Farmers Perception and Adoption of Drought Tolerant Wheat Varieties in the Arid and Semi-arid Lands of Kenya

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Abstract

Wheat is an important cereal crop in Kenya and ranks second after maize in its cereal crop priority grown mainly in highlands parts of the country. About 20% of the country is classified as medium to high potential land ideal for wheat production. The limited ideal land for crop production has forced farmers to extend production in to the arid to semi-arid areas. Drought tolerant wheat varieties (DTV) have been developed for the Arid and Semi Arid Lands (ASAL) but adoption is generally low. Production has therefore lagged behind in meeting national demand resulting in importation in order to bridge the gap. This study was therefore designed to describe and determine farmer perception and adoption of drought tolerant wheat varieties by assessing socio-economic factors influencing adoption of DTV in the (ASALs) areas of Kenya. A sample size of one hundred and eight (108) wheat farmers from Ololung'a division of Narok and Isinya division of Kajiado districts respectively were randomly selected. The collected data was analyzed using SPSS version 12 for windows. Descriptive statistics like frequency distribution and inferential statistics like Chi-square and T-test were used. Farmer perception on drought tolerant wheat varieties was very low (0.9%) with majority of the farmers (77.8%) being uncertain of the objective of drought tolerant wheat varieties as a technology and its benefits. Eighty seven point nine percent (87.9%) of the farmers identified input cost as a major constraint and 85.1% lacked the relevant information. Opportunities for adoption cited by 91.6% of the respondents included the availability of the appropriate technology. There was no significant difference in perception between the farmers of Narok and Kajiado districts. However, there were significant differences in adoption levels by farmers with the average percentage for Narok mean of 1.58 being higher than Kajiado mean of 1.33 with a t-test value of -2.497; ($P<0.014$; $\alpha=0.05$. Age, gender, and education did not have any statistical significance relationship in the adoption of DTV but farm size, land tenure system and extension

services were statistically significant. It is therefore recommended that extension services be given great emphasize in the ASAL of Kenya.

Key words: Perception, adoption, drought tolerant wheat varieties ASAL

Introduction

About one fifth of the developing world's wheat (*Triticum aestivum* L) areas are located in environments that are regarded as arid and semi-arid lands (ASALs) for crop production because of drought, heat and soil problems (Torkamani, 2005; CIMMYT, 1997). Despite these limitations the world's arid and semi-arid lands and cropping environment are increasingly crucial for food security in developing world. Worldwide, land with inherent characteristics for arable crop production continues to decline, while population growth and demand for wheat are rising. Therefore gains in wheat production in ASAL environments are important because it is unlikely that increased production in the favourable environments will be sufficient to meet the projected growth demand for wheat from the present to 2020 (Alary *et al.*, 2007).

Wheat has been grown in Kenya since the turn of the 20th century at first by large-scale farmers and later by small-scale producers (Kinyua, 1997). It was traditionally cultivated in the high attitudes ranging from 1,800 meters above sea level to 3,000 meters above sea level. Recently wheat has been introduced into lower dry lands areas of Machakos, Naivasha, Koibatek and Lower Narok among others (Kinyua, 1997). There has been a slow growth rate of 0.9% while consumption of wheat products, spurred by population growth, urbanization and changing consumption habits has been increasing by 5.1% per year (FAO, 2002). For example, from 1980 to 2000, Kenya has gone from being self sufficient in wheat production to being a net importer to meet its consumption needs (FAO, 2002). The objective therefore of this study was to determine farmer perception and the socio-economic factors affecting adoption of drought tolerant wheat varieties in the arid and semi-arid area of Narok and Kajiado counties of Kenya. Though a number of drought tolerant wheat varieties are available in Kenya (Figure 1), adoption of these varieties of wheat has been very low among the farming communities in the arid and semi-arid lands (ASAL) of Ololung'a division of Narok and Isinya division of Kajiado districts. Thus, there was need for a study to identify and describe factors influencing adoption of drought tolerant varieties of wheat in arid and semi-arid land of Kenya which are vast and cover about 83% of Kenya's total land surface and support approximately 25% of the human population.

The purpose of the study was to identify and describe factors that influenced adoption of drought tolerant varieties of wheat in ASAL areas of Kenya so as to suggest remedies from the findings.

Process of Adoption

The decision to make full use of an idea, practice or technology as the best course of action available is adoption (Ajayi *et al*, 2003; Vago, 1990). It goes through the following stages; Knowledge stage- one become aware of the existence of innovation and can form a favourable or unfavourable opinion about it. Extension agents need to provide adequate information so that when people form opinions they should be sound opinion. To form sound or positive opinion, the new idea must be consistent with farmers' needs, attitudes, and current practices (Miyata and Manatunge, 2004). This is followed by interest stage where an individual becomes interested in the idea and seeks more information. At evaluation stage individual makes a mental evaluation of the new idea to his/her present and anticipated future situation and makes the decision either to try it or not. This is followed by trial stage where the individual uses the innovation on a small scale to determine its utility. This will lead to adoption where individual farmer accepts the innovation and commits oneself to its use.

The above adoption processes focus on farmers' characteristics as the main constraint of adoption. It assumes that barriers to adoption are largely psychological due to risk aversion, which is linked to farmers' conservative attitudes. These conservative attitudes vary among individuals of different educational levels, gender, age, and social status. Based on the degree of conservativeness, farmers have been classified as either early adopters or late adopters. This theory assumes that early adopters are less risk averse and will adopt innovations early. These innovations are adopted with considerable time lag by other farmers who observe their performance on the early adopter farms (Vago, 1990).

Materials and Methods

The Location of Study

The data in this study was obtained through a sociological enquiry research technique conducted in Narok and Kajiado districts, Rift Valley Province of Kenya in 2009. The study was carried out in Ololung'a division of Narok and Isinya of Kajiado counties of the Rift Valley Province of Kenya. The pastoral Maasai whose farming system is based on livestock mainly inhabit these two districts. Narok district is situated in the south western tip of Kenya and s divided into seven divisions namely Mau, Osupuko, Ololung'a,

Limotiok, Olokurto, Forest/Game parks and central divisions. Ololung'a division is further divided into five (5) location and eleven (11) sub-locations. It lies between latitudes 0^0 50' and 2^0 05' south and longitude 35^0 58' and 36^0 05 east. It occupies an area of over 17,128km^2. The average rainfall is <500-1800mm per annum with the lowest amount recorded of 50mm on the Loita plains. The large central plains are very dry with unreliable rainfall and infertile soils. Wheat is grown in Lower Highland zone (LH4), the Upper Midland zone is for ranching (UM and UM6). Most of the land in Narok falls under the category of trust land and less than half is mixed farming while large scale companies and wealthy individuals have introduced large scale cultivation of wheat barley and rapeseed. The soils of the district are diverse ranging from mountain soils to those on plains and seasonal swamps.

Kajiado district consists of almost entirely of ranching zones except for small areas near Kilimanjaro. It is bordered by the republic of Tanzania to the Southwest, Taita-Taveta and Kiambu district. The district is divided into six divisions namely Central (Isinya), Magadi, Loitokitok, Mashuru, Namanga and Ngong. Central (Isinya) division is further divide into twelve (12) locations and twenty six sub-locations. The aim of the study was to determine farmer perception in adoption of drought tolerant wheat varieties in the Arid and Semi-arid lands of Narok and Kajiado districts.

Research Design and Population

The data collected through a sociological enquiry research technique using *Ex-post facto* design. It uses survey to examine effects of naturally occurring influence of independent variables on the dependent variable (Kathuri and Pals, 1993). A questionnaire was administered to one hundred and eight (108) sampled wheat farmers in the two districts. The choice of the two districts was purposive while random numbers were used to achieve the desired number of the farmers. The sampling procedure used was cluster sampling where farmers' were randomly selected from each cluster unit. The researcher used α=0.05 level for significant test and as a point at which to accept or reject the null hypothesis if the probability of obtaining the result by chance is α=0.05 or less.

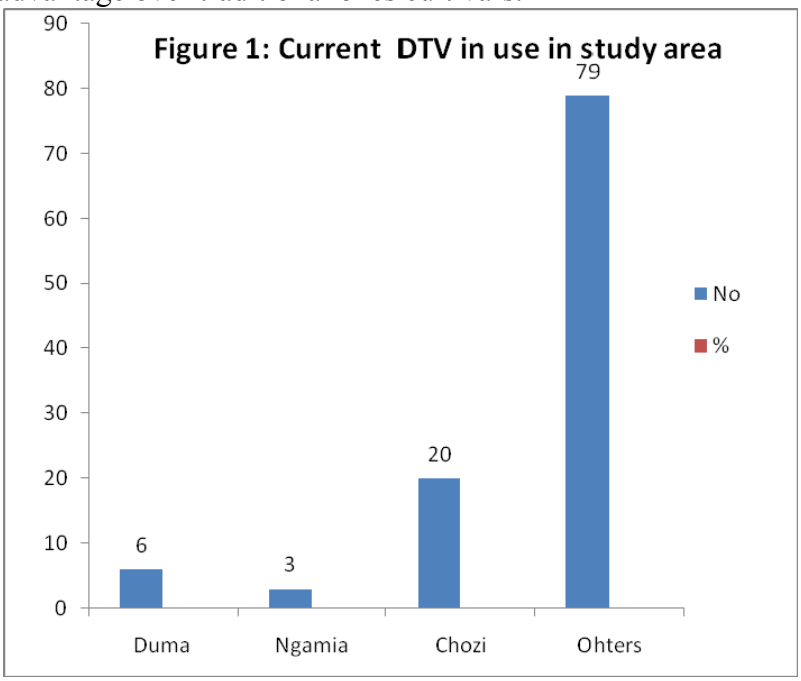
Statistical Analysis

The Statistical Package for the Social Sciences (SPSS) version 12.0 was used for analysis data especially Chi-square for relationship and T-test to assess the difference in perception of farmers in the two districts.

Results and Discussions

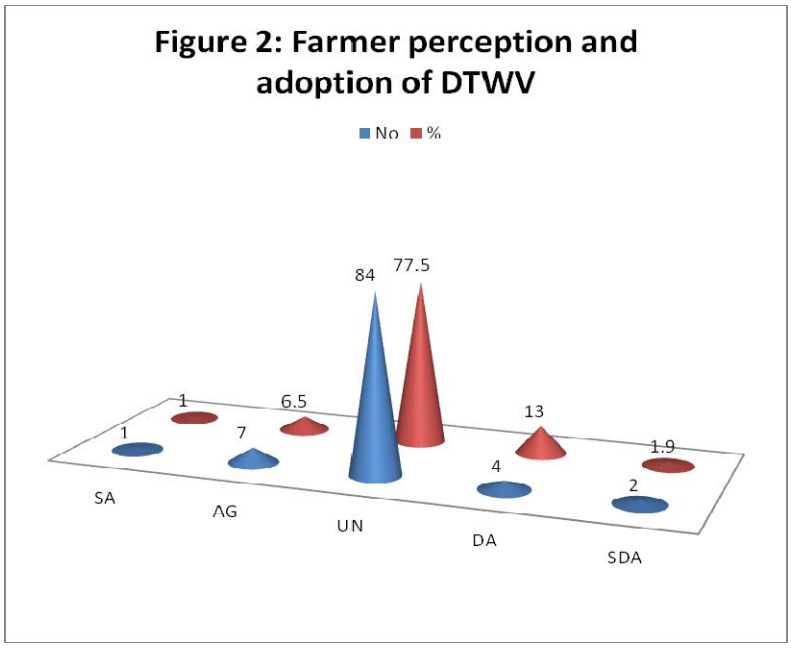
Frequency Distribution at which Farmer's Respondent to Various Levels of Perception

A majority (77.5%) of farmers were uncertain of the objective and relative advantage of planting drought tolerant wheat varieties (Figure 1). This is contrary to Amaza *et al*. (2008) who noted that higher yields of improved maize varieties were positively related to farmer perception and which influenced higher adoption. The second level of assessment showed that, 13% of the farmers disagreed on any advantages that come with DTWV in their farming activities. Only 6.5% of the farmers agreed with that DTWV had an advantage over traditional ones cultivars.



Farmers' response to triability of drought tolerant wheat varieties showed that 54.6% were uncertain of the performance of the technology. Farmers in general may want to try a new technology so as to observe its efficiency before adopting it. This implies that technologies must be able to lend themselves for trials before adoption (Abdulai and Huffman, 2005). Sometimes farmers would rather watch their neighbours adopt a technology before trying it out. This concurs with Ndiema (2010) who found that the more experience the farmer has the higher the intensity of adoption. About 23.1% of the farmers disagreed that the technology was complex i.e. a majority found it complex. The study also looked at farmer's awareness concerning drought tolerant wheat varieties which showed that it was not the

same in the two districts. This is supported by the fact that more farmers (58.3%) from Narok district were aware of DTWV compared to Kajiado with 33.3%. The service providers in Narok district were more aggressive in promotion of DTWV than those of Kajiado district. This means that information dissemination about drought tolerant varieties in Kajiado should be given priority by the ministry of agriculture and other extension service providers in the area. This phenomenon was also assessed by examining the presence of drought tolerant varieties found in the area of study. Figure 2 shows Duma was known by 5.6%, Ngamia 2.8% and Chozi 18.5% and others 73.1%. The highest percentage of farmers planted varieties that were not drought tolerant.



Key: Strongly Agree (SA), Agree (AG), Uncertain (UC), Disagree (DA), strongly disagree (SDA)

T-test Differences in Perception of DTWV by Farmers between the Two Districts

There was no statistical significant difference in perception by farmers of Narok district and Kajiado districts concerning the drought tolerant wheat varieties which is shown on Table 1. This means that the relative advantage of the technology for Narok 2.54 compared to 2.69 for Kajiado at a t-test of -1.034; $P \leq 0.303$ at $\alpha=0.05$ were nearly similar. The study shows that complexities presented by technology to the farming communities and their averseness to the technology was not significant. This finding concurs with Wubeneh and Sanders (2006) who found that farmers perceptions of

technology characteristics influenced its adoption. Simple technology can easily aid farmer perception and influence its uptake. The fact that no significant difference was found between Narok and Kajiado farmers implies that they experience similar difficulties in positive perception of drought tolerant wheat varieties.

Table 1: A t-test analysis of differences in perceptions of farmers of Narok and Kajiado

Farmers' perception	Narok		Kajiado				
	Mean	**STD**	**Mean**	**STD**	**df**	**t-test**	**P value**
DTWV Advantage	2.54	0.73	2.69	0.71	106	1.03	0.30NS
DTWV Consistent	2.89	0.54	2.97	0.56	106	0.74	0.46NS
DTWV Triable	2.92	0.96	2.81	0.71	106	0.62	0.40NS
DTWV Complex	2.90	0.67	2.83	0.37	106	0.57	0.56NS

* P<0.05, NS: Not significant

Chi-square Relationship between Socio-economic Characteristics and Adoption of DTV

Chi-square relationship between gender and adoption of drought tolerant varieties was not statistically significant $\chi 2$ calc. =2.59, 1 df < χ^2 crit. value =3.841; P≤0.459 at α =0.05 and so was education level with χ^2 calculated 12.39 at 9 df with χ^2 critical value 16.92; P≤0.17 at α=0.05 (Table 2). This concurs with findings by Doss and Morris, (2001) on adoption of maize in Ghana where technology adoption decision dependent on access to resources rather than gender. It was also found that farmer characteristics that included gender and contacts with extension agents influenced adoption positively. The analysis on Education levels of the farmers and adoption of DTWV in ASAL was the same across the varieties in the two districts of Narok and Kajiado. The results show that DTWV for ASAL was independent of education in that farmers of both informal and tertiary were not different in their knowledge and its adoption. Dadi, *et al.,* (2004) also found that education and gender had little or no influence on adoption behaviour of farmers in Ethiopia. Studies by Weir and Knight, (2004) however show that education level of a farmer encourages early adoption. Land tenure system and extension service significantly influences adoption of DTV with χ^2 cal. =22.11, 9df, χ^2 crit. = 16.92; P<0.009; α =0.05, and showed that χ^2 calc. =17.24, 9df, χ^2 crit.=16.92, P<0.045; α=0.05 respectively. Land tenure system is an institutional arrangement that is important in diffusion of information of any agricultural technology. Farmers must perceive benefits accrued from investment made in new technologies before considering change of current farm practices. Farmers must have rights to land resources,

which they are operating if technology improvements have to be implemented as noted by Perz (2003). Mugisha *et al.* (2004) however found land tenure was the reason for non-adoption of IPM in Uganda although land tenure system was an inflexible constraint in adoption. The farmer's right to land resource should not be interpreted to mean that private ownership is the only form of land tenure which enhances adoption of technology. The study also looked at extension service information flow to the farmers and its ability to influence adoption of technology. Several studies have indicated a positive relationship between contact with agricultural extension information sources and adoption (Moser and Barrett, 2006; World Bank, 1993). Farmers who have been exposed to an intensive extension education adopted many agricultural innovations in contrast to neighbours who are not exposed to extension campaigns.

Table 2: Chi-Square relationship social characteristics and adoption of DTV

Social characteristics	**Drought tolerant varieties**					
Gender	**Duma**	**Ngamia**	**Chozi**	**Others**	χ^2	**P**
Male	5	3	19	65	2.5	0.46
Female	1	0	1	14		
Informal	0	0	7	17		
Education						
Primary	0	1	5	15	12.3	0.17
Secondary	4	2	7	42		
Tertiary	2	0	1	5		
Land tenure						
Personal	1	2	14	53		
Rent/hire	3	1	3	18	22.1	0.00**
Communal	0	0	3	6		
Family	2	0	0	2		
Fellow farmers	2	1	12	26		
Research	3	0	0	10	17.2	0.045*
Extension services						
Extension	0	2	6	31		
N/A	1	0	2	12		

ns=not significant; *=p≤0.05; **=p≤0.001

Conclusion

Lack of difference between the two districts as far as perception was concerned is explained by the fact that majority of the farmers were uncertain about drought tolerant wheat varieties. Majority of farmers still

cultivate other varieties other than the recommended drought tolerant wheat varieties for ASAL conditions.

Farmers still use inappropriate varieties in ASAL which is very low considering the number of years the technology has been in existence.

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