFSP compared to the base district, Kasungu. We did not observe differences between Kasungu and Dowa districts.

The results in the Tobit model (Table 5) show that generalised trust positively influences the amount of OFSP that households consume at a 5 percent significance level. In the OFSP model, generalised trust significantly influences the amount of OFSP that households consume. If the share of generalised trust increases by one point, consumption on QPM increases by 1.8 kilograms. For the QPM model, the share of ingroup trust positively increases consumption of QPM. If the share of ingroup trust increases by one point, consumption of QPM will increase by 3.1 Kilograms. The outgroup trust variable is not significant in both OFSP and QPM models.

Table 5: Tobit Models coefficients on Factors Affecting Amount of OFSP and QPM Consumption of QPM and OFSP (7-day recall)

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Variable name** | **Quantity of OFSP consumed** | | **Quantity of QPM consumed** | |
| **Generalised Trust Tobit Model** | **Ingroup and Outgroup Trust Tobit Model** | **Generalised Trust Tobit Model** | **Ingroup and Outgroup Trust Tobit Model** |
| **Share of generalized trust** | **1.823\*\*** |  | 1.479 |  |
|  | **(0.86)** |  | (1.22) |  |
| **Share of ingroup trust** |  | 0.107 |  | **3.070\*** |
|  |  | (0.10) |  | **(1.85)** |
| Share of Outgroup trust |  | -0.028 |  | -1.912 |
|  |  | (0.10) |  | (1.79) |
| Age of Household head (years) | 0.011 | -0.000 | 0.019 | 0.021 |
|  | (0.02) | (0.00) | (0.02) | (0.02) |
| Education of Household Head (years) | 0.356 | 0.035 | 0.248 | 0.239 |
|  | (0.55) | (0.04) | (0.43) | (0.42) |
| Household size | 0.192 | -0.011 | 0.092 | 0.086 |
|  | (0.15) | (0.01) | (0.13) | (0.13) |
| **Household type (1=Headed by Adult Female)** | **-0.911\*** | **-0.112\*\*** | -0.751 | -0.654 |
|  | **(0.48)** | **(0.06)** | (0.57) | (0.55) |
| **Access to nutrition education (1=Yes)** | **1.665\*\*\*** | **0.181\*\*\*** | **1.838\*\*\*** | **1.804\*\*\*** |
|  | **(0.66)** | **(0.07)** | **(0.55)** | **(0.56)** |
| Access to education on healthy diets (1=Yes) | -1.122 | -0.072 | -1.003 | -1.081 |
|  | (0.77) | (0.07) | (1.22) | (1.21) |
| **Access to education on healthy cooking practices (1=Yes)** | **1.447\*\*** | **0.181\*\*** | 0.740 | 0.922 |
|  | **(0.67)** | **(0.07)** | (1.10) | (1.07) |
| District (1=Kasungu) |  |  |  |  |
| **2. Mchinji** | 0.577 | **0.146\*\*** | 0.103 | 0.066 |
|  | (0.74) | **(0.06)** | (0.51) | (0.51) |
| 3.Dowa | -0.653 | 0.061 | **1.492\*\*** | **1.471\*\*** |
|  | (0.74) | (0.06) | **(0.73)** | **(0.73)** |
| Constant | -1.283 | 0.170 | -1.744 | -1.812 |
|  | (1.94) | (0.20) | (1.84) | (1.77) |
| N | 419 | 419 | 419 | 419 |

In addition to the trust variables, the amount of QPM or OFSP consumed is also significantly influenced by the sex of the household head, access to nutritional education, and access to education on healthy cooking practices. The sex of the household head significantly influences amount of OFSP, and female headed households are likely to consume 0.9 to 0.1 kilograms of lower amounts of OFSP. An increase in access to nutrition education increases the consumption of OFSP by 0.2 kilograms or 1.7 kilograms. Access to education on healthy cooking practices is likely to increase consumption of OFSP by 0.2 kilograms or 1.5 kilograms. With QPM, access to nutrition education increases consumption of QPM by 1.8 kilograms. District variations were observed in both the OFSP and QPM models. People in Dowa are more likely to consume 1.5 kilograms of QPM compared to those in Kasungu.

**5.0 Discussion**

Our results show that most participants shared almost 50 percent of their initial endowments (MK1000). This is similar to a study by Holden and Tilahun (2021), who observed that people are, on average, trusting by sending half of their initial endowment. There were no observable differences between female and male-headed households in our sample, as opposed to the observations that men and more trusting than women (Olmo et al., 2020)

On the effect of social trust, the share of social trust for ingroup and outgroup members does not significantly affect the decision to consume either OFSP or QMP. The observation could be related more to knowledge being the factor for one to decide to consume food products, compared to social trust that builds perceptions and expectations. Other factors, like the sex of the household head, are more likely to influence the consumption decision of whether to consume OFSP or QPM. As biofortified foods, people have to understand the significance of eating such foods compared to traditional maize or sweet potato.

On the extent of consumption, the Tobit models show that the generalised trust is positively associated with the extent (amount) of consuming QPM. The effect was not significant for the OFSP model. It was the share of in-group trust that was positively significant at 10 percent in the OFSP model. The results imply the significance of trust in the level of consumption of biofortified foods among rural households. With social trust or interpersonal trust, individuals can influence each other to consume more of biofortified foods if one has already decided to consume such food products. Like the bivariate model, the sex of the household head, access to nutrition education, and healthy cooking practices significantly influence the extent of consumption among rural households. These are enabler variables that should be enhanced in interventions that promote consumption of biofortified foods that are considered a cost-effective way of addressing the malnutrition challenge among rural households (Ofori et al., 2022).

**6.0 Conclusion and Recommendations**

As the world strives to achieve the Sustainable Development Goals (SDGs) by 2030, there are growing concerns about rising global hunger. Considering the need to reverse the malnutrition challenges and enhance human capital development, countries continue to invest in programs that support scaling up nutrition-sensitive agriculture while aligning actions throughout agrifood systems to ensure that diverse, nutritious foods are available to all people, including vulnerable populations, through the value chain. The objective is to promote diversified food production and consumption, particularly among poor households living in remote areas with little access to markets and enhance the food supply chain from farm to table. One such intervention is the biofortification of agricultural-based food products that rural households produce or procure in local markets for household consumption. The Orange-Fleshed Sweet Potato (OFSP) and Quality Protein Maize (QPM, often referred to as yellow maize) are two of the biofortified farm-based crops being promoted across Africa, including in Malawi.

The objective was to determine the effect of social trust on consumer decisions of OFSP and QPM. To achieve this objective, we hypothesize that (H1) higher social trust of household decision-makers increases the likelihood of households consuming OFSP and yellow maize, and (H2) higher social trust of household decision-makers increases the extent of households consuming OFSP and yellow maize. We used the Berg, Dickhaut, and McCabe (BDM) investment game to elicit social trust for OFSP and QPM.

Using data from three selected districts in Malawi and the bivariate probit and Tobit models, we observe mixed effects of different categories of social trust. People who are more likely to trust other people within their circle (in-group) are more likely to consume more of QPM. The generalised trust (either ingroup or outgroup) is positively associated with consuming more of OFSP. As opposed to the amount consumed, the decision to consume either OFSP or QPM is not significantly associated with social trust, but nutritional knowledge, and access to education on healthy cooking practices. To support the consumption decisions for OFSP and QPM, we recommend enhanced government and public interventions in disseminating nutritional information on the benefits of and best practices of biofortified foods to influence change among rural households. To promote increased consumption of OFSP and QPM, interventions should use more of social networks that build social trust in biofortified foods available in the communities, either through own production or through purchases in the markets.

**Contribution:**

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**References**

Bouis, H. E., & Saltzman, A. (2017). Improving nutrition through biofortification: a review of evidence from HarvestPlus, 2003 through 2016. *Global Food Security, 12*, 49-58.

Chambukira, M., Edriss, A. K., Pangapanga-Phiri, I., & Kaphaika, C. (2025). Does the adoption of pro-nutritional technologies spur farmers’ yields? Evidence from biofortified Orange-Fleshed Sweet Potato crop in rural Malawi. *World Development Sustainability, 6*, 100202.

Coleman, J. S. (1988). Social capital in the creation of human capital. *American journal of sociology, 94*, S95-S120.

Day, J. K., & Settersten Jr, R. A. (2018). Less trusting and connected? Social trust and social integration among young adults during the recession. *Advances in Life Course Research, 37*, 57-68.

Díaz-Gómez, J., Twyman, R. M., Zhu, C., Farré, G., Serrano, J. C., Portero-Otin, M., Muñoz, P., Sandmann, G., Capell, T., & Christou, P. (2017). Biofortification of crops with nutrients: factors affecting utilization and storage. *Current opinion in biotechnology, 44*, 115-123.

Hamukwala, P., Oparinde, A., Binswanger‐Mkhize, H. P., & Kirsten, J. (2019). Design factors influencing willingness‐to‐pay estimates in the Becker‐DeGroot‐Marschak (BDM) mechanism and the non‐hypothetical choice experiment: A Case of biofortified maize in Zambia. *Journal of Agricultural Economics, 70*(1), 81-100.

Holden, S. T., & Tilahun, M. (2021). Preferences, trust, and performance in youth business groups. *Plos one, 16*(9), e0257637.

Johnson, N. D., & Mislin, A. A. (2011). Trust games: A meta-analysis. *Journal of economic psychology, 32*(5), 865-889.

Kaphaika, C. S., Katengeza, S. P., Pangapanga-Phiri, I., & Chambukira, M. H. (2023). More interventions, low adoption: To what extent are the existing seed sources to blame? The case of orange fleshed sweet potato in Central and Northern Malawi. *Sustainability, 15*(19), 14390.

Keele, L. (2007). Social capital and the dynamics of trust in government. *American Journal of Political Science, 51*(2), 241-254.

Kwon, O. Y. (2019). Social trust: its concepts, determinants, roles, and raising ways. *Social trust and economic development*, 19-49.

Larzelere, R. E., & Huston, T. L. (1980). The dyadic trust scale: Toward understanding interpersonal trust in close relationships. *Journal of Marriage and the Family*, 595-604.

National Statistics Office. (2017). Malawi Micronutrient Survey 2015-2016. Retrieved from *Zomba, Malawi*: chrome-extension://efaidnbmnnnibpcajpcglclefindmkaj/<https://dhsprogram.com/pubs/pdf/FR319/FR319.m.final.pdf>

Nyakurwa, C., Gasura, E., & Mabasa, S. (2017). Potential for quality protein maize for reducing proteinenergy undernutrition in maize dependent Sub-Saharan African countries: A review. *African Crop Science Journal, 25*(4), 521-537.

Ofori, K. F., Antoniello, S., English, M. M., & Aryee, A. N. (2022). Improving nutrition through biofortification–A systematic review. *Frontiers in nutrition, 9*, 1043655.

Olmo, R., Marcel, A. L. M., Mark, & Jelte, M. W. (2020). Sex differences in trust and trustworthiness: A meta-analysis of the trust game and the gift-exchange game. *Journal of economic psychology, 81*, 102329. doi:<https://doi.org/10.1016/j.joep.2020.102329>

Sadoulet, E., & de Janvry, A. (1995). Quantitative development policy analysis: *Johns Hopkins University Press Baltimore*.

Samuel, L., de Barcellos, M. D., Watabaji, M. D., & De Steur, H. (2024). Factors affecting farmers’ acceptance and adoption of biofortified crops: A systematic review. *Outlook on Agriculture, 53*(1), 15-29. doi:10.1177/00307270231212924

Szreter, S., & Woolcock, M. (2004). Health by association? Social capital, social theory, and the political economy of public health. *International Journal of Epidemiology, 33*(4), 650-667. doi:10.1093/ije/dyh013

Talsma, E. F., Melse-Boonstra, A., & Brouwer, I. D. (2017). Acceptance and adoption of biofortified crops in low-and middle-income countries: a systematic review. *Nutrition reviews, 75*(10), 798-829.

Tamilina, L., & Tamilina, N. (2018). Explaining the impact of formal institutions on social trust: A psychological approach. *Journal of Interdisciplinary Economics, 30*(2), 164-190.

Taylor, P., Funk, C., & Clark, A. (2007). Americans and social trust: Who, where and why. *A Social Trends Report*, 1-10.

UNICEF. (2023). Child Food Poverty Brief: Key drivers of malnutrition among children 6 - 23 months. Retrieved from <https://www.unicef.org/malawi/reports/child-food-poverty-brief>

UNICEF. (2024). The State of Food Security and Nutrition in the World 2024.

Vega-Zamora, M., Torres-Ruiz, F. J., & Parras-Rosa, M. (2019). Towards sustainable consumption: Keys to communication for improving trust in organic foods. *Journal of Cleaner Production, 216*, 511-519.

Wang, D., Yun, K., Shuo, L., Xiangyu, C., & Peng, W. (2021). Does social trust restrain excess perk consumption? Evidence from China. *International Review of Economics & Finance, 76*, 1078-1092. doi:<https://doi.org/10.1016/j.iref.2021.08.007>

Wooldridge, J. M. (2010). Econometric analysis of cross section and panel data: *MIT Press*.

**Annexe:** **The Trust Game**

***The Trust Game***

*This is an experiment in two stages. You will play with another anonymous person. This person will either be a member of your own village or another unknown village member (but in the same district). You will never find out who the person you play with is, but we select a real person randomly. The experiment is about trust and trustworthiness and involves money to be sent between you and the other person. You will be both a sender and a receiver of money who decides whether to return some of the money received back to the sender. As a sender, you will first receive 1000 MK, which you will decide over (split into five 200 MK notes). You may decide to keep the whole 1000 MK for yourself or to invest the whole or part of it (as much as you want). The amount you invest will be tripled by us (e.g., if you invest 400 MK, we triple it to 1200 MK, or if you invest the whole 1000 MK, we triple it to 3000 MK). We put the tripled amount into an envelope for your investment. The same is done for all village members that participate from your village and for other village members in other villages. Before you know whether you will play with another person in your village or another village member, we ask you to decide how much you will invest in each of these, knowing that only one will be selected for real. A lottery (coin toss) with an equal chance for each will determine who of these you will play with. Stage 2: We also want to know how much you, as a receiver, will return of the tripled amount sent to you by an anonymous sender in your own village or another unknown village member. Who you receive money from is also determined by a lottery afterward. For each alternative amount received, we want you to state how much you decide to return when the other person is from your own village and when the other person is another unknown village member. What you decide for each amount received and for each type of person, before you know which type of person you receive money from, will be binding for you when you receive the envelope from the real person that was decided by the lottery. You will only know whether that person comes from your own village or is another unknown village member. We may give an example: If the amount you find in the envelope is 1200 MK, how much of this will you return in the cases a) the sender comes from your own village, b) the sender comes from another unknown village member? You are free to decide to keep the whole amount (return nothing) or return the whole amount or any amount between all or nothing (split in 200 MK units). Since we do not know what amount you will find in the envelope, we need to ask you what you would return for all possible amounts you may find in the envelope for cases a) and b). It is only when we return next time that we will bring this envelope and we can find out how much money there is. We use a lottery to distribute the envelopes sent among your village members and other unknown village members.*

F2. You are given 1000 MK and can decide how much of it you are willing to invest if the tripled amount of your investment is to be sent to a random (anonymous) member of your village.

1=1000 MK sent, your anonymous village mate will get 3000 MK, you retain nothing

2=800 MK, your anonymous village mate will get 2400 MK, you retain 200 MK

3=600 MK, your anonymous village mate will get 1800 MK, you retain 400 MK

4=400 MK, your anonymous village mate will get 1200 MK, you retain 600 MK

5=200 MK, your anonymous village mate will get 600 MK, you retain 800 MK

6=0 MK, your anonymous village mate will get 0 MK, you retain 1000 MK

F3. How much of the 1000 MK are you willing to invest if the tripled amount of your investment is sent to a random member from unknown village but is from the same district who participates in the experiment?

1= 1000 MK sent, the random member from unknown village will get 3000 MK, you retain nothing

2=800 MK sent, the unknown village member will get 2400 MK, you retain 200 MK

3=600 MK sent, the unknown village member will get 1800 MK, you retain 400 MK

4=400 MK sent, the unknown village member will get 1200 MK, you retain 600 MK

5=200 MK sent, the unknown village member will get 600 MK, you retain 800 MK

6=0 MK sent, the unknown village member will get 0 MK, you retain 1000 MK

*The lottery which determines whether you will play the game with another unknown member of your own village or with an unknown village member, after you have answered some more questions. We will now ask you how you would respond (amount returned) as a receiver (trustee) of a random envelope from an anonymous member in your own village and an unknown village member, depending on how big the amount in the envelope you receive is. You know that we have tripled the amount that the other person sent in the envelope. The amounts you decide to return now will be binding for what you have to return when you get the real envelope – but the amount you find there is unknown till you open it as it depends on the decision of the sender (trustor) of that envelope. You will never know who the sender is.*

F4. How much will you leave in the envelope (return to the sender who is a random anonymous person in own village) if the amount in the envelope is 3000 MK?

1=3000 MK returned to an anonymous person in own village, you keep nothing

2=2400 MK returned to an anonymous person in own village, 600 MK kept

3=1800 MK returned to an anonymous person in own village, 1200 MK kept

4=1200 MK returned to an anonymous person in own village, 1800MK kept

5=1000 MK returned to an anonymous person in own village, 2000MK kept

6=800 MK returned to an anonymous person in own village, 2200 MK kept

7=600 MK returned to an anonymous person in own village, 2400 MK kept

8=400 MK returned to an anonymous person in own village, 2600 MK kept

9=200 MK returned to an anonymous person in own village, 2800 MK kept

10=0 MK returned to an anonymous person in own village, 3000 MK kept

F5. How much will you leave in the envelope (return to the sender, who is a random, anonymous, unknown village member) if the amount in the envelope is 3000 MK?

1=3000 MK returned to anonymous, unknown village member, 0 MK kept

2=2400 MK returned to anonymous, unknown village member, 600 MK kept

3=1800 MK returned to anonymous, unknown village member, 1200 MK kept

4=1200 MK returned to anonymous, unknown village member, 1800 MK kept

5=1000 MK returned to anonymous, unknown village member, 2000 MK kept

6=800 MK returned to anonymous, unknown village member, 2200 MK kept

7=600 MK returned to anonymous, unknown village member, 2400 MK kept

8=400 MK returned to anonymous, unknown village member, 2600 MK kept

9=200 MK returned to anonymous, unknown village member, 2800 MK kept

10=0 MK returned to anonymous, unknown village member, 3000MK kept

F6. How much will you leave in the envelope (return to the sender, who is a random anonymous person in own village) if the amount in the envelope is 2400 MK?

1=2400 MK returned to anonymous unknown village member, 0MK kept

2=1800 MK returned to anonymous unknown village member, 600 MK kept

3=1200 MK returned to anonymous unknown village member, 1200 MK kept

4=1000 MK returned to anonymous unknown village member, 1400 MK kept

5=800 MK returned to anonymous unknown village member, 1600 MK kept

6=600 MK returned to anonymous unknown village member, 1800 MK kept

7=400 MK returned to anonymous unknown village member, 2000 MK kept

8=200 MK returned to anonymous unknown village member, 2200 MK kept

9=0 MK returned to anonymous unknown village member, 3000MK kept

F7. How much will you leave in the envelope (return to the sender who is a random anonymous person in own village) if the amount in the envelope is 1800 MK?

1=1800 MK returned to anonymous person in own village, 0 MK kept

2=1200 MK returned to anonymous person in own village, 600 MK kept

3=1000 MK returned to anonymous person in own village, 800 MK kept

4=800 MK returned to anonymous person in own village, 1000 MK kept

5=600 MK returned to anonymous person in own village, 1200 MK kept

6=400 MK returned to anonymous person in own village, 1400 MK kept

7=200 MK returned to anonymous person in own village, 1600 MK kept

8=0 MK returned to anonymous person in own village, 1800 MK kept

F8. How much will you leave in the envelope (return to the sender who is a random anonymous unknown village member) if the amount in the envelope is 1800 MK?

1=1800 MK returned to anonymous unknown village member, 0 MK kept

2=1200 MK returned to anonymous unknown village member, 600 MK kept

3=1000 MK returned to anonymous unknown village member, 800 MK kept

4=800 MK returned to anonymous unknown village member, 1000 MK kept

5=600 MK returned to anonymous unknown village member, 1200 MK kept

6=400 MK returned to anonymous unknown village member, 1400 MK kept

7=200 MK returned to anonymous unknown village member, 1600 MK kept

8=0 MK returned to anonymous unknown village member, 1800 MK kept

F9. How much will you leave in the envelope (return to the sender who is a random anonymous person in own village) if the amount in the envelope is 1200 MK?

1=1200 MK returned to anonymous person in own village, 0 MK kept

2=1000 MK returned to anonymous person in own village, 200 MK kept

3=800 MK returned to anonymous person in own village, 400 MK kept

4=600 MK returned to anonymous person in own village, 600 MK kept

5=400 MK returned to anonymous person in own village, 800 MK kept

6=200 MK returned to anonymous person in own village, 1000 MK kept

7=0 MK returned to anonymous person in own village, 1200 MK kept

F10. How much will you leave in the envelope (return to the sender who is a random anonymous person in own village) if the amount in the envelope is 600 MK?

1=600 MK returned to anonymous person in own village, 0 MK kept

2=400 MK returned to anonymous person in own village, 200 MK kept

3=200 MK returned to anonymous person in own village, 400 MK kept

4=0 MK returned to anonymous person in own village, 600 MK kept

F11. How much will you leave in the envelope (return to the sender who is a random anonymous unknown village member) if the amount in the envelope is 600 MK?

1=600 MK returned to anonymous unknown village member, 0 MK kept

2=400 MK returned to anonymous unknown village member, 200 MK kept

3=200 MK returned to anonymous unknown village member, 400 MK kept

4=0 MK returned to anonymous unknown village member, 600 MK kept

F12. How much of the tripled amount you have sent to the anonymous unknown village member do you expect to get back?

1=Less than one third

2=One third

3=Half

4=More than half

5=Nothing as I sent nothing

6=Nothing although I sent some

F13. As a receiver (trustee) in the game, how obliged do you feel to return an amount at least as big as the amount sent by the anonymous sender (trustor) from your own village?

1=Extremely obliged 2=Somewhat obliged 3=Not obliged at all

F14. As a receiver (trustee) in the game, how obliged do you feel to return an amount at least as big as the amount sent by the sender (trustor) who is an unknown village member?

1=Extremely obliged 2=Somewhat obliged 3=Not obliged at all

*Lottery for whether the receiver will be another person from own group or from another group: Use a six sided die to determine whether you will play with another anonymous player from own village or another unknown member in the village* F15. Outcome of lottery for type of trustee in trust game

1=Trustee is an anonymous village mate (white bead) 2=Trustee is an unknown village member (black bead)

*Enumerator: Triples the amount for the appropriate receiver and marks the envelope for whether it is for within group (own village) (I=Ingroup) or outgroup (O) (unknown village member). The envelope is given to the Supervisor who is responsible for collecting and redistributing all envelopes. The unique registration number must specify the type of group; Ingroup (I) or Outgroup (O) based on the lottery, the village ID and member ID of the sender (to make sure the envelope is returned to the correct sender). The stated amounts returned will be used also to determine how much they have to return when they get the envelopes from the unknown player they play with. E.g., if they find 1800 MK in the envelope they have to return what they stated they would return in the table above for the type of trustor they received the envelope from.*

Annexe Table 1: Bivariate Probit Model Margins on Factors Affecting the Extent Of Consumption of QPM and OFSP (7-day recall)

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | **OFSP Consumption** | | | | | | **QPM Consumption** | | | | | |
| **Variable name** | **Bprobit1** | **Bprobit2** | **Bprobit3** | **Bprobit4** | **Bprobit5** | **Bprobit6** | **Bprobit1** | **Bprobit2** | **Bprobit3** | **Bprobit4** | **Bprobit5** | **Bprobit6** |
| Share of generalized trust | 0.019 | 0.031 | 0.028 |  |  |  | 0.064 | 0.066 | 0.064 |  |  |  |
|  | (0.08) | (0.08) | (0.08) |  |  |  | (0.07) | (0.07) | (0.07) |  |  |  |
| Share of ingroup trust |  |  |  | 0.103 | 0.084 | 0.108 |  |  |  | 0.073 | 0.048 | 0.069 |
|  |  |  |  | (0.10) | (0.10) | (0.10) |  |  |  | (0.09) | (0.08) | (0.08) |
| Share of Outgroup trust |  |  |  | -0.031 | -0.009 | -0.009 |  |  |  | 0.016 | 0.024 | 0.024 |
|  |  |  |  | (0.11) | (0.10) | (0.10) |  |  |  | (0.09) | (0.09) | (0.09) |
| Age of Household Head (years) |  | -0.000 | -0.000 |  | -0.000 | -0.000 |  | -0.001 | -0.000 |  | -0.001 | -0.001 |
|  |  | (0.00) | (0.00) |  | (0.00) | (0.00) |  | (0.00) | (0.00) |  | (0.00) | (0.00) |
| Education of Household Head (level completed) |  | 0.022 | 0.034 |  | 0.023 | 0.036 |  | 0.035 | 0.043 |  | 0.035 | 0.043 |
|  |  | (0.04) | (0.04) |  | (0.04) | (0.04) |  | (0.03) | (0.03) |  | (0.03) | (0.03) |
| Household size |  | -0.009 | -0.011 |  | -0.009 | -0.011 |  | -0.006 | -0.007 |  | -0.006 | -0.007 |
|  |  | (0.01) | (0.01) |  | (0.01) | (0.01) |  | (0.01) | (0.01) |  | (0.01) | (0.01) |
| **Household type (1=Headed by Adult Male)** |  | **-0.131\*\*** | **-0.115\*\*** |  | **-0.129\*\*** | **-0.111\*\*** |  | -0.060 | -0.043 |  | -0.058 | -0.041 |
|  |  | **(0.06)** | **(0.06)** |  | **(0.06)** | **(0.06)** |  | (0.05) | (0.05) |  | (0.05) | (0.05) |
| **Access to nutrition education (1=Yes)** |  | **0.157\*\*\*** | **0.186\*\*\*\*** |  | **0.155\*\*\*** | **0.184\*\*\*** |  | **0.229\*\*\*\*** | **0.251\*\*\*\*** |  | **0.227\*\*\*\*** | **0.250\*\*\*\*** |
|  |  | **(0.05)** | **(0.06)** |  | **(0.05)** | **(0.06)** |  | **(0.05)** | **(0.05)** |  | **(0.05)** | **(0.05)** |
| Access to education on healthy diets (1=Yes) |  |  | -0.071 |  |  | -0.074 |  |  | -0.041 |  |  | -0.008 |
|  |  |  | (0.07) |  |  | (0.07) |  |  | (0.06) |  |  | (0.05) |
| **Access to education on healthy cooking practices (1=Yes)** |  |  | **0.173\*\*\*** |  |  | **0.179\*\*\*** |  |  | **0.138\*\*** |  |  | **0.142\*\*** |
|  |  |  | **(0.07)** |  |  | **(0.07)** |  |  | **(0.06)** |  |  | **(0.06)** |
| District (1=Kasungu) |  |  |  |  |  |  |  |  |  |  |  |  |
| **2. Mchinji** |  | **0.129\*\*** | **0.144\*\*** |  | **0.130\*\*** | **0.144\*\*** |  | -0.036 | -0.024 |  | -0.034 | -0.023 |
|  |  | **(0.06)** | **(0.06)** |  | **(0.06)** | **(0.06)** |  | (0.05) | (0.05) |  | (0.05) | (0.05) |
| 3.Dowa |  | 0.064 | 0.064 |  | 0.062 | 0.062 |  | 0.033 | 0.034 |  | 0.035 | 0.035 |
|  |  | (0.06) | (0.06) |  | (0.06) | (0.06) |  | (0.05) | (0.05) |  | (0.05) | (0.05) |
| N | 421 | 419 | 419 | 421 | 419 | 419 | 421 | 419 | 419 | 421 | 419 | 419 |

Standard errors in parentheses

\* p<0.1 \*\* p<0.05 \*\*\* p<0.01 \*\*\*\* p<0.001

Annexe Table 2: Tobit Model coefficients on Factors Affecting Extent of Consumption of QPM and OFSP (7-day recall)

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Variable name** | **Quantity of QPM consumed** | | | | | | **Quantity of OFSP consumed** | | | | | |
|  | **Tobit 1** | **Tobit 2** | **Tobit 3** | **Tobit 4** | **Tobit 5** | **Tobit 6** | **Tobit 1** | **Tobit 2** | **Tobit 3** | **Tobit 4** | **Tobit 5** | **Tobit 6** |
| Share of generalized trust | 1.721 | 1.531 | 1.479 |  |  |  | **1.687\*** | **1.887\*\*** | **1.823\*\*** |  |  |  |
|  | (1.27) | (1.23) | (1.22) |  |  |  | **(0.86)** | **(0.87)** | **(0.86)** |  |  |  |
| **Share of ingroup trust** |  |  |  | **3.208\*** | 2.955 | **3.070\*** |  |  |  | 1.054 | 0.908 | 0.107 |
|  |  |  |  | **(1.92)** | (1.86) | **(1.85)** |  |  |  | (0.88) | (0.88) | (0.10) |
| Share of Outgroup trust |  |  |  | -1.792 | -1.852 | -1.912 |  |  |  | 1.557 | **1.720\*** | -0.028 |
|  |  |  |  | (1.78) | (1.77) | (1.79) |  |  |  | (1.03) | **(1.03)** | (0.10) |
| Age of Household Head (years) |  | 0.019 | 0.019 |  | 0.021 | 0.021 |  | 0.010 | 0.011 |  | 0.010 | -0.000 |
|  |  | (0.02) | (0.02) |  | (0.02) | (0.02) |  | (0.02) | (0.02) |  | (0.02) | (0.00) |
| Education of Household Head (years) |  | 0.160 | 0.248 |  | 0.137 | 0.239 |  | 0.230 | 0.356 |  | 0.222 | 0.035 |
|  |  | (0.41) | (0.43) |  | (0.42) | (0.42) |  | (0.55) | (0.55) |  | (0.54) | (0.04) |
| Household size |  | 0.092 | 0.092 |  | 0.089 | 0.086 |  | 0.199 | 0.192 |  | 0.204 | -0.011 |
|  |  | (0.13) | (0.13) |  | (0.13) | (0.13) |  | (0.16) | (0.15) |  | (0.15) | (0.01) |
| Household type (1=Headed by Adult Female) |  | -0.770 | -0.751 |  | -0.691 | -0.654 |  | **-1.005\*\*** | **-0.911\*** |  | **-0.971\*\*** | **-0.112\*\*** |
|  |  | (0.54) | (0.57) |  | (0.53) | (0.55) |  | **(0.49)** | **(0.48)** |  | **(0.49)** | **(0.06)** |
| **Access to nutrition education (1=Yes)** |  | **1.895\*\*\*\*** | **1.838\*\*\*** |  | **1.832\*\*\*\*** | **1.804\*\*\*** |  | **1.558\*\*\*** | **1.665\*\*\*** |  | **1.494\*\*\*** | **0.181\*\*\*** |
|  |  | **(0.52)** | **(0.55)** |  | **(0.51)** | **(0.56)** |  | **(0.55)** | **(0.66)** |  | **(0.54)** | **(0.07)** |
| Access to education on healthy diets (1=Yes) |  |  | -1.003 |  |  | -1.081 |  |  | -1.122 |  |  | -0.072 |
|  |  |  | (1.22) |  |  | (1.21) |  |  | (0.77) |  |  | (0.07) |
| **Access to education on healthy cooking practices (1=Yes)** |  |  | 0.740 |  |  | 0.922 |  |  | **1.447\*\*** |  |  | **0.181\*\*** |
|  |  |  | (1.10) |  |  | (1.07) |  |  | **(0.67)** |  |  | **(0.07)** |
| District (1=Kasungu) |  |  |  |  |  |  |  |  |  |  |  |  |
| 2. Mchinji |  | 0.029 | 0.103 |  | -0.020 | 0.066 |  | 0.444 | 0.577 |  | 0.518 | **0.146\*\*** |
|  |  | (0.51) | (0.51) |  | (0.51) | (0.51) |  | (0.75) | (0.74) |  | (0.76) | **(0.06)** |
| 3.Dowa |  | 1.483\*\* | 1.492\*\* |  | 1.467\*\* | 1.471\*\* |  | -0.668 | -0.653 |  | -0.604 | 0.061 |
|  |  | (0.73) | (0.73) |  | (0.73) | (0.73) |  | (0.74) | (0.74) |  | (0.74) | (0.06) |
| Constant | 1.365\*\* | -1.834 | -1.744 | 1.377\*\* | -1.730 | -1.812 | 2.107\*\*\*\* | -0.654 | -1.283 | 1.680\*\*\* | -0.986 | 0.170 |
|  | (0.63) | (1.67) | (1.84) | (0.61) | (1.55) | (1.77) | (0.44) | (1.47) | (1.94) | (0.52) | (1.45) | (0.20) |
| N | 421 | 419 | 419 | 421 | 419 | 419 | 421 | 419 | 419 | 421 | 419 | 419 |

Standard errors in parentheses. \* p<0.1 \*\* p<0.05 \*\*\* p<0.01 \*\*\*\* p<0.001