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Full Length Research Paper

Contribution of input trade fairs to food security in rural Swaziland: Case study of households under the Ngwempisi constituency

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The objective of the study was to determine the contribution of input trade fairs (ITFs) to household food security in rural Swaziland. Given the prevailing drought condition, a number of interventions, including ITFs, have been attempted to mitigate the effects of natural disasters on the livelihoods of rural households. Through a survey of 92 randomly selected households, a regression model was used, where amongst other factors influencing net food availability, was a dummy variable indicating whether a household was a recipient or non-recipient of ITFs. Having tested for structural stability on whether the regression for recipients differs from that of non-recipients in terms of intercepts and coefficients, homogeneity and autocorrelation, the analytical results indicated that ITFs significantly contribute to household net food availability. The study, therefore, recommends that ITFs can be considered as a temporary measure to respond to the current food crisis. The long-term solution, however, lies with the full implementation of Swaziland's newly formulated Food Security Policy.

Key words: Input trade fairs, food production, food security, drought, Swaziland.

INTRODUCTION

Food is one of the basic human needs, hence, the reason almost every government, particularly in the third world, declares the provision of sufficient and adequate nutrition as its first development objective (Sijm, 1997; Mechlem, 2004). Millions of smallholder farmers throughout Africa are, however, too poor to participate in agricultural activities and are, therefore, unable to utilise productivity-enhancing modern inputs such as mineral fertilizer and improved seed varieties (World Bank, 1986; Crawford et al., 2003). In Africa, food has become the most important item in any development agenda during the last three decades (Maxwell, 2000a). To this end, there have been attempts of varying degrees to find effective ways of ensuring that all Africans have access at all times to the minimum quantities of food necessary to lead active and healthy lives (Yaro, 2004). In spite of this intention and putting great emphasis on the food production sector, food insecurity remains a persistent problem in Africa, particularly in sub-Saharan Africa (Diao et al., 2008).

The causes of food crises in Africa are numerous, varied and complex. Von Braun et al. (1999) and Swift and Hamilton (2000) provide a comprehensive summary of the principal factors attributed to the continent's failure to adequately feed its population. These factors include:

(i) Climatic hazards.
(ii) Severe environmental degradation.
(iii) Rapid population growth outstripping agricultural growth.
(iv) Unstable macroeconomic environment and inappropriate government policies in some nations.
(v) Low purchasing power of the people (poverty).
(vi) The absence of food security policies at national or regional levels.
(vii) Lack of storage facilities.
(viii) Limited access to infrastructure and basic services.
(ix) Civil war.

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(x) Inappropriate incentives.
(xi) Low productivity of agriculture resulting from insufficient use of improved inputs and poor control of weeds.

According to Maxwell (2000b), agriculture remains at the heart of food security. This is not only for the obvious reason that the agriculture sector is the only source of food, but because of its multiple roles as a source of employment and livelihoods, and as one of the main engines for economic activity (Delgado, 1999; Diao et al., 2008). The agriculture sector in Swaziland has over the years been overly pre-occupied with the policy of ensuring adequate food supply for all citizens. The main strategy for achieving this objective has been the intensification of food production, particularly maize, which is the staple food for the Swazi people. Since the 1996 World Food Summit, Swaziland has adopted food security as one of the main goals of the agriculture sector. It was after that Summit that the Millenium Development Goal of reducing by half the number of the world's undernourished population by 2015 was adopted (Yaro, 2004).

As indicated above, food security in Swaziland has been closely related to maize production, which unfortunately has been declining since the 1990s (Lukhele and Gumede, 2008). In recent years, Swaziland's maize production has been estimated to be between forty and sixty percent of the domestic requirements (WFP/FAO, 2007). In the past 5 to 10 years, Swaziland has been severely affected by drought and almost a third of the country's population that rely on rain-fed agriculture have been the worst affected (WFP/FAO, 2005). It has been noted that the recurring drought, poverty amongst the majority of the people, and the general decline in agricultural productivity due to declining soil fertility are some of the factors that have contributed to continued food insecurity and general suffering of the majority of the people in Swaziland (IFAD, 2006).

Crop failures are frequent and alternative sources of income are becoming marginal, making the recovery of impoverished households an increasing challenge. Even if normal rainfall resumes, some households have been finding it increasingly difficult to recover from drought due to lack of access to the right inputs, particularly seeds and fertiliser at the right time. For some households, the lack of access to inputs could be due to lack of money for purchasing, while for others it is due to inadequate information pertaining to the type and quantity of inputs available and the long distance to be covered to get them. In collaboration with development partners, most governments are considering appropriate strategies that incorporate both food and provision of agricultural inputs to households affected by climate-related disasters (Sperling et al., 2008). Assistance in the form of agricultural inputs for poor farming households has been found to help beneficiaries recover from disasters and improve their resilience in the phase of climate change while food aid helps in providing immediate relief (Orindi and Ochieng, 2005; McGuire and Sperling, 2008).

In a bid to help Swazi farmers recover from the effects of drought, whilst also complementing the World Food Programme (WFP)'s efforts of providing food aid, FAO, as part of its Initiative on Soaring Food Prices (ISFP), started distributing free agricultural inputs in 2005, through a programme called "Input Trade Fairs" (ITFs). One of the programme's objectives is to ensure that increased production is translated into improved diets, particularly for vulnerable groups, and improve household food security. The notion behind the introduction of ITFs by FAO was that many of the food aid beneficiaries are people that could produce food for themselves if they had economic means of accessing agricultural inputs (Kelly et al., 2003; Longley, 2006).

Although FAO has introduced a monitoring and evaluation instrument for ITFs in Swaziland, no empirical evidence has been brought forward to show the true incremental impact on agricultural output for ITF beneficiaries. The aim of the current study was, therefore, to assess the contribution of ITFs in addressing the problem of food insecurity in Swaziland, using Ngwempisi constituency in the Manzini region as a case study. Net maize grain available at household level was used as a proxy for food security in this study. More specifically, the objectives of the study were to:

(1) Determine whether or not recipients of ITF vouchers had, on average, significantly higher net grain available than non-recipients, while controlling for other conceptually-driven determinants of household net grain availability in a model adapted from the one used by Haile et al. (2005).
(2) Identify those determinants/factors for which the impact on net maize grain available differs between ITF recipients and non-recipients; and determine the patterns of such impacts.

Among the various definitions of food security (Maxwell, 1996; 2000b), Swaziland, in developing its Food Security Policy, adopted the 1996 World Food Summit definition, which holds that food security represents a situation whereby all people, at all times, have physical, social and economic access to sufficient, safe and nutritious food that meets their dietary needs and food preferences for an active and healthy life (FAO, 1996; GoS, 2005). The concept of food security is widely known to rest on three pillars, namely, availability, access, and utilization (FAO, 1996). These concepts are inherently hierarchical (Barrett, 2010). Food availability is necessary but not sufficient for access, and access is necessary but not sufficient for utilization (Webb et al., 2006). Own production, in a way, guarantees the household unlimited access and entitlement to its produce, as it can to decide

to consume or sell it upon harvesting, in order to generate revenue to buy other commodities (Sen, 1981, p. 46). The use of net maize grain as a proxy for food security in this study is, therefore, based on the premise that through successful own production a household would be assured of access upon harvesting (Webb et al., 2006; Drimie et al., 2009). Maize is a source of starch, and producing maize alone may not necessarily guarantee food security. However, if there is increased productivity such that there is excess maize, a household may decide to trade the surplus and use the returns to procure other sources of essential nutrients such as proteins, fats and vitamins (Barrett, 2010). Smallholder households are distinctly characterised by the fact that an important part of what they eat comes from their own fields. Although some food may be purchased and a substantial part of the total agricultural produce may be sold for cash, there remains a subsistence component necessary for household maintenance that is self-provisioned (Netting, 1993, p.83).

INPUT TRADE FAIRS (ITFS) PROGRAMME

The basic premise of the input voucher and fair approach is that even in the presence of natural disasters, such as drought, agricultural inputs will be available in a particular region in one way or the other. Farmers' constraints, nonetheless, hinge on their limited access to the inputs, usually owing to the sharply depleted financial resources sometimes combined with the collapse of social networks (Orindi and Ochieng, 2005). Another assumption is that farmers are eager, willing and capable of selecting the required inputs that will enable them to resuscitate their livelihoods (Sperling et al., 2008).

The issue of agricultural subsidies, particularly of seed and fertilizer, has always brought mixed feelings amongst researchers and policy makers. According to Morris et al. (2007), the negativity of most economists and development agencies towards agricultural subsidies finds its origins in the high cost and limited effectiveness of fertilizer subsidies in the 1970s and 1980s. The contention is that subsidy programmes, which often involve state monopolies in the marketing of inputs, tend to undermine the emergence of efficient, widespread, private input distribution networks (World Bank, 1981; Crawford et al., 2003). Moreover, there are significant opportunity costs to devoting public funds to subsidizing agricultural inputs rather than investing in market development, agricultural research, transportation infrastructure, or other public goods to achieve a country's development goals (Bramel et al., 2004). Other authors contend that direct inputs distribution tends to be continuous, hence compromising its long-term effectiveness as beneficiaries are likely to develop dependency syndromes, leading to disruptions of local markets (Sperling et al., 2008; Remington et al., 2002).

Proponents of subsidies, however, believe that subsidies are the only way to jump-start African agriculture and deliver concrete food security and income benefits to the rural poor (Kachule and Chilongo, 2007). They argue that governments can avoid the mistakes of the past by implementing "smart subsidies," which are designed to target the poor and support, rather than undercut, the development of private input distribution markets (Doward, 2009). ITFs have been proposed as a way to make subsidies "smart." Smart subsidies are, therefore, considered as mechanisms that provide subsidized goods and services designed both to promote market development whilst enhancing the welfare of the poor (Orindi and Ochieng, 2005).

ITFs are rapidly becoming the preferred method of agricultural input distribution in many areas supported by FAO. Through this system, vouchers with a cash value are distributed to farmers identified as requiring assistance. These farmers gather at the fairs and 'purchase' agricultural inputs of their choice using their own discretion regarding which items meet their specific needs. The fairs provide a market for local producers of quality seed, which are not always available from commercial suppliers. ITFs constitute a flexible market development policy, as they support local agricultural retail businesses and encourage them to expand trade in more remote areas, from which they, as well as farmers, would benefit (Gregory, 2006; FAO, 2008).

According to FAO (2008), ITFs began as seed fairs in the late 1990s and responded to the problem of disaster by providing affected farmers with exactly what they needed in terms of inputs for the following season. The technique of ITFs (or Seed Fairs, as they were originally known) was developed in Kenya by Catholic Relief Services, in collaboration with the International Crops Research Institute for the Semi-Arid Tropics (ICRISAT) in the late 1990s. Since then fairs have been successfully implemented in Kenya, southern Sudan, Somalia and Uganda (Remington et al., 2002).

In today's ITFs, farmers are given vouchers of a pre-set financial limit, based on the actual costs of planting a given area of the staple crop, while also providing for some vegetable or other crop seed, necessary tools and in some cases machinery hire for land cultivation (FAO, 2008). The ability of ITFs to supply a large array of farm inputs is limited only by the stocks available to vendors and the demand of farmers for particular inputs. The inputs are usually supplied by local traders or local agents of international seed and fertilizer companies, having been informed in advance of the date and location of the fair.

Advantages and disadvantages of input trade fairs

In theory, ITFs have a number of advantages over direct government in-kind provision of inputs to farmers (Minot and Benson, 2009; Cullen and Lawson, 2005). Unlike

direct subsidy distribution, where input companies, procurement agencies, large traders and transporters capture most of the benefit, the proceeds from the sale in ITFs, particularly of seed, is shared mostly among community-based traders, many of whom are women (Sperling et al., 2008). This results in increased financial and social capital in the communities (Kalinda and Simfukwe, 2007). A diversity of crops and varieties are on offer at ITFs, usually reflecting the predominant crops sold also at local seed/grain markets. Farmers have the option to use their vouchers to obtain crops and varieties of particular interest and to access multiple types of inputs (Orindi and Ochieng, 2005). In emergency response situations, vouchers can replace food aid as a medium-term support to those affected (Sperling and Longley, 2002). In this context, ITFs offer a flexible programming approach that can potentially suit a range of different situations on the continuum between relief and development, and have thus been seen to lie at the 'nexus between relief and development' (Remington et al., 2002: 326).

Depending on how they are implemented, ITFs can also have disadvantages. Administrative costs can be high, particularly if the government attempts to target certain types of households, such as small farmers (Sperling et al., 2008). In an area where ITFs have not been conducted before, implementers would need to be trained, and this is a process that requires time and budgetary support (Gaye and Jawo, 2004). Vouchers may leak out of the target group if the intended beneficiaries resell the vouchers to others, hence, defeating the goal of boosting their agricultural productivity. Unlike in direct subsidy distribution, ITFs are not a once-off activity. In order to promote input market development, the voucher programmes need to be in place for a while, depending on the severity of the underlying cause of livelihood disruption (Minot and Benson, 2009). One-time voucher programmes are likely to retard rather than enhance market development and result in less efficient use of inputs by farmers. Given a choice, agricultural input suppliers would prefer direct subsidy distribution over ITFs. In direct subsidy distribution the relief agency is the customer and relief agencies are ideal customers because they place large orders and always pay on time. In contrast, reaching rural farmers is expensive and risky because smallholders may decide not to purchase the more expensive commercial inputs (Remington et al., 2002).

Input trade fairs in Swaziland

ITFs in Swaziland are organized by the local FAO office in collaboration with the Ministry of Agriculture. The first ITFs were introduced in 2005/2006, in response to the effects of drought that has affected the country since 2001. Since inception, ITFs have been conducted in Swaziland every year, targeting a total of 10 000, 15 000, 30 000 and 5, 000 households in 2005/2006, 2006/2007, 2007/2008 and 2008/2009, respectively. The decline in the number of beneficiaries in 2008/2009, according to FAO-local office, was caused by the reduced support received from donor agencies. The value of vouchers transferred to beneficiaries was E180 in 2005/2006, rising to E250 in 2006/2007, E300 in 2007/2008 and E650 in 2008/2009.

The choice of locations to hold ITFs is made considering findings of the annual Vulnerability Assessment and sometimes the FAO/WFP crop and food assessment. Once the areas have been identified, agricultural input suppliers are invited to register to participate at the fair. There is normally a wide range of inputs considered, including seeds of various crops, fertilizers, tools and herbicides, amongst others. The suppliers, particularly for seeds, will normally include reputable commercial suppliers and farmers from within the same communities. All inputs traded during the fair will first be certified by the Ministry of Agriculture to ensure quality and relevance to the targeted area. The identification of beneficiaries is made by community leaders in consultation with Government Extension Officers who consider household vulnerability status and commitment to farming. The beneficiaries comprise poor families that have lost their capability to continue with agricultural production as a result of drought. Priority is normally given to female headed households, widows, the elderly and child-headed households. On the day of the fair, beneficiaries are provided with a voucher booklet containing coupons of different cash denominations, amounting to the value that has been specified for that particular year.

ITFs in Swaziland have covered all the four administrative regions, namely Hhohho, Shiselweni, Lubombo and Manzini. The positive effects of the project are that disadvantaged farmers are able to access good quality approved seeds and farm inputs such as hand tools and fertilizers, and that farmers are trained in seed production and conservation agriculture. According to FAO (2007) the ITFs have also improved the income of seed producers, both large and small. In 2006/2007, 42 small-scale seed producers based in the different communities that had been trained and approved by the Seed Quality Control Unit of the Ministry of Agriculture, and 4 large input suppliers, participated through the selling of inputs. The suppliers shared a total of US$540,000 as settlement for used vouchers. About 71% of the vouchers were spent on seed purchases, 14% on fertilizer, 14% on tools and 1% on veterinary drugs (FAO, 2007). As evidenced by the quantities in Table 1, maize has always been the leading seed type traded through ITFs over the years. In the 2006/2007 ITF, 182 MT of maize seed was bought by ITF beneficiaries in all the country's four regions. Other items that are normally preferred include chemical fertilizers, hoes and machetes.

Table 1. Seed types distributed through ITFs in Swaziland (2006/2007 season).

Inputs	Quantities distributed (MT)
Maize	182
Groundnuts	8.8
Jugo beans	8.2
Beans	13.95
Cow peas	1.3
Sorghum	1
Mung beans	1.5
Sesame	0.01

Source: FAO (2007).

MATERIALS AND METHODS

Sampling and data collection

The Ngwempisi area was purposively selected for conducting the study on the basis that it is located in the Highveld and, therefore, it is a high rainfall receiving area. Besides being located in a high-rainfall area, Ngwempisi has an added advantage in that it is located within the Mahlangatsha Rural Development Area, hence, it has better access to agricultural technical support in the form of Government tractor hire and extension services (Funnell, 1982; Nkambule, 2007). These characteristics eliminate the unfavourable and uncontrollable agricultural production conditions that would hinder households from producing to their potential after benefiting from ITFs. The Ngwempisi constituency started benefiting from ITFs in 2007 and it is one of the few high rainfall areas to have ever been targeted for support. This presented an opportunity for the current study to effectively measure the impact of the ITF programme in an area conducive to producing a variety of crops under rain-fed conditions. Hence, this study assessed the impact of ITFs a year after their initial introduction in the Ngwempisi constituency, based on the population of 120 households that had benefited on this occasion. FAO had chosen the beneficiaries according the criteria outlined earlier this article , namely, targeting families that had lost their capability to continue with agricultural production due to the persistent draught, with female headed households, widows, the elderly and child-headed households given priority. To effectively control for other effects, the target population of non-beneficiaries consisted of those that had not been chosen to benefit from the ITF programme even though they qualified for ITFs based on the above-mentioned criteria. The data used in this study were obtained through a survey of a total of 92 households; with 46 randomly selected from among the population of 120 beneficiaries and the other 46, which served as the control group, selected from among non-beneficiaries that qualified for ITFs. In each case, the ten chiefdoms forming the Ngwempisi constituency were used as further strata. Primary data were collected from the sampled households in December 2008 through interviews with household heads using a structured questionnaire. The questionnaire was used to capture information on various characteristics of the farm households including farm size, agricultural enterprises and crop outputs. Respondents were also asked to provide information regarding their perceptions about the programme, the targeting criterion, major problems identified since the inception of the programme and possible solutions to the identified problems.

Data analysis

As the major focus was to determine the impact of Input Trade Fairs on household net maize grain availability, the relationship was studied using Ordinary Least Squares (OLS) as shown in Equations (1) to (8). The model was based on the one used by Haile, et.al. (2005). It should be noted, however, that the model was linearized by taking the natural logarithm of the continuous variables:

$$\ln(Y) = \beta_o + \beta_1 D_1 + \beta_2 X_2 + \beta_3 \ln(X_3) + \beta_4 \ln(X_4) + \beta_5 \ln(X_5) + \beta_6 \ln(X_6) + \beta_7 \ln(X_7) + \beta_8 \ln(X_8) + \beta_9 \ln(X_9) + \beta_{10} \ln(X_{10}) + \beta_{11} \ln(X_{11}) + \beta_{12} \ln(X_{12}) + \beta_{13} \ln(X_{13}) + \beta_{14} D_1 \ln(X_8) + U \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (1)$$

where: Y (Dependent variable) = Net maize grain available (kg) for each household estimated for 12 months (November 2007 to November 2008). D_1 (Dummy variable) = 1 if received input voucher; = 0 otherwise. X_2 (Sex of household head) = 1 if the head of household is male = 0 otherwise. X_3 = Educational status of head (0= illiterate, 1= adult education, 2= primary education, 3= secondary education). X_4 = Family size (number). X_5 = Size of arable land (hectare). X_6 = Fertility status of land (0= poor, 1= intermediate, 2 = fertile). X_7 = Number of oxen owned (number). X_8 = Quantity of improved seeds used (kg). X_9 = Quantity of herbicides used (in litres). X_{10} = Quantity of pesticides (in litres). X_{11} = Total grain harvested (kg). X_{12} = Age of household head (years). X_{13} = Employed family members (number). U = Error term. β_o = intercept. β_i = Coefficients of the explanatory variables D_1, X_2,…,X_{14}. ln = Natural logarithm.

The term D_1 in the model measured the effect of the ITFs on net maize grain available. Hence, if it was significant in the direction favourable to ITFs then ITFs would be deemed to have a positive impact on food security. Consistent with regression models, the presence of other explanatory factors (Xs) was important because the model was able to assess the individual impact of one factor (ITFs in this case), with the effect of the other factors kept constant (Gunst and Mason, 1980, p.262; Myers, 1986, p.51). The term $\beta_{14} D_1 \ln X_8$ in the model represented the interaction between the dummy variable D_1 (indicating whether or not the household received input vouchers) and the amount of maize hybrid seed used. This term was included because it was the only significant interaction term in a set of preliminary result based on the model with all possible two-factor interactions with D_1 included[1]. Its significance corroborates with the belief that planting hybrid seeds enhances productivity (Chirwa, 2005). Hybrid seed was one commodity that was availed during ITFs, and theoretically its use would be expected to improve the household net maize grain availability.

Another importance of the Xs was that the model could assess whether (or not) the impact of each is the same for households

[1] These preliminary results are not presented here.

which had received input vouchers compared to those households which had not received these vouchers. This was done by evaluating two types of conditional expectation (taken one at a time) of the dependent variable ln(Y). The first of these was evaluated, given $D_1 = 1$ and the Xs to obtain the function for households which had received input vouchers. The second conditional expectation was evaluated, given the Xs and $D_1 = 0$ for the function of households which had not received input vouchers. Symbolically, this may be represented as follows:

For the households which had received input vouchers, the function is given by:

$$E(\ln(Y)|\ D=1,\ Xs) = (\beta_o + \beta_1) + \beta_2 X_2 + \beta_3 \ln(X_3) + \beta_4 \ln(X_4) + \beta_5 \ln(X_5) + \beta_6 \ln(X_6) + \beta_7 \ln(X_7) + (\beta_8 + \beta_{14}) \ln(X_8) + \beta_9 \ln(X_9) + \beta_{10} \ln(X_{10}) + \beta_{11} \ln(X_{11}) + \beta_{12} \ln(X_{12}) + \beta_{13} \ln(X_{13}) \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (2)$$

whereas, the function for those households that did not receive input vouchers is given by,:

$$E(\ln(Y)|\ D=0,\ Xs) = \beta_o + \beta_2 X_2 + \beta_3 \ln(X_3) + \beta_4 \ln(X_4) + \beta_5 \ln(X_5) + \beta_6 \ln(X_6) + \beta_7 \ln(X_7) + \beta_8 \ln(X_8) + \beta_9 \ln(X_9) + \beta_{10} \ln(X_{10}) + \beta_{11} \ln(X_{11}) + \beta_{12} \ln(X_{12}) + \beta_{13} \ln(X_{13}) \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (3)$$

Notably, the difference between the two functions was in the intercepts and the coefficients of $\ln X_8$, the amount of maize hybrid seed used. The differences between the intercepts and the coefficients of $\ln X_8$ were β_1 and β_{14}, respectively. If the first difference, β_1, was significant and the other terms (involving Xs) each assumed the value zero, then the net maize grain available would be deemed to be significantly different between the two groups of households (those which had received input vouchers and those which had not). If the second difference, β_{14}, was significant, then a unit increase in amount of maize hybrid seed used would be deemed to significantly differently impact on net maize available between the two types of households.

RESULTS AND DISCUSSION

The following section presents and discusses the results of applying the model as follows: First the model is written in an estimated form and then the estimates and tests of significance are tabled. Finally, the structural stability of the model is tested to see if there is statistical difference between the functions representing recipients and non-recipients. The model in Equation (1) is represented in estimated form as follows:

$$\hat{Y} = \hat{\beta}_0 + \hat{\beta}_1 D_1 + \hat{\beta}_2 X_2 + \hat{\beta}_3 \ln(X_3) + \hat{\beta}_4 \ln(X_4) + \hat{\beta}_5 \ln(X_5) + \hat{\beta}_6 \ln(X_6) + \hat{\beta}_7 \ln(X_7) + \hat{\beta}_8 \ln(X_8) + \hat{\beta}_9 \ln(X_9) + \hat{\beta}_{10} \ln(X_{10}) + \hat{\beta}_{11} \ln(X_{11}) + \hat{\beta}_{12} \ln(X_{12}) + \hat{\beta}_{13} \ln(X_{13}) + \hat{\beta}_{14} D_1 \ln(X_8) \quad \ldots\ldots (4)$$

According to the results presented in Table 2, the model was significant ($p<0.01$) and explained 76.2% of total variation in household net maize grain available. The DW was 1.57, indicating no presence of autocorrelation. Both these results indicated that the model fit was good.

Sex of household head, education status of household head, size of arable land, soil fertility status, quantity of hybrid seed, herbicide, pesticide and age of household head were each, individually, not significant. Family size and number of oxen were significant ($p<0.05$) showing signs in conformity with *a priori* expectation. These results were consistent with observations made by Alene et al. (2000) that the larger the family size the more labour available for food production. Households with more oxen have an alternative to using tractors for ploughing, which are sometimes not easily accessible to rural households (Kebede et al., 1990; Govereh and Jayne, 1999; Nkambule, 2007).

As expected, beneficiaries of ITFs had significantly ($p<0.05$) higher net maize grain available than non beneficiaries. The beneficiaries had more access to inputs required to improve agricultural production. Mole and Vasco (2007) made the same observation in Mozambique where they found that recipient households increased food surpluses, allowing them to enter the market to exchange part of the produce for cash. The interaction between ITF and quantity of hybrid seed was also significant ($p<0.05$).[2] Total maize grain harvested and number of family members employed were also found to be significant ($p<0.01$) and both were in conformity with *a priori* expectations. Employed family members normally provide financial resources that households may use to procure agricultural inputs (Jayne et al., 1994) over and above inputs received through ITFs.

Testing for structural stability of the regression model

Recall that earlier in the study, the two types of conditional expectation of the regression model in Equation (1) were evaluated. One was taken given the ITF dummy variable, $D_1 = 1$ that led to Equation (2), which is the regression for households that received input vouchers. The other was evaluated similarly, but given $D_1 = 0$ that led to Equation (3), the regression which represented households that did not receive input vouchers. Since the coefficient of D_1 was significant ($P<0.05$) in the regression results (Table 2) for the model in Equation (1), it was, therefore, appropriate to separate Equation (1) based on the values of D_1 into regression Equations (2) and (3). Following Gujarati (1995, p.512), the two regressions were then compared on the bases of the intercept and coefficients of the other explanatory variables. It was through such comparison that the study was able to determine whether or not ITF recipients were significantly better than non-recipients, in terms of household net maize grain available. To proceed, first Equations (2) and (3) are written in estimated form as follows:

[2] Further explanation for the interaction is provided under the subsection on Testing for Structural Stability of the Regression Model

Table 2. OLS results for analysing impact of input trade fairs on household net maize grain.

Variable	Unstandardised coefficients		Standardised coefficients	t	Sig
	$\hat{\beta}$	Std. error	Beta		
Constant	2.801	1.006		2.784	0.007***
Received ITF	0.877	0.377	0.468	2.325	0.023**
Sex	-0.01565	0.144	-0.008	-0.109	0.914
Educational status	-0.140	0.121	-0.090	-1.154	0.252
Family size	0.220	0.120	0.123	1.835	0.071*
Size of arable land	-0.03904	0.103	-0.029	-0.379	0.706
Soil fertility status	0.01226	0.172	0.005	0.071	0.943
Number of oxen	0.185	0.101	0.140	1.834	0.071*
Quantity of hybrid seed	-0.02136	0.109	-0.018	-0.196	0.846
Quantity of herbicide	0.09938	0.087	0.083	1.141	0.258
Quantity of pesticide	0.06165	0.108	0.043	0.569	0.571
Total grain harvested	0.399	0.049	0.661	8.211	0.000***
Age household head	0.219	0.223	0.070	0.984	0.328
Number of family members employed	0.439	0.124	0.260	3.537	0.001***
Interaction (ITF and hybrid seed)	-0.323	0.147	-0.457	-2.193	0.031**

	ANOVA					Model summary	
Model	***Sum of squares***	***df***	***Mean square***	***F***	***Sig.***	R^2	***DW***
Regression	59.527	14	4.252				
Residual	18.640	74	0.252	16.880	0.000***	0.762	1.570
Total	78.167	88					

***Significant at 1% significance level. **Significant at 5% significance level. * Significant at 10% significance level. Source: Authors' survey 2008).

$$\hat{Y}_1 = (\hat{\beta}_O + \hat{\beta}_1) + \hat{\beta}_2 X_2 + \hat{\beta}_3 \ln(X_3) + \hat{\beta}_4 \ln(X_4) + \hat{\beta}_5 \ln(X_5) + \hat{\beta}_6 \ln(X_6) + \hat{\beta}_7 \ln(X_7) + (\hat{\beta}_8 + \hat{\beta}_{14}) \ln(X_8) + \hat{\beta}_9 \ln(X_9) + \hat{\beta}_{10} \ln(X_{10}) + \hat{\beta}_{11} \ln(X_{11}) + \hat{\beta}_{12} \ln(X_{12}) + \hat{\beta}_{13} \ln(X_{13}) \quad \ldots\ldots(5)$$

And:

$$\hat{Y}_2 = \hat{\beta}_O + \hat{\beta}_2 X_2 + \hat{\beta}_3 \ln(X_3) + \hat{\beta}_4 \ln(X_4) + \hat{\beta}_5 \ln(X_5) + \hat{\beta}_6 \ln(X_6) + \hat{\beta}_7 \ln(X_7) + \hat{\beta}_8 \ln(X_8) + \hat{\beta}_9 \ln(X_9) + \beta_{10} \ln(X_{10}) + \beta_{11} \ln(X_{11}) + \beta_{12} \ln(X_{12}) + \beta_{13} \ln(X_{13}) \quad \ldots\ldots(6)$$

Then the estimates of the coefficients in the estimated regression equation in (4), as provided in Table 2, are substituted into Equations (5) and (6) to obtain:

$$\hat{Y}_1 = 3.678 - 0.01565 X_2 - 0.140 \ln(X_3) + 0.22 \ln(X_4) - 0.03904 \ln(X_5) + 0.01225 \ln(X_6) + 0.185 \ln(X_7) - 0.34436 \ln(X_8) + 0.09938 \ln(X_9) + 0.06165 \ln(X_{10}) + 0.399 \ln(X_{11}) + 0.219 \ln(X_{12}) + 0.439 \ln(X_{13}) \quad \ldots\ldots(7)$$

for households that received input vouchers, and:

$$\hat{Y}_2 = 2.801 - 0.0155 X_2 - 0.140 \ln(X_3) + 0.22 \ln(X_4) - 0.03904 \ln(X_5) + 0.01226 \ln(X_6) + 0.185 \ln(X_7) - 0.02136 \ln(X_8) + 0.09936 \ln(X_9) + 0.06165 \ln(X_{10}) + 0.399 \ln(X_{11}) + 0.219 \ln(X_{12}) + 0.439 \ln(X_{13}) \quad \ldots\ldots(8)$$

for households that did not receive input vouchers.

It was noted earlier, that the two regressions (2) and (3) differ only in the intercept and the coefficient of $\ln(X_8)$ (natural logarithm of quantity of hybrid seed) as follows:

Difference between intercepts: $(\beta_o + \beta_1) - \beta_o = \beta_1$

Difference between coefficients of $\ln(X_8)$: $(\beta_8 + \beta_{14}) - \beta_8 = \beta_{14}$

In these differences, substituting the estimates gives:

Table 3. Testing significance of impact of benefiting from Input Trade Fairs.

Explanatory variable	Function for recipients of input vouchers (D_1= 1)	Function for non-recipients of input vouchers (D_1= 0)	Difference between recipients and non-recipients
Constant	3.678	2.801	0.877**
Sex of the household head [ln(X_2)]	–0.01565	–0.01565	–
Educational status of head [ln(X_3)]	–0.140	–0.140	–
Family size [ln(X_4)]	0.220	0.220	–
Size of arable land [ln(X_5)]	–0.03904	–0.03904	–
Fertility status of the fields[ln(X_6)]	0.01226	0.01226	–
Number of owned-oxen [ln(X_7)]	0.1850	0.1850	–
Quantity of hybrid seed used ln(X_8)]	–0.34436	–0.02136	–0.323***
Amount of herbicide used [ln(X_9)]	0.09938	0.09938	–
Amount of pesticide used [ln(X_{10})]	0.06165	0.06165	–
Total quantity of grain received [ln(X_{11})]	0.3990	0.3990	–
Age of the household head [ln(X_{12})]	0.2190	0.2190	–
Number of employed family members [ln(X_{13})]	0.439	0.439	–

***Significant at 1% significance level. **Significant at 5% significance level. Source: Authors' survey (2008).

Difference between intercepts: $(\hat{\beta}_O + \hat{\beta}_1) - \hat{\beta}_0 = \hat{\beta}_1 = 0.877$ (p<0.01)

Difference between coefficients of ln(X_8): $(\hat{\beta}_8 + \hat{\beta}_{14}) - \hat{\beta}_8 = \hat{\beta}_{14} = 0.323$ (p<0.05)

The results of the test of structural stability of equation (1), as summarized in Table 3, indicate that having adjusted for the other factors affecting net maize grain availability in each of the Functions (2) and (3), the net maize grain available for ITF recipients was significantly (p<0.01) higher by 0.877 compared to that of non recipients. These results confirm that ITFs had made a significant positive impact on household food availability in the Ngwempisi constituency. The results also indicate that in the event recipients of ITF vouchers spend their allocation on an additional log of the quantity of maize hybrid seeds, and non-recipients increased their usage of these seeds by an equivalent amount, there is a likelihood that the net household maize grain will significantly (p<0.01) be reduced by 0.323 logs more for recipients than for non-recipients. The reason behind this observation is that owing to the high prices of maize hybrid seeds, ITF recipients that chose to buy more seed could only afford very small quantities, hence, reducing the chances of buying other complimentary inputs, considering the value of the vouchers allocated per household. Those that managed to have net maize grain probably bought large quantities of affordable maize seed varieties from cheaper suppliers and were able to purchase other agricultural inputs such as fertilizer that are known to improve productivity (Rutsch, 2003). These findings conform to what was observed by Longley et al. (2005) that in most developing countries, the price of formal sector seed is normally between two to five times higher than informal sector seed. The formal sector in the case of Swaziland refers to the big urban-based agricultural input suppliers, whereas the informal sector refers to the rural based small-scale seed producers that are trained by the Ministry of Agriculture in on-farm seed production.

A test of homogeneity of variances of the errors for the two groups (ITF recipients and non-recipients) was also conducted based on the dummy variable (D_1). Using the Levene's test, the results indicated that there was no homogeneity of variances of the errors for the two groups (F = 2.170, P = 0.098), hence, the results in Table 3 are justified (Brown and Forsyth, 1974).

Additional information gathered from respondents indicated that since inception, the ITF programme has made a significant impact in the lives of the beneficiaries. Most of the farmers

that benefited from the ITF programme (95.7%) have produced maize as the major crop and in conformity with the quantitative results, recipients managed to receive high yields (21.7% compared to 8.7% of non-recipients harvested at least 2.5 tonnes) because Ngwempisi has favourable climatic conditions. The perceptions of the farmers about how to improve the programme could be summarized into the following categories: proper targeting to ensure inclusion of the most vulnerable; such orphans and the elderly and exclusion of those that could afford the inputs (50.0% of farmers), increase of the value of the voucher to ensure affordability of inputs critical to increased production; such as basal fertilizer (30.4%), proper timing of the trade fairs to ensure effectiveness (7.6%), regular monitoring and evaluation of the programme (3.3%), and provision of only scarce inputs, such as seeds, fertilizers instead of tools (1.1%). The remaining 7.6% of the farmers did not provide their perceptions about the programme. Clearly, the results indicate that respondents felt that targeting had been one of the major challenges of the programme. Like other relief programmes implemented by Non-Governmental Organisations, the ITF programme was also found to be characterised by errors of inclusion and exclusion.

Another challenge experienced under the programme is the late scheduling. Respondents indicated that in the previous seasons, the programme was scheduled way after the first rains, denying beneficiaries an opportunity to plant early as usually advised by Extension Officers.

Conclusion

Using a comparative analysis between ITF recipients and non recipients, the study was successful in showing that Input Trade Fairs have a significant positive impact on household net maize availability. Although recipients are highly constrained by the value of ITF vouchers, the flexibility of the programme provides recipients with options to buy inputs of their choice, particularly those that they feel will enhance their plans of producing enough food for the household. Whilst inputs such as hybrid seeds are being promoted as a technology for achieving high productivity, the high retail prices restrict recipients to buy such inputs in small quantities, hence limiting odds of improving household food production.

The provision of farm input vouchers through the Input Trade Fairs programme should be continued as a temporary measure to respond to the current food crisis. However, concerted efforts must be made to eventually replace ITFs with long-term interventions as contained in the newly formulated National Programme for Food Security (GoS, 2006). As it is widely accepted that agricultural production is highly dependent on water availability, the programme should channel more emphasis towards water resources development and agricultural and livelihoods diversification. In the interim, ITF implementers and coordinators should ensure that fairs are staged well before the planting season in order to allow farmers enough time to plan for their various enterprises. Programme implementers should improve targeting for the purpose of minimising errors of inclusion and exclusion. This will reduce chances of having community conflicts that may end up affecting successful implementation of the programme. In order for the ITF programme to have a meaningful impact, recipients should be encouraged to produce according to agro-ecological suitability. This study, for instance, provided evidence to show that areas such as Ngwempisi, which is located in the Highveld, are still capable of producing maize under rain-fed conditions. This may not, however, be the case in the Lowveld, where some farmers still insist on planting maize under rain-fed conditions, despite being advised to consider drought-tolerant crops.

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