FACTORS INFLUENCING CLIMATE CHANGE AWARENESS: THE CASE STUDY OF SMALL-SCALE MAIZE FARMERS IN MPUMALANGA PROVINCE OF SOUTH AFRICA.

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ABSTRACT

Climate change is possibly the greatest environmental challenge facing the world this century. The impact of climate change is a reality and it cuts across all climate - sensitive sectors including the Agriculture sector. It well documented by several scientists, Intergovernmental Panel on Climate Change and other experts that climate change threatens sustainable economic development and the totality of human existence. This study was conducted in Nkangala District, Mpumalanga province. Mpumalanga province remains the largest production region for forestry and the majority of the people living in Mpumalanga are farmers and they have contributed immensely to promote food security. However, due to the impacts and threaten by climate variability and change which resulted into shortage of food production and changes in the rainfall pattern. It was noted that there is a need for climate change awareness across the agriculture sector including farmers. Random sampling technique was used to select two hundred and fifty one farmers to be interviewed. The questionnaire was administrated to farmers and included matters relating to climate change awareness and agronomic practices including maize production. Data was captured and analysed using software package for social science (SPSS version 20). Descriptive analysis was used to describe data and Multivariate regression analysis was conducted to demonstrate the relationship and association of variables. It was noted that the majority of farmers in this province need capacity building and also climate change awareness initiatives which would assist these farmers to build the adaptive capacity, increase resilience and reduce vulnerability.

Keywords: Climate Change awareness, Nkangala District Mpumalanga Province South Africa, Small Scale maize farmers.

1. Introduction

According to (Hughton, D. 2002) climate change is possibly the greatest environmental challenge facing the world today. The impact of climate change varies globally; however, the problem and the challenges of climate change are becoming more threatening to sustainable economic development and the totality of human existence (Adejuwon, S.A, 2004). Small-scale farmers suffer the most because of their dependence on rain-fed agriculture, limited financial capacity, low adaptive capacity, high dependence on natural resources, inability to detect the occurrence of extreme hydrological and meteorological events due to low technology adoption, limited infrastructure, illiteracy, lack of skills, level of awareness and lack of capacity to diversify (Kurukulasuriya, P. and R. Mendelssohn, 2006a). Maize constitutes about 70 percent of grain production and covers about 60 percent of the cropping area in South Africa. It is a summer crop, mostly grown in semi - arid regions of the country, and is highly susceptible to changes in precipitation and temperature [Durand, W. 2006 & Benhin, J.K.A, 2006). In addition, maize is the main staple food in Southern Africa, and maize production in the country constitutes about 50 percent of the output within the Southern African Development Community (SADC) region (Durand, W. 2006). Consequently, maize is one of the key drivers of food inflation in South Africa BFAP (Bureau for Food and Agricultural Policy, 2007). A considerable number of studies have been done to investigate the impact of climate change on yields of grain crops such as maize under controlled experiments (Du Toit *et al;* 2002 & Durand, W. 2006). There is very little awareness on climate change in the developing countries (IPCC, 1996: Climate Change 1995). The overall objective of the paper is (i) to create awareness through which farmers can understand the impact and the threats that climate change pose within the agriculture sector. (ii) Build adaptive capacity and reduce vulnerability facing small scale farmers in Mpumalanga Province. This will enable small scale maize farmers in Mpumalanga province to have basic understanding about the impact of climate change in their areas.

2. Materials and Methods

This paper used quantitative design as a well detailed structured questionnaire written in English language as part of the data collection methods. The questionnaires consist of a logical flow of closed ended questions which address issues related to climate change, agricultural production, yields etc. Data was collected through face to face interviews with the farmers and also the help of the extension officer where 251 questionnaires were administered in the study area. The study was conducted in Emakhazeni local municipality within the Nkangala district municipality in the Mpumalanga province of South Africa. Stratified sampling technique was used to select two hundred and fifty one farmers to be interviewed. Data was captured and analysed using software package for social science (SPSS version 20). Descriptive analysis was used to describe data and Univariate regression analysis was conducted to demonstrate the relationship and association of variables. The following econometric model was used to determine association of variables:

Wi = _ + _Xi + _i (1)

Wi is the dependent variable value for person i (2)

Xi is the independent variable value for person i (3)

_ and _ are parameter values (4)

_i is the random error term (5)

The parameter _ is called the intercept or the value of W when X = 0 (6)

The parameter _ is called the slope or the change in W when X increases by one (7)

3. Results and Discussion

As shown in Table 1, there is association among the following variables: gender, age, occupation, education, source of income, information on climate change, extension service, importance of information on climate and quantity of harvest. This is supported by the fact that their estimate values are more than 1 at 95% confidence interval.

Gender (Female) had significant impact on the level of climate change awareness. According to Table 1, the odds of climate change awareness are 1.00 percent higher for female households than male households. It is widely recognised that climate change does not affect people equally (UNEP, 2011). It was reported that women and men perceive and experience climate change in diverse ways because of their distinct socially constructed gender roles, responsibilities, status and identities, which result in varied coping strategies and responses (Luseno *et al;* 2003 & , FAO, 2010). The situation observed in Mpumalanga province is not different from a research conducted in Limpopo province by (Maponya, P. and S. Mpandeli, 2012) that women play a vital role in supporting households and communities, thus, they are more aware and adapt to climate change through experience gained in agricultural production and the fact that the majority of these women spend most of their time in the field ploughing, removing weeds, monitoring the crops, harvesting etc. Often, women are more vulnerable to climate change than men.

Age is another significant variable which is associated to climate change awareness. According to Table 1 the odds of climate change awareness are 1.00 percent higher across all age categories. This is not surprising because climate change awareness is made across all age categories even in the schools and out of the school through the use of fliers, posters and many medium. According to (Bayard *et al;* 2005) age is positively related to some climate change adaptation measures that are related to agricultural activities. According to (Okoye, 1998) found that age is positively related to the awareness and adoption of conservation measures. The result of this research agrees with the findings of (Yusuf, 2005) that most farmers are within their active years and can make positive contribution to agricultural production, thus farmers' age had a significant impact on the awareness of climate change.

According to Table 1 the odds of climate change awareness are 1.10 percent higher across all occupations. The study shows that occupations of the respondents have significant impact on the level of climate change awareness. This could be from the fact that some farmers take farming as a full time and some farmers take farming as part time activity but in each case, they all come across awareness either through indigenous knowledge or at their various place of work through adverts. According to (Adebayo Tukur, 2003) occupation has a significant association with awareness of climate change. The more they carry out farming activities, the more the awareness and adoption to climate change.

According to Table 1 the odds of climate change awareness are 1.01 percent higher across all educational levels. Many research studies have shown that education increases ones's ability to receive, decode, and understand information relevant to perception and making innovative decisions (Wozniak, 1984). However, the result from the study area showed that education increases the probability of the level of climate change awareness. According to (Noor, 1981) and (Omolola,

2005) are of the view that education facilitates farmers' understanding and use of improved crop technologies. According to (Anley & Haile-Gabrile, 2007) improving education and employment is the key to stimulate local participation in various adaptation measures and natural resource management initiatives.

According to Table 1 the odds of climate change awareness are 1.00 percent higher across for households who rely on maize as source of income than households who don't rely on maize as source of income. From the study, farmers who rely on maize as a source of income have no other job or extra source of income, than farming activities, thus, they are involve and concern about their environment in relation to their faming activities because they need to provide for the household thereby tends to be more aware of the climate change as an environmental factor responsible for production, unlike farmers who have other source of income apart from farming.

According to Table 1 the odds of climate change awareness are 1.53 percent for households with climate change information. This shows that climate change information is significantly associated with awareness level of climate change. This is not surprising because a study reported by (Luseno *et al;* 2003) said the more the farmers had access to extension services and information about climate change, the more they adapt to climate change. From this study, the amount on climate change information at farmers' disposal determines the level of awareness of climate change. According to (Pender *et al;* 2004), it is hypothesized that farmers who have significant extension contacts have better chances to be aware of changing climatic conditions and as well as adaptation measures in response to climatic changes.

Access to extension services is another significant variable which is associated to climate change awareness. According to Table 1 the odds of climate change awareness are 1.50 percent for households with access to extension services. The study shows that access to extension services significantly affects awareness to climate change. Extension services provide an important source of information on climate change as well as agricultural production and management practices. Farmers who have significant extension contacts have better chances to be aware of changing climatic conditions and also of the various management practices that they can use to adapt to changes in climatic conditions. The role of extension service is to provide information to extension clients in order to allow them to use available resources by increasing technological options and organizational skills that in turn allow them to take greater advantage of production and market opportunities (GoK, Government of the Republic of Kenya 2001). According to (Nhemachena, 2008, & Apata *et al;* 2009 & Deressa *et al;* 2009 & Bryan *et al;* 2009) they have indicated that access to extension services had a strong positive influence on adapting to climate change and awareness.

According to Table 1 the odds of climate change awareness are 1.12 percent for households who recognise the importance of climate change information. According to (Hassan and Nhemachena, 2008) farmers that perceive change in climatic conditions and farmers who have access to climate change information have higher chances of taking adaptive measures in response to observable changes. Importance of climate change information brings about awareness on climate change and enhances farmer's knowledge on adaptation to climate change.

According to Table 1 the odds of climate change awareness are 1.01 percent for households who received good quantity of harvest. Good quantity of harvest is another significant variable which is associated to climate change awareness. Though the relationship between seasonal climate variables can be quite complex, we expected that farm revenues would have a significant relationship with climate change awareness (Kurukulasuriya and Mendelssohn, 2006a).

4. Summary and Conclusion

Due to prevailing problems associated with changes in weather patterns such as high temperatures, changes in rainfall patterns and effect of greenhouse gases (GHGs), which has resulted in low crop production, food insecurity, low income for farmers, there is a need to investigate whether small scale maize farmers are aware of climate change. So this study will enable small scale maize farmers and households in Mpumalanga province to understand the meaning of climate change, by creating awareness through which households and farmers can cope with climate change. This will improve climate change adaptation and thus increasing maize production as well as income for households and farmers.

Table 1: Univariate regression analysis of potential determinants of climate change awareness and maize production

Variable	Total	(%)	OR [95%CI]
Females	52	20.7	1.00[0.508 – 2.711] 1
Age	251	100	0.99 [0.440 – 2.567] 1
Occupation	251	100	1.10 [0.675 – 3000] 1
Education	251	100	1.01[0.599 – 2899] 1
Source of income (Yes)	179	71.3	0.97[0.127 – 2.112] 1
Climate change info	251	100	1.53[0.76 – 3.555] 1
Extension Service	251	100	1.50[0.68 – 3.44] 1
Importance of info	251	100	1.12[0.576 – 2.666] 1
Quantity of harvest	251	100	101[0.11- 2011] 1

OR= Odds ratio; 95%CI = 95% confidence intervals; 1< = no association; 1> = association

REFERENCES

Adebayo A.A, and A.L. Tukur, 2003. Farmers' Perception of Environmental Problems in Adamawa State, Nigeria. African Journal of Environmental Management, Vol. 1.

Adejuwon, S.A, 2004. Impact of climate variability and climate change on crop yield in Nigeria. Contributed paper to Stakeholders workshop on Assessment of Impact & Adaptation to Climate Change (AIACC). 2-8.

Anley, Y., A. Bogale, and A. Haile-Gabrile, 2007. Adoption decision and use intensity of soil and water conservation measures by smallholder subsistence farmers in Dedo district, western Ethiopia. Land degradation and development, 18, 289-302.

Apata, T.G., K.D. Samuel, and Adeola, A.O, 2009. Analysis of climate change perception and adaptation among arable food crop farmer's in South West Nigeria. Contributed paper prepared for presentation at International Association of Agricultural Economists' 2009 conference, Beijing, China.

Bayard, B., C.M. Jolly, and D.A. Shannon, 2007. The economics of adoption and management of alley cropping in Haiti, *Journal of environmental management*, 84: 62 –70.

Benhin, J.K.A, 2006. Climate change and South African agriculture: Impacts and adaptation options. CEEPA Discussion paper No. 21. CEEPA, University of Pretoria, South Africa.

BFAP (Bureau for Food and Agricultural Policy), 2007. Modeling the economic impact of climate change on the South African maize industry, BFAP report # 2007 – 02.

Bryan, E., T.T. Deressa, G.A. Gbetibouo, and C. Ringler, 2009. Adaptation to climate change in Ethiopia and South Africa: options and constraints. Environmental Science and Policy, Vol 12:413-426.

D'Emden, F., R. S. Llewellyn, and M.P. Burton, 2008. Factors affecting adoption of conservation tillage in Australian cropping regions. The Australian Journal of Agricultural and Resource Economics.Vol 52: 169-182.

Deressa, T.T., R.N. Hassan, C. Ringler, T. Alemu, and M. Yesuf, 2009. Determinants of farmers' choice of adaptation methods to climate change in the Nile Basin of Ethiopia. *Global Environmental Change*, Vol 19:248-255, Featherstone.

Du Toit, A. S, M. A. Prinsloo, W. Durand, and G. Kiker, 2002. Vulnerability of maize production to climate change and adaptation assessment in South Africa. Combined Congress: South African Society of Crop Protection and South African Society of Horticulture Science; Pietermaritzburg, South Africa.

Durand, W. 2006. Assessing the impact of climate change on crop water use in South Africa. CEEPA Discussion Paper # 28. University of Pretoria, South Africa

FAO (Food and Agricultural Organisation), 2010. The State of Food and Agriculture - An FAO Perspective, Rome. London.

GoK (Government of the Republic of Kenya) 2001. National Agricultural Extension Policy-Ministry of Agriculture and Rural Development.

Hughton, D. 2002. Introduction to climate change: Lecture notes for meteorologists *page 13-15.*

IPCC, 1996: Climate Change 1995: The Science of Climate Change [Houghton, J.T., et al. (eds.)]. Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA, 572 pp

Kruger, A. C, and S. Shongwe, 2004. Temperature trends in South Africa: 1960–2003. International Journal of Climatology24 (15): 1929–1945

Kurukulasuriya, P. and R. Mendelssohn, 2006a. Endogenous irrigation: the impact of climate change on farmers in Africa.CEEPA Discussion Paper No. 18. Centre for Environmental Economics and Policy in Africa. Pretoria, South Africa: University of Pretoria

Lambrou, Y. and S. Nelson, 2010. Farmers in a Changing Climate: Does Gender Matter? – Food Security in Andhra Pradesh, India. Food and Agricultural Organisation (FAO), Rome.

Luseno, W.K.., J.G. Mcpeak, C.B. Barrett, D. Little, and G. Gebru, 2003. Assessing the value of climate forecast information for pastoralists: Evidence from Southern Ethiopia and Northern Kenya. World Development, 31(9): 1477–1494.

Maponya, P. and S. Mpandeli, 2012. Climate Change and Agricultural Production in South Africa: Impacts and Adaptation options.

Nhemachena, C. and H. Hassan, 2007. Micro-level analysis of farmers' adaptation to climate change in Southern Africa. IFPRI Discussion Paper No. 00714. International Food Policy Research Institute, Washington, D. C.

Hassan, R and C. Nhemachena, 2008. Determinants of African farmers' strategies for adaptation to climate change: Multinomial choice analysis. African Journal of Agricultural and Resource Economics, Vol 2 No. 1:83-104.

Nhemachena, C., 2008. Agriculture and future climate dynamics in Africa: Impacts and adaptation options. PhD Thesis. Department of Agricultural economics, extension and rural development. University of Pretoria.

Noor, A. 1981. Educational and Basic Human Needs. World Bank Working Paper No. 450.

Okoye, CU, 1998. Comparative analysis of factors in the adoption of traditional and recommended soil erosion control practices in Nigeria. Soil & Tillage Research 45, 251–63.

Omolola, A. S. 2005. *Agribusiness credit in Nigeria: Dimensions of Institutional and Policy Deficiency.* A paper presented at the third National Conference of ARMTH in Ilorin. In: G.C Onubougu and B.C Nnadozie (Eds): Agricultural Rebirth in Nigeria. Proceedings of the 39th Annual Conference of the Agricultural Society of Nigeria. University of Benin, Nigeria, Pp44-49.

Pender, J, S. Ssewanyana, E. Kato, and E. Nkonya, 2004. Linkages between poverty and land management in rural Uganda: Evidence from Uganda National Household Survey, 1999/00. EPTD Discussion Paper No. 122.

UNEP, 2011. Women at the frontline of climate change gender risks and hopes. pp 19.

Wozniak, G.D., 1984. The adoption of interrelated innovations: A human capital approach. Review of Economics and Statistics 66 (LXVI): 70–79.

Yusuf, O., 2005. Economics analysis of 'egusi' melon production in Okehi Local Government Area of Kogi State, unpublished M.Sc. Thesis, Department of Agricultural Economics and Rural Sociology, Ahmadu Bello University, Zaria, Pp. 40-41.