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Full Length Research Paper

Impact of drought on food scarcity in Limpopo province, South Africa

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Drought in Limpopo province is having serious ecological and economic consequences and will pose an increasing challenge to communities as the global climate is changing. A representative sample of 300 farmers aged 16 to 65+ years was used. The study involved Sekhukhune and Capricorn districts. The following 11 local municipalities were visited: Elias Motsoaledi, Makhuduthamaga, Fetakgomo, Ephraim Mogale, Tubatse, Lepelle Nkumpi, Blouberg, Aganang, Polokwane, and Molemole. The results showed that current Limpopo province weather is dominated by drought and as results of the severe drought the province experienced reduced grazing and water for livestock and irrigation which negatively impacted the agricultural sector and hence resulting in food scarcity. The results also indicated that in some parts of the Limpopo province, farmers are already forced to sell their livestock because of drought conditions, and that there was a shortage of rainfall in the following years: 1982, 1983, 1984, 1986, 1990, 1991, 1992, 1993, 1994, 2002, 2003, 2005, 2008 and 2009, respectively. The results showed enhanced probabilities of 50% for above normal maximum temperatures in the entire Limpopo province. This is again raising very serious temperature trends in Limpopo province which will increase poor rainfall patterns and accelerate frequency of droughts.This will in turn place a serious challenge for agriculture, not only in the province but South Africa as a whole because a sharp decline in agricultural production would not only have implications for a province or country but also for the region as a whole.

Key words: Drought, climate variability, climate change, agricultural production, food scarcity, Limpopo province, South Africa.

INTRODUCTION

Limpopo Province is one of South Africa's richest agricultural areas. It is a major producer of vegetables. The subtropical climate enjoyed by much of the province gives rise to the cultivation of tea, coffee and fruits, especially tropical fruits. Forestry makes a major contribution to the economy, as do tobacco, sunflower, wheat, cotton, maize, and groundnuts. Livestock farming includes cattle ranching and game. The abundance of orchards with various sub-tropical fruits and nuts form the basis of a thriving agro-industrial sector (StatsSA, 2006).

Drought is emerging as one of the main challenges Limpopo province farmers will have to face for many years to come (Makhura et al., 2004). It could become a major threat to food security, as it has a strong impact on food production, access and distribution. Furthermore, given an estimate of 3 million farmers in South Africa who produce food primarily to meet their family needs, rural poverty in Limpopo province could be worsening with drought (StatsSA, 2007). Indeed, due to their low income, lower technological and capital stocks, households are predicted to have limited options to adapt to changing weather patterns like drought (Mendelsohn et al., 2000).

Drought is a serious problem in the province considering the fact that the province is in a semi arid area with low, unreliable rainfall (LDA, 2010). The impact of lower rainfall has negative effects on the agricultural sector, low rainfall resulting in decreases in agricultural activities, loss of livestock, shortage of drinking water, low yields and shortage of seeds for subsequent cultivation. Limpopo province is a

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Figure 1. Geographic location of the greater Sekhukhune and Capricorn districts in Limpopo province. Source: StatsSA (2006).

drought prone province which faces challenges of drought from time to time. As a result of the severe drought, the province experienced reduced grazing and water for livestock and irrigation which negatively impacted the agricultural sector. Limpopo province was worst affected by drought in the past eight years where dams were only 50% full, compared with 84% in late nineties. The agricultural sector is also seen as an important source of livelihood for the Limpopo province especially those in rural areas, but with extreme weather like drought, it is going to be very difficult for people to cope. It is quite disturbing that in some parts of the province, farmers are already forced to sell their livestock because of drought conditions. This will in turn place a serious challenge for agriculture and result insufficient/ shortage amount of food (food scarcity) not only in the province but South Africa as a whole. According to Makhura (2001), a sharp decline in agricultural production would not only have implications for a province or country but also for the region as a whole.

On the geographical locality of the study site, Limpopo province is situated in the northern part of South Africa. It is the gateway to the rest of Africa, with its shared borders making it favourably situated for economic cooperation with other parts of Southern Africa (StatsSA, 2011). Two districts were selected as the study areas, namely Greater Sekhukhune and Capricorn (Figure 1). This was based on different agricultural setups and the different climatic conditions.

The paper was guided by the following hypothesis: (a) In Limpopo province, areas that are hot and dry, increases in warming and declining precipitation are expected to have negative impacts on agricultural crop production, (b) in Limpopo province, there are districts that are experiencing dry and average wet conditions, increases in seasonal rainfall are expected to increase agricultural crop production, (c) improved access of Limpopo farmers to resources such as credit, extension, information etc, enhances farm level use of adaptation measures against changing weather patterns like drought. Considering the negative and unwanted impacts of drought and the geographic situation vulnerability of Limpopo province farmers especially its rural communities, there is a need to design purposeful, comprehensive/systemic mechanisms to cope with drought impacts. The first step in such a process is to obtain appropriate, up to date, relevant, exact knowledge and perception of the people involved in drought phenomena; and understanding its contexts, causes, interactions, and impacts. And the next step then

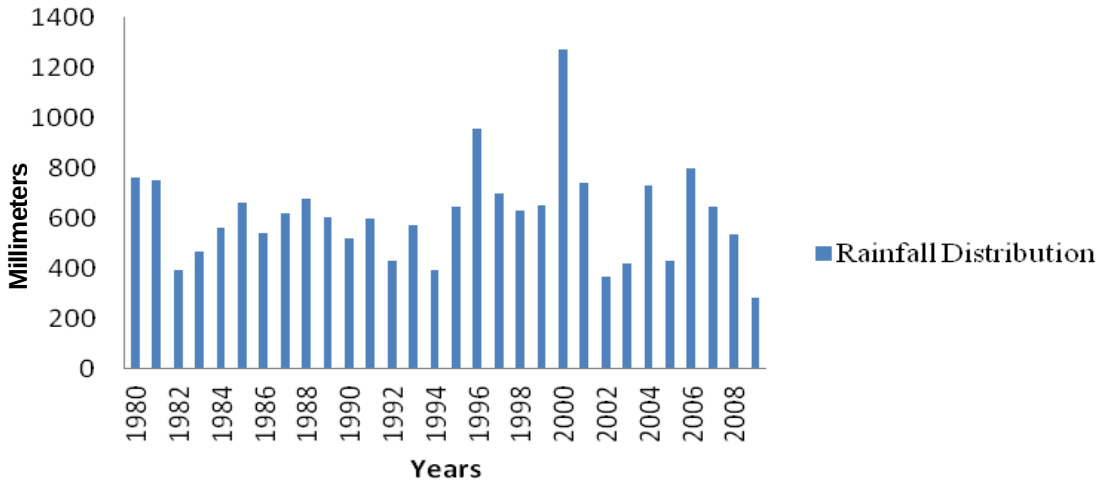

Figure 2. Rainfall distribution in Limpopo province (1980 to 2009). Source: SAWS (2012).

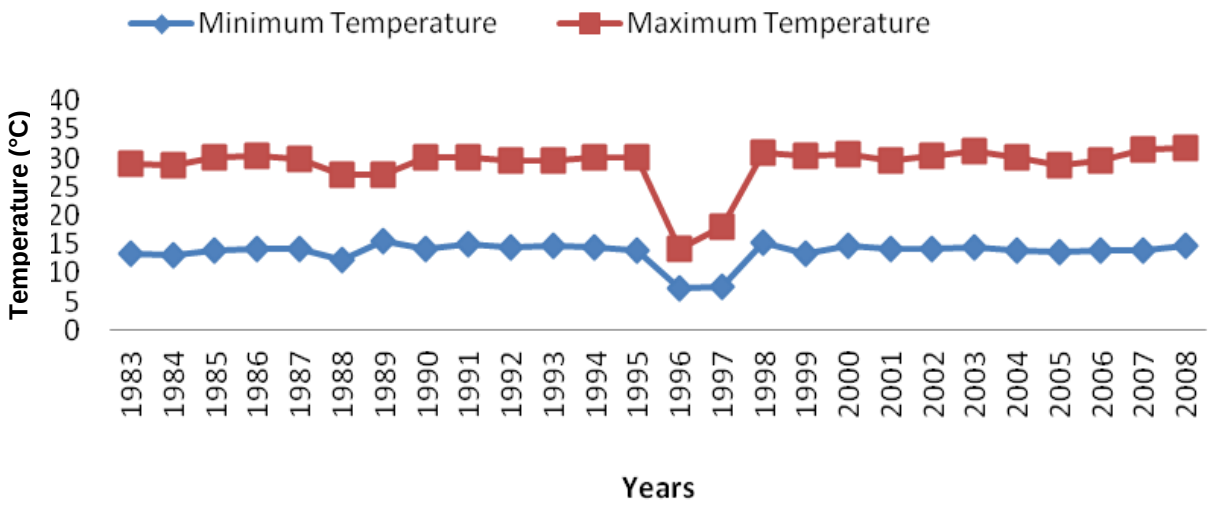

Figure 3. Capricorn district monthly average temperature: 1983 to 2008. Source: SAWS (2012).

would be identification of affective policies, approaches, and mechanisms for decision making and plans to cope with this phenomenon and reduce its impacts.

MATERIALS AND METHODS

This paper contains elements of both quantitative and qualitative research designs. According to Creswell (1994), mixed methods are used in order to explore a topic in breadth and depth, hence questionnaire which included matters relating to climate change and agricultural production was used in the interviews, and focus group discussions was conducted after face to face interviews with farmers.

Permission was asked from the two district offices to conduct research in their different local municipalities. The following local municipalities were visited: Elias Motsoaledi, Makhuduthamaga, Fetakgomo, Ephraim Mogale, Tubatse, Lepelle Nkumpi, Blouberg, Aganang, Polokwane and Molemole. The survey targeted three hundred farmers in Sekhukhune and Capricorn Districts. The two districts namely Sekhukhune and Capricorn were asked to provide the list of farmers in their municipalities.

Limpopo province is one of South Africa's poorest and it is against this background that more research is needed to develop its agricultural sector since majority of the communities depend on it. The selection of two districts were based on different agricultural setups and different climatic conditions.The purposeful sampling method used covered most of the productive farms in the two selected districts in the province and also covered the uniform or homogeneous characteristics of farmers. The sample frame was designed to meet the objectives of the study, and it had to adhere to the statistical specifications for accuracy and representativity.

Rainfall distribution for the past 29 years was obtained from the South African Weather Services as seen in Figure 2. Average monthly Capricorn temperatures for the past 25 years was obtained from the South African Weather Services as seen in Figure 3. Average monthly Sekhukhune temperature for the past 25 years was obtained from the South African Weather Services as seen in Figure 4. Current rainfall outlook in Limpopo province was also obtained from South Africa Weather Service as indicated in Figure 5. Current temperature outlook in

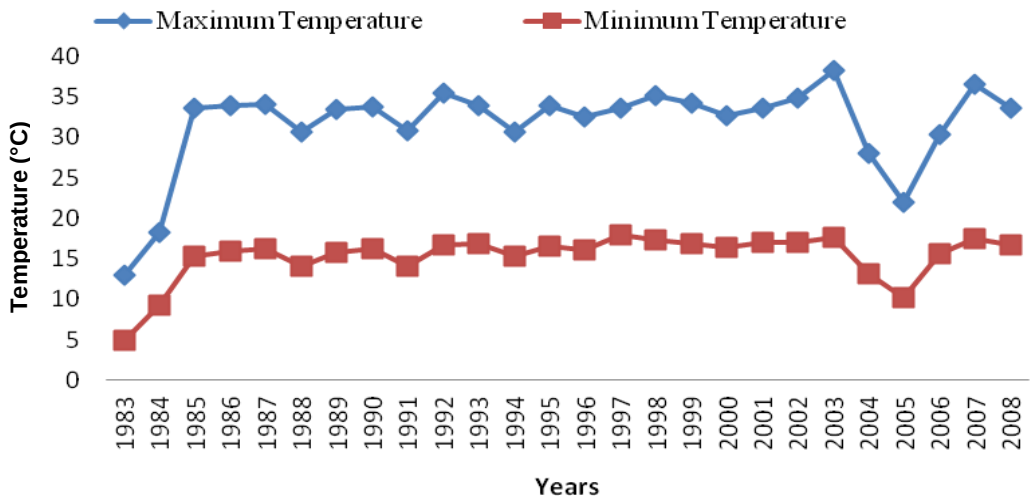

Figure 4. Sekhukhune district monthly average temperature: 1983 to 2008. Source: SAWS (South Africa Weather Service) (2012).

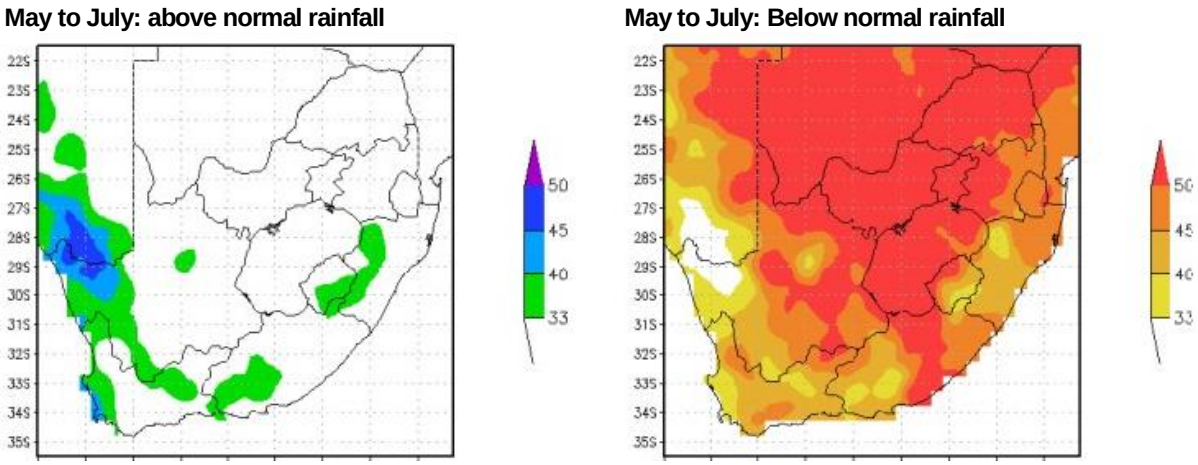

Figure 5. Rainfall outlook in Limpopo province: May to July, 2012. Source: SAWS (South Africa Weather Service) (2012).

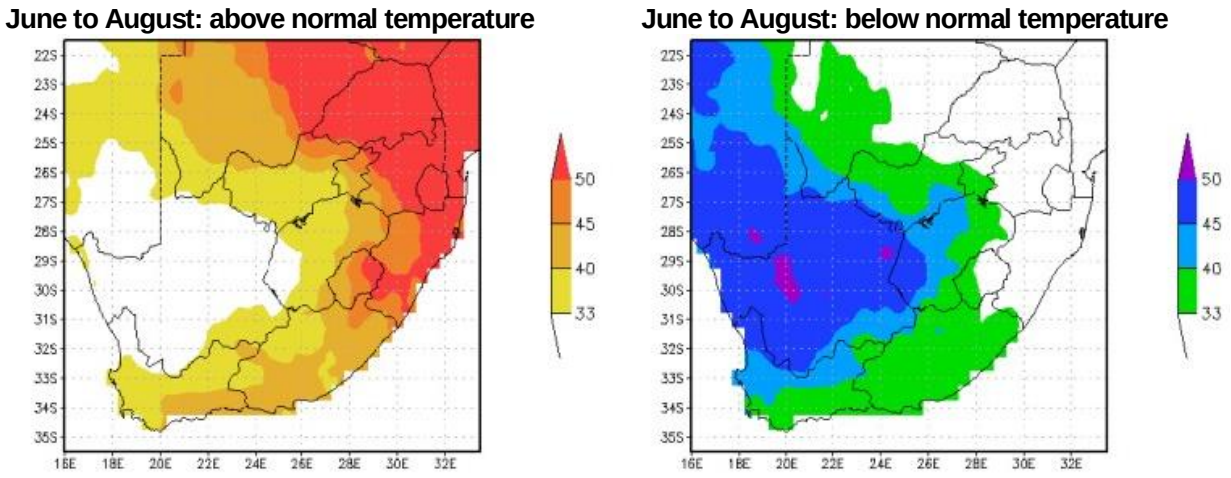

Figure 6. Temperature outlook in Limpopo province: June to August, 2012. Source: SAWS (South Africa Weather Service) (2012).

Limpopo province was also obtained from South Africa Weather Service as indicated in Figure 6. Univariate analysis was conducted to demonstrate the relationship between selected variables and food scarcity as stated in the general equation below:

$$Wi = \_ + \_Xi + \_i \quad (1)$$

where, Wi is the dependent variable value for person i, Xi is the independent variable value for person I, _ and _ are parameter values, _i is the random error term. The parameter _ is called the intercept or the value of W when X = 0, the parameter _ is called the slope or the change in W when X increases by one.

RESULTS AND DISCUSSION

Rainfall distribution in Limpopo province (1980 to 2009)

As indicated in Figure 2, there is variation in rainfall distribution in Limpopo province overtime. According to LDA (2010), Limpopo province average annual rainfall is 600 mm and the threshold for rainfall agriculture is averaged at 250 mm annually. It is evident from Figure 2 that there was a shortage of rainfall in the following years: 1982, 1983, 1984, 1986, 1990, 1991, 1992, 1993, 1994, 2002, 2003, 2005, 2008 and 2009, respectively. According to Letsatsi-Duba (2009), the occurrence of drought in 2009 was the worst ever in Limpopo province.

This is also evident in Figure 2 which shows rainfall averaged to 282.1 mm annually in 2009, nearly dropping below threshold for rainfall agriculture. There were also good rainfall years in Limpopo province as shown in Figure 2, especially 1980, 1981, 2000 and 2001, respectively. In general, it can be concluded that rainfall distribution has indeed changed in the past 29 years in Limpopo province, and information on rainfall amount and variability is important for improved decisions making with regards to planting time, crops choice and crop variety etc.

As a result of the rainfall fluctuations over the past 29 years, it is important for farmers in the province to adopt multi cropping system in order to counteract the problem of drought across the districts.

Capricorn district monthly average temperature (1983 to 2008)

Capricorn district average temperatures trends shows high levels which are above South Africa average temperatures. Only few years namely 1988, 1996 and 1997 shows average temperatures that are below South Africa average temperatures as indicated in Figure 3.

This situation is also supported by Kruger and Shongwe (2004) who found that there was a significant increase in temperature between 1960 to 2003 for Polokwane, Bela Bela and Musina stations in the Limpopo province. This condition has led to occurrence of droughts around Capricorn district and put most communities vulnerable to food scarcity.

Sekhukhune district monthly average temperature (1983 to 2008)

According to Climate Info (2012), average minimum monthly temperature in South Africa is at 14ºC and average maximum monthly temperature is 26ºC. As indicated in Figure 4, Sekhukhune district temperature has been changing overtime and showed high temperature levels which are above South Africa average. These results are consistent with Hughes and Balling (1996) who reported that there is an increase in average temperatures per decade over the period 1960 to 1990, and these trends were significant for both non urban and urban stations. Figure 4 shows that only average temperatures in 1982, 1983, 2004 and 2005 were below the South Africa average temperature. This result also explains why Sekhukhune district is frequented by droughts and poor rainfall.

Rainfall outlook in Limpopo province (May to July, 2012)

As indicated in Figure 5, the rainfall outlook for Sekhukhune and Capricorn districts looks very bad. The results indicated that the probability of both districts in receiving below normal rainfall is 50% for May to July, 2012. It is evident from Figure 5 that there is no/little probability for both districts to receive above normal rainfall. This will create lot of problems for farmers and it will require the use of adaptation measures like using of drip irrigation which saves water irrigating during cool conditions to avoid evapotranspiration and to adhere to the water restrictions issued all the time.

Temperature outlook in Limpopo province (June to August, 2012)

The results in Figure 6 shows that average temperatures in Sekhukhune and Capricorn districts for June to August, 2012 is high. The results showed enhanced probabilities of 50% for above normal maximum temperatures in the entire Limpopo province. This is again raising a very serious temperature trends in Limpopo province, which will increase poor rainfall patterns and accelerate frequency of droughts. Perceptions on long-term temperature are divided into five as can be seen in Figure 7. The results indicate that 54.7% of farmers perceive that long-term temperatures are increasing. This is true as Jarraud (2011) emphasised that over the last ten years, from 2001 to 2010, global temperatures have averaged 0.46ºC above the 1961 to 1990 average, and are the highest ever recorded for a 10-year period since the beginning of instrumental climate records. Only few farmers believed temperature was decreasing, which is an indication that there is change in temperature.

On the other hand, the overall perception on long term changes in precipitation is that Limpopo province as indicated in Figure 8 is getting drier and that there are

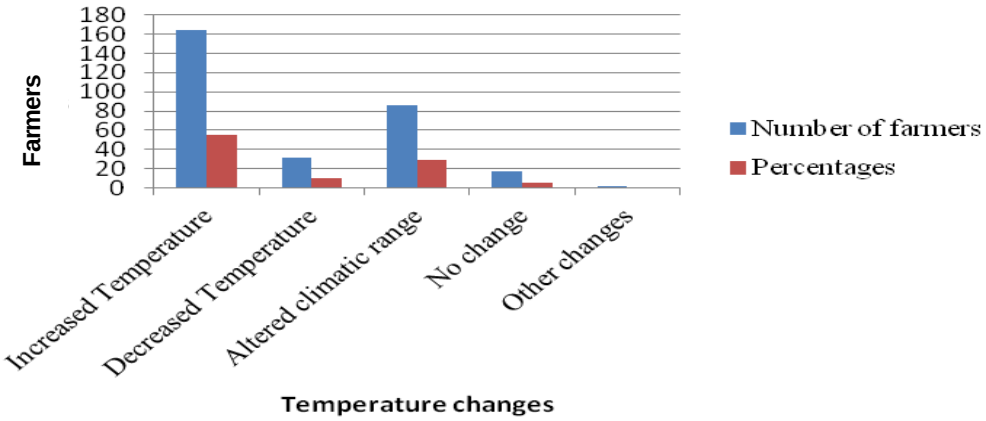

Figure 7. Perception on long term temperature changes.

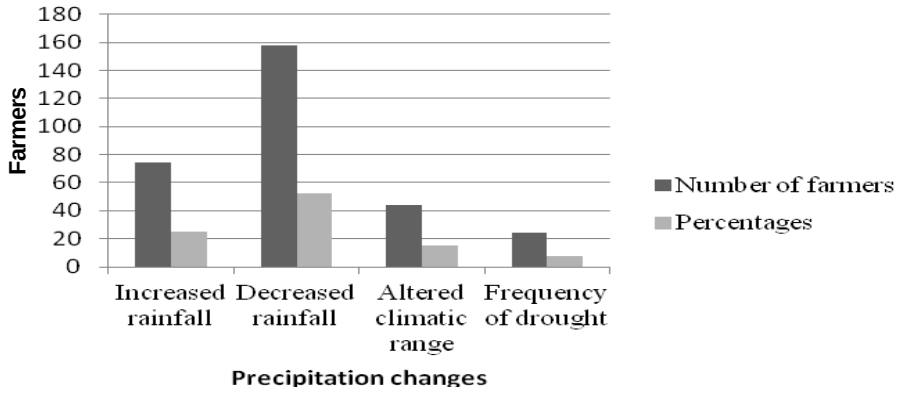

Figure 8. Farmers perception on precipitation changes.

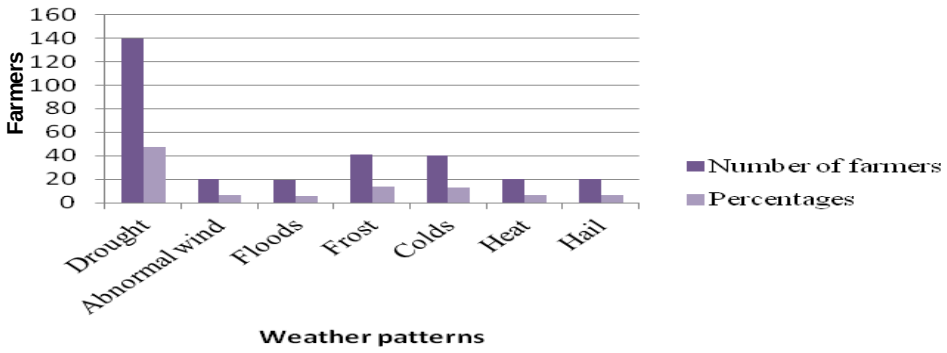

Figure 9. Current experience on weather patterns.

pronounced decreased rainfall altered climatic changes and frequency of droughts (52.7, 15 and 8%). This shortage of water will have a negative impact on agricultural production and thus resulting in food scarcity. It also evident from Figure 9, that current Limpopo province weather is dominated by drought as observed by 47% of farmers. This observation is in line with Letsatsi-Duba (2009) statement when she said Limpopo province is a drought prone province which faces challenges of drought from time to time. As a result of the severe drought, the province experienced reduced grazing and water for livestock and irrigation which negatively impacted the agricultural sector.

As indicated in Table 1, the odds of farmers to face food scarcity are 1.00 times higher for male farmers than female

Table 1. Univariate analysis of potential determinants of food scarcity.

Variable	Total	Food scarcity (%)	OR [95%CI]
Sex of farmers			
Male	136	18.4	1.00[0.373–2.403]
Female	164	17	1
Information of climate change			
Yes	171	13.5	2.01[1.103–3.667]
No	129	23.8	1
Adaptation to climate change			
Yes	55	10.9	1.78[1.013– 4.464]
No	245	17.9	1
Information received through extension Services			
Yes	146	17.8	0.95[0.517–1.730]
No	154	17	1

OR = Odds ratio; 95%CI = 95% confidence intervals.

farmers. This is true as IPCC (2011) emphasised that women's knowledge of seed varieties, cultivation, storage, and use is a valuable form of human capital that makes them food secure.

According to FAO (2011), women also play an important role in postharvest activities, and as grains or other crops come in from the fields, women decides what will be stored , processed and saved for next year crops. These activities make women farmers more food secure than men farmers, especially during drought periods.

According to Table 1, the odds of farmers to face food scarcity is 2.01 higher for those that have access to climate change information than those who did not have access to information. Again, the results raised the issue of type of information farmers are receiving and the source they use in getting accurate information regarding drought.

The following sources are more popular among farmers in the Limpopo province: (a) radios, (b) television, (c) newspapers and (d) magazines.

As indicated in Table 1, the odds of farmers to face food scarcity are 1.78 times higher for farmers who adapt to climate variability and change than those who cannot adapt to climate variability and change. In view of this, it can be deduced that farmers do not have enough adaptation strategies hence they are still vulnerable to food scarcity. The odds of farmers to face food scarcity are 0.95 times less for farmers who receive information through extension services than those who do not receive information through extension services. This reflects the importance of extension services to avoid food scarcity.

Through extension services farmers can receives skills, knowledge to produce food even in times of drought. It was also supported by Mmbengwa (2009) who said farmers with access to extension services have better chance of engaging more profitably in agriculture than those that have no access.

Conclusion

Drought is a recurring problem in Limpopo province. According to Mpandeli (2005), in times of drought, different coping strategies should be gathered, understood and shared amongst a range of end users for example, either by the National agro meteorological committee, research institutions such as Agricultural Research Council and the South African Weather Service.

Limpopo province farmers should also be encouraged to use drought-resistant cultivars during drought periods to avoid food scarcity.

Rainfall distribution and temperature trends are likely to increase the frequency and magnitude of extreme weather events such as droughts in Limpopo province which has already experienced some these weather events especially floods and droughts, example, floods that destroyed crops, infrastructure, affected the harvesting period in 2000 and January, 2012 .

While there is uncertainty in the projections with regard to the exact magnitude, rate and regional patterns of drought, its consequences will change the fates of generations to come.

According to UNFCCC (2008), Africa will be hit hardest by climate changes, as larger areas could be stricken by yield decreases of over 50% by the year 2020 as results of increasingly hotter and drier climate. This will threaten food security and people livelihoods in most parts of Africa and thus resulting in food scarcity.

This study examined the trends of climate change factors such as temperature, rainfall overtime which may results in food scarcity. The results from the present study could be used as a baseline in understanding the consequences of drought on food scarcity.

As such, the analysis utilized the Statistical Package of

Social Science Software to determine variables associated with food scarcity.

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