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PERCEPTIONS OF COMMUNAL LIVESTOCK FARMERS OF INSTITUTIONAL SUPPORT FOR CLIMATE CHANGE MEASURES IN AMATHOLE DISTRICT, EASTERN CAPE, SOUTH AFRICA

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Abstract:

Climate change related disasters such as floods, droughts and high temperatures subject livestock production to vulnerability. Responding to climate change disasters is thus crucial to improving agricultural production. To support effective adaptation, this study seeks to determine the perceptions of communal livestock farmers (CLFs) with regard to accessing support materials and implementing response strategies to climate change disasters. A snowball sampling method was used to select 388 communal livestock farmers from five villages in Raymond Mhlaba, Amahlathi and Ngqushwa Local Municipalities, in Amathole District Municipality. A Likert scale questionnaire was developed for perception measurement. Descriptive statistics and principal component analysis were used to analyse the collected data. Findings on perceptions revealed a poor response rate by government and poor access to support materials for farmers before, during and after climate change disasters. CLFs perceived the process of accessing relief material as arduous and slow. The results show correlations between capacity building, monitoring and awareness campaigns on climate change and poor monitoring of availability and quantity of water resources through extension officers. The study recommends the capacitating of communal livestock farmers on effective mitigating strategies that may be employed before climate change disasters strike. Awareness campaigns and steps taken before, during and after disasters should form part of the capacity development of CLFs. The use of mass media and social media should be incorporated into awareness campaigns and form part of reporting to government departments. Relief materials disseminated during periods of disaster should be tagged 'national emergency' to speed up their distribution and use.

Key words: indigenous knowledge, disaster management, policy implementation, response, support material, and training

1. Introduction

African Development Bank Group (2016) disclosed that in 2014, over 60% of the people in Africa lived in rural areas and relied on agriculture for their livelihoods (Ssozi *et al.,* 2019:284). Likewise, in the development of Sub-Saharan Africa (SSA), agriculture plays a crucial role as the major source of income, food and employment, and as such is an effective bulwark against poverty (Ssozi *et al.,* 2019; Gwiriri *et al.,* 2019; Salahuddin *et al.,* 2020:2). In South Africa, 82% of land is suitable for agriculture; the communal farming sector occupies an estimated 17% of this land and accounts for 40% of the estimated 13.4 million cattle currently held in South Africa (Department of Agriculture Forestry and Fisheries [DAFF], 2017). Although livestock are found throughout the country, the highest numbers are concentrated in the Eastern Cape Province (Goni *et al.,* 2018:34; Department of Rural Development and Agrarian Reform [DRDAR], 2014). The communal farming areas of the Eastern Cape Province are characterised by villages, which consist of residential areas, cropping areas and grazing areas, with grazing land shared by different livestock (Goni *et al.,* 2018:34). Cattle, sheep and goats have long provided multiple and diverse roles essential for attaining livelihood, food and nutrition security (Mapiye *et al.,* 2019:1; Molotsi *et al.,* 2020:1; Goqwana *et al;* 2008: Gwiriri *et al.,* 2019). Global climate change is one of the greatest environmental challenges facing the world this century (Harris, 2017). Concerned with the implications of global climate change, several governments came together in 1988 and formed the Intergovernmental Panel on Climate Change [IPCC] (Department of Environmental Affairs and Tourism, 2004; Department of Environmental Affairs, 2017). This led to the United Nations Framework Convention on Climate Change (UNFCCC), which was tabled in 1992 at the United Nations Conference on Environment and Development (Morna, Dube, Makamure & Robinson, 2014). The South African government became a signatory to the UNFCCC in August 1997 (Department of Environmental and Traditional Affairs [DETA], 2004). In addition, the South African government endorsed its own national climate change response policy White Paper [NCCRPWP] in 2011 (DETA, 2011). The policy aimed at one key objective: 'Effectively manage inevitable climate change impacts through interventions that build and sustain South Africa's social, economic and environmental resilience and emergency response capacity' (Department of Environmental Affairs [DEA], 2011:5). The response capacity of the government was divided into mitigation interventions and adaptation interventions. In the Eastern Cape Province, South Africa, communal livestock

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farming is a common practice. However, the practice is prone to climate variability that could have effects on livestock production and hence on human welfare and survival. Although climate change is a physical process, its rapid negative impacts cut across social, cultural, ecological, political, and economic sectors and determine prospects for water, food and health security (Barners *et al.*, 2013:541; IPCC, 2014). Farmers, especially the resource-poor whose livelihoods and welfare are directly affected by climate change risks, undoubtedly hold a long-term concern of climate change and its associated risks (Barnes et al., 2013; Niles & Mueller, 2016:133), as it affects their incomes. The National Climate Change Response Policy (NCCRP) is central to South Africa's climate change response, particularly in the agricultural sector. The National Climate Change Response Policy White Paper (NCCRPWP) has extensively documented its climate change adaptation objectives and strategic priorities, its disaster risk reduction plan and land and water management adaptation policies, all of which are required to aid South Africa's transition from a climate-sensitive to a climate-resilient state. Agricultural extension services play a significant role in the implementation of the policy. The service is regarded as a critical institutional actor in the implementation of adaptation responses, before, during and after disaster. Meanwhile, several climate change-related events have been reported in the Eastern Cape Province (ECP) in recent years. For example, a heavy rainstorm in 2009-2010 wreaked havoc on communal areas of Mthatha, Ntabankulu and Mtlontlo (International Federation of Red Cross and Red Crescent Societies [IFRCRCC], 2011), destroying houses, farms and infrastructure across the affected area. Floods were also experienced in Port Alfred and surrounding coastal areas in 2012 (Pyle & Jacobs, 2016:1). A year or two earlier, hail storms affected the Eastern Cape where properties and crops were damaged and livestock killed, with about 500 households affected and over 1500 displaced (IFRCRCC, 2011). The perceptions of affected farmers would be valuable for institutions responding to the vagaries of climate change. Several studies concur that perception is the process by which organisms interpret and organise sensations to produce a meaningful experience (Lindsay & Norman, 1977; Ndamani & Watanabe, 2015; Pickens, 2005). Thus, perception is key, and has been observed to influence how farmers cope and adapt to climate change (Molua, 2014; Mustapha *et al*, 2013). As opined by Popoola, Yusuf and Monde (2019:47), an understanding of the perceptions of smallholder farmers could be vital for a better understanding of the kinds of mitigation strategies that would be most effective. According to Wiid and Ziervogel (2012: 153), 'assessing the experiences, perceptions and responses of stakeholders to relatively recent changes in climate can support the development of adaptive capacity and help to ground policy in local realities'. It is on the basis of these facts that the study sought to understand the perceptions of communal livestock farmers with regard to climate change, before, during and after disasters, the severity of attendant risks and the threat that climate change posed to sustainable farming.

2. Main Text

The study was conducted in Amathole District Municipality in the Eastern Cape Province of South Africa. Three local municipalities were randomly selected; Raymond Mhlaba, Amahlathi and Ngqushwa. Raymond Mhlaba Local Municipality is situated in a semi-arid environment, Amahlathi is an area dominated by woodland, and Ngqushwa is a coastal area. On the basis of the snowball sampling technique, a total of 388 communal livestock farmers (CLFs) were sampled in five communities (Endulwini, KwaManana, Mqukwana, Endlovini, and Lower Qetho) which cut across all three local municipalities. A Likert scale questionnaire was developed based on a review of the relevant literature and the policy guidelines stipulated by the Eastern Cape Provincial Policy on Climate Change, comprising 36 statements to which respondents had to agree or disagree. Statements covered the perceptions of the farmers on 1) support material provided before disasters; 2) relief materials provided during disasters; 3) relief material provided after disasters. The Likert scale questions allowed for responses that varied from strongly disagree (5), disagree (4), don't know (3), agree (2) to strongly agree (1). Total and mean perception scores were computed for each support item, after which a cut-off mean score of 3.5 [(5+4+3+2+1) /5+0.5)] was used to differentiate between the various levels of supports (before disaster, during disaster and after disaster) for the CLFs. A rating of $\geq$3.5 indicated ineffective climate change awareness and poor support, while <3.5 indicated effective climate change awareness and good support. Content and face validity of the questionnaire was also calculated. The Cronbach's alpha reliability coefficient was 0.82. The demographic characteristics of communal livestock farmers revealed that more males (54%) were involved in livestock production than females and that 38.5% were between the ages of 60-69 years. About 52.1% of the respondents had primary school as their highest level of education. A significant number (63.9%) of respondents were married, and the majority (82.0%) had up to five occupants per household; only about 0.5% of the respondents had more than 15 occupants per household. Descriptive statistical analysis was done, while an exploratory Principal Component Analysis (PCA) (Orthogonal rotation technique) was performed on the data collected for the CLFs, using SPSS version 2 (2021).

2.1 Perceptions of access to support materials for cattle production

The study assessed the perceptions of livestock farmers with regard to accessing support materials for cattle production in the study area. Thirteen variable factors were analysed (see Table 1); of all the variables, three yielded a result of $\geq$3.5. The first of these was that government responded quickly to support farmers affected by climate change disasters (CCD) (X =4.51); the second was that livestock farmers were encouraged to keep fodder

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banks and crop residues for animal feed (X=4.58) and the third was that monitoring of environmental conditions related to potential droughts was adequate (X=4.61). The findings confirm the difficulties faced by the livestock farmers with regard to the process that must be followed for accessing support materials for cattle production.

2.2 Perceptions of support materials provided before disasters

Table 2 presents the livestock farmers' perceptions of the support materials provided before climate change disasters in the study area. Six yielded a result of ≥3.5. The items are: There is massive education and training by government for livestock farmers on CCD (X=4.5); Extension services conduct training on CCD management (X=4.60); Climate-smart training on livestock management was provided to farmers (X=4.49), The procedure for reporting CCD was spelled out clearly to farmers in training (X=4.57), Farmers ensure that they are registered on government database so that they benefit in times of disaster (X=4.51), and Establishment of relevant association that assists with disaster relief X=4.58). The findings indicate there has been poor dissemination of support materials and training for livestock farmers before disasters. This means that livestock farmers are not adequately prepared before disasters strike.

2.3 Perceptions of relief material provided during disasters

Eight items were analysed to ascertain how the livestock farmers (LF) perceived the support materials provided during disasters. All eight items had values below the 3.5 mean score benchmark, indicating good support to the farmers during disaster. See Table 3.

2.4 Perceptions of relief material provided after disasters

Table 4 shows the results of questions on the livestock farmers' perceptions of relief materials provided after climate change disasters. The findings show that one item out of the five was not significant: Farmers and other stakeholders organised into a forum to discuss issues relating to disaster (X=4.51). This indicates that no interaction is taking place amongst farmers at a formal level, where farmers might get to share ideas and information relating to climate change disasters.

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Table 1: Perceptions of access to support materials for cattle production (n=388)

Support material	SA	A	NE	D	SD	%	Mean scores	Std Dev.
Government responded quickly to support farmers affected by CCD	3	4	24	118	239	100	4.51	.751
Livestock farmers were encouraged to keep fodder banks and crop residues for animal feed	7	2	25	82	272	100	4.58	.782
The procedure to access relief material was too long	246	99	37	5	1	100	1.49*	.741
Farmers only were supported, with poor attention to livestock	3	59	309	13	4	100	1.89*	.518
Government relief materials (feed, water) were inadequate	260	104	3	3	18	100	1.49*	.935
Inadequate actions were taken to prevent or reduce the effects of disasters	41	54	264	18	11	100	2.75*	.805
There was poor infrastructure for mitigation measures to take place	264	77	13	7	27	100	1.58*	1.108
Poor early warning information was provided on possible disasters	309	61	11	1	6	100	1.25*	.655
Limited training of farmers and department officials on the use and interpretation of disaster information systems	256	108	17	1	6	100	1.39*	.707
Poor development of farmers' skills on the identification of livestock for submitting applications	295	75	8	6	4	100	1.29*	.672
There was adequate monitoring of environmental conditions related to potential droughts	12	10	5	66	295	100	4.61	.896
There was poor monitoring of availability and quality of water resources through extension officers	293	67	10	7	11	100	1.37*	.855
Farmers ensure livestock infrastructure is adequate to provide shelter during disasters	292	72	4	6	14	100	1.37*	.865

Strongly Agree (SA), Agree (A), Neutral (NE), Disagree (D), Strongly Disagree (SD)

- * = Significant if the mean score is <3.5. Source: Field survey

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Table 2: Perceptions of support materials provided before disasters (n=388)

Perceptions	SA	A	NE	D	SD	%	Mean scores	Std Dev.
There is massive education and training by government for livestock farmers on CCD	20	9	3	69	287	100	4.53	1.035
Extension services conduct training on CCD management	13	14	4	53	304	100	4.60	.968
Climate-smart training on livestock management was provided to farmers	17	8	5	95	263	100	4.49	.968
The procedure for reporting CCD was spelled out clearly to farmers in training	7	17	4	81	279	100	4.57	.868
Government focusses only on large-scale farmers	273	94	6	7	8	100	1.40*	.785
Limited training of farmers on the use and interpretation of disaster information systems	261	104	13	8	2	100	1.40*	.695
Poor development of farmers' skills on the identification of livestock for the submission of applications	105	268	11	3	1	100	1.76*	.566
There was a lack of training for livestock farmers on how to keep fodder banks and conserve crop residues as animal feed	270	104	7	6	1	100	1.36*	.627
Farmers ensure that they are registered on government database so that they benefit in times of disaster	13	6	15	100	254	100	4.51	.859
Establishment of relevant association that assists with disaster relief	3	9	15	99	262	100	4.58	.718

Strongly Agree (SA), Agree (A), Neutral (NE), Disagree (D), Strongly Disagree (SD)
* = Significant if the mean score is <3.5. Source: Field survey

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Table 3: Perceptions of relief materials provided during disasters (n=388)

Perceptions	**SA**	**A**	**NE**	**D**	**SD**	**%**	**Mean scores**	**Std Dev.**
Farmers identify and report incidents of disasters	329	39	11	6	3	100	1.24*	.654
Report any incident of disaster to the nearest local office immediately	264	64	32	27	1	100	1.54*	.931
Government assists in co-ordinating the application of disaster relief aid	283	50	44	8	3	100	1.46*	.962
Farmers always apply best farming practices at all times to prevent and mitigate future disaster**s**	60	275	35	17	1	100	2.03*	.668
Farmers are encouraged by government to acquire insurance plans	276	57	35	18	2	100	1.47*	.879
Farmers form part of the Disaster Management Committees	38	56	276	9	9	100	2.63*	.772
Farmers contribute to the Agricultural Disaster Management Stakeholders' Forum	283	56	49	0	0	100	1.32*	.685
Establishment of relevant association to assist in disaster relief	0	0	15	311	62	100	1.86*	.447

Strongly Agree (SA), Agree (A), Neutral (NE), Disagree (D), Strongly Disagree (SA)
* = Significant if the mean score is <3.5. Source: Field survey

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Table 4: Perceptions of relief materials provided after disaster (n=388)

Support material	SA	A	NE	D	SD	%	Mean	Std. Dev
Farmers and other stakeholders are organised in a forum to discuss issues related to disaster	7	19	18	70	274	100	4.51	.946
Farmers assist in coordinating information on disasters and relief materials received	64	288	15	10	11	100	1.95*	.773
Assessment takes place as and when a disaster has been reported, and appropriate response is conducted by farmers	324	37	20	2	5	100	1.16*	.652
Farmers ensure that livestock infrastructure is well maintained and operational to provide shelter during disasters	58	308	20	1	1	100	1.83*	.515
Farmers do not have evaluation and monitoring skills to assess the damages caused by disasters	277	96	15	0	0	100	1.26*	.514

Strongly Agree (SA), Agree (A), Neutral (NE), Disagree (D), Strongly Disagree (SD**)**
* = Significant if the mean score is <3.5. Source: Field survey

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2.5 Principal component analysis

KMO and Bartlett's test for the 36 climate change policy implementation guidelines for livestock farmers' stipulated by the Eastern Cape Provincial Policy on Climate Change was subjected to principal component analysis (PCA) (orthogonal rotation technique). Prior to performing the PCA, a test was performed for the suitability of the data for factor analysis. Inspection of the correlation matrix revealed the presence of many coefficients of .4 and above. The Kaiser-Meyer-Olkin (KMO) value was .859, exceeding the recommended value of .5 (Field, 2009). The value of the KMO suggests that the dataset was appropriate for PCA. Bartlett's test of sphericity revealed a significant result of $p<0.000$, which was significant (i.e., $p<0.005$), further supporting the data's suitability for factor analysis (Pallant, 2013). The factors selected (contingent upon the Kaiser criterion of an Eigen-value of ≥ 1) explained 72.75% of the variance. A principal component analysis (PCA) with varimax rotation was performed to ascertain the dimensionality of the skill item measures. The Eigen value and the scree plot suggested a set of 7-factor climate change policy guidelines (see Table 5). The seven factors accounted for 72.75% of the variance scores. The item loadings for the factors ranged from 0.827 to 0.866. Seven components that had an Eigen value of >1 were extracted. An interpretation of the scree plot (Fig.1) revealed inflexions that justified retaining five components. According to Costello and Osborne (2011), the content of a component can best be interpreted by examining the items with factor loadings of 0.4 or above; components with factor loadings greater than 0.4 were therefore included in the study's analysis.

Table 5: Total variance of the Eigen values from the 36 items

	Initial Eigen values			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings
Components	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total
1	13.550	37.638	37.638	13.550	37.638	37.638	11.036
2	4.137	11.491	49.129	4.137	11.491	49.129	5.239
3	3.113	8.646	57.775	3.113	8.646	57.775	3.016
4	1.542	4.283	62.058	1.542	4.283	62.058	2.279
5	1.465	4.070	66.127	1.465	4.070	66.127	1.643
6	1.312	3.644	69.771	1.312	3.644	69.771	1.533
7	1.074	2.983	72.754	1.074	2.983	72.754	1.446

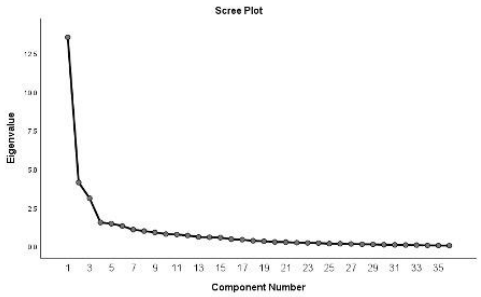

Figure 1: Scree plot of Eigen-values after PCA

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Factor loadings after rotation indicated that certain perception items clustered on the same component, with component 1 representing capacity building, monitoring and awareness campaigns on climate change, component 2 representing inadequate sensitisation of livestock farmers with regard to climate change, along with poor training and poor provision of government relief materials, component 3 representing poor monitoring and evaluation skills, and bureaucracy in accessing relief materials, component 4 representing the use of indigenous knowledge to mitigate against climate change, component 5 representing poor support to livestock farmers, component 6 representing farmers' membership of agricultural disaster management forums, reporting of incidents and coordination of responses to incidents when they occur, and component 7 representing poor strategies by government to mitigate against climate change disasters. Out of the 36 climate change policy implementation guidelines analysed, component 1 (capacity building, monitoring and awareness campaigns on climate change) correlated with 16 guidelines, having a high correlation of .904 with 'monitoring of availability and quantity of water resources through extension officers was poor' and lowest correlation of -.0522 with 'farmers form part of disaster management committees'. Component 2 (inadequate sensitisation of livestock farmers with regard to climate change, along with poor training and poor provision of government relief materials) was highly associated with 'limited training of farmers on the use and interpretation of disaster information systems' at .784, and the lowest correlation of -.486 with 'farmers ensure that livestock infrastructure is well maintained'. Component 7 (poor strategies by government to mitigate against climate change disasters) correlated only with 'Monitoring of environment conditions as related to potential drought occurence was adequate at -.535. Component 4 (the use of indigenous knowledge to mitigate against climate change) and component 6 (farmers' membership of agricultural disaster management forums, reporting of incidents and coordination of responses to incidents) correlated with three guidelines. Component 4 had the highest correlation at .858 with 'farmers always apply best farming practices at all times to prevent and mitigate future disasters' and lowest correlation at .565 with the implementation guideline 'report any incident of disaster to the nearest local office immediately'. The highest correlation value was .644 between component 6 (membership of disaster management forums, reporting of incidents and coordination of responses) and climate change implementation guideline 'farmers contribute to agricultural disaster management stakeholder forums'. The lowest correlation for this guideline was .464, with 'assist in coordinating the application of disaster relief aid'. Research findings on correlations indicate that there is a relationship between capacity building, monitoring and awareness campaigns on climate change and poor access to resources and support material, information and training, and lack of awareness on interpreting available information. These correlations negatively affect the implementation of support materials and training before, during and after disasters. Results further indicate poor response and or adaptation to climate change disasters. Applications for disaster support are low, which may be as a result of challenges associated with acquiring information and obtaining training.

The findings of the research reveal delays in accessing support for livestock formers, unnecessarily long processes and a poor response rate for those who do seek support materials and training to cope with climate change disasters (see Table 1). This may be a consequence of the many duties and responsibilities that are carried out by various stakeholders involved in livestock production. The policy that governs government support for farmers before, during and after disasters is the Early Warning and Disaster Risk Management Policy, which identifies the bodies responsible for such support as the Department of Rural Development and Agrarian Reform (DRDAR), the National Department of Agriculture, Forestry and Fisheries, the farmers themselves, the farmer organisations and local municipalities. Each stakeholder has to follow certain processes before procurement of support material is approved. These processes are time consuming, forcing farmers to wait before access to relief is granted. The process only commences after farmers report disaster incidents to local extension or municipal offices (Table 1). These results are in agreement with the findings of a study conducted by Hlala *et al.* (2019:1089) in Kwazulu-Natal, which suggested a slow and complex implementation of responses to climate change. There appears to be a lack of co-ordination between the district and local levels of government, which has the potential to lead to duplication. As shown in Tables 1 and 2, lack of information, poor government support services, poor training and a low level of skills among farmers are barriers to accessing relief material before, during and after disasters. Access to relevant information and support prior to climate change disasters is key to mitigating against their effects, and would help farmers adapt before disasters occur, thus minimising damage to infrastructure and losses associated with cattle production. Karimi *et al.* (2018:175) concur with the finding that response efficacy and knowledge are key, as they determine the adaptation choices of farmers. Farmers' perceived lack of training on how to keep fodder banks and crop residues for animal feed is also an indication of lack of preparedness for disaster. In addition, it is clear that monitoring of the environment for droughts, and exchange of information

between stakeholders, was poor or limited (Table 1). Institutional constraints, including a perceived lack of government support, are an external barrier to adaptation (Talanow *et al.*, 2021). However, Makaya *et al.* (2020) indicated that appropriate and timeous response to disaster should be expedited by all responsible national government institutions to ameliorate disaster impacts. Institutions such as the South African Weather Services usually announce the onset of disasters such as floods, high temperatures and droughts, based on weather and climate pattern analysis, in local media and to other government departments such as the Department of Agriculture and Rural Development (DARD) and the Department of Water and Sanitation (DWS). DARD cascades the information to local agriculture extension officers, who alert farmers about impending disasters and implement the disaster management plan (Talanow *et al.*, 2021). Despite these governance arrangements, the response rate to disasters is slow; there is limited access to information and poor resource capacity among farmers to prepare for disasters, which has been to their detriment when extreme weather events occur. Access to relief materials for disasters frequently depends on farmers' contact networks and is made through a wide range of consultations, some of which are 'prickly', in that different bodies disagree on areas of responsibility. This finding confirms that of Makaya *et a.l* (2020). Popoola *et al*. (2018:1205) state that without improvements to climate change responses by government and other responsible bodies, already resource-poor farming communities will remain vulnerable to harsh climatic conditions. Mapiye *et al,* (2018); Phuong *et al.* (2018:701), Tirivangasi and Nyuhunda (2019) and Fanadzo *et al.* (2021:1) all concur that limited access to resources, support and information results in limited disaster preparedness and response among farmers. It is important to design strategies that support knowledge flow and the capacitation of farmers with skills to combat such challenges, alongside the development of income diversification on the part of the farmers, so as to ensure sustainable livelihoods. Correlations in this study indicate a strong relationship between capacity building, monitoring and awareness of climate change, on the one hand, and poor monitoring of availability and quantity of water resources through extension officers, on the other. These results concur with those of Mhlanga-Ndlovu *et al*. (2019:8) who found poor access to extension services and poor awareness of climate change by institutional services, along with lack of early warning systems for climatic stresses.

Findings from this study reveal that communal livestock farmers in the study area perceive that they have poor access to support materials related to climate change and extreme weather events. Most recognise that they are unprepared for the kinds of disasters that have already affected them and are likely to affect them in the future. The response rate for relief materials before, during and after disasters was poor, and quite inadequate to cope with and reduce the effects of disasters associated with climate change. Key challenges include a lack of appropriate and relevant information, lack of awareness, lack of capacity and lack of effective early warning systems. The study recommends that the responsible bodies take steps to enhance their capacity and clarify their roles in this regard. Communal livestock farmers need to be capacitated on mitigating strategies they can undertake before climate change disasters strike, which should include methods of hay and silage preservation, water conservation and veld management for quality preservation. Awareness campaigns and training in steps to be taken before, during and after disaster should form part of the capacity development of CLFs. The use of mass media, particularly radio, and social media should be incorporated into awareness campaigns, in which reporting channels and contact numbers should be made clear, so that farmers who are aware of approaching conditions can transmit the relevant information to others. Upon reception of such reports, government departments and municipalities should step into action with strategies already prepared beforehand for the various 'before, during and after disaster' scenarios – in addition to training farmers well in advance of such events. Farmers should be encouraged to join local farming associations and such associations should be capacitated. Lastly, all relief materials intended for farmers during disasters should be tagged 'national emergency' in order to speed up their dissemination.

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