Public Extension agents' need for new competencies: Evidence from Limpopo province, South Africa

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INTRODUCTION

Broad political and scientific consensus exist that climate change and variability is happening and will continue well into the future (Christensen et al. 2007).

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Agriculture in most places worldwide, including Southern Africa, is expected to be most negatively affected by climate change and variability (IPCC 2011; Lobell & Field 2007).

A large proportion of South Africa's agricultural production, especially by smallholder producers (SHP), depends on rainfall.

The importance of extension in farmers’ yields is widely acknowledged (Wang 2014, Hasan et al. 2013).

Public extension in South Africa:

- has government mandate to help smallholder farmers achieve household food security.

Cont’d.

Extension agents’ competencies and support for farmers’ production is thus critical, especially under the variable climate of smallholder farmers’ production systems.

However, most observers and extension practitioners have commented on the overall poor performance of public agricultural extension, especially, in developing countries.

(Umhlaba Rural Services 2007; Benhin 2006; Jacobs 2003; Rivera, Qamar & Crowder 2001).

Serious problems in respect of efficiency and relevance of the public agricultural extension service in South Africa have been highlighted (DOA, 2005).

- Sixty percent of Agricultural and advisory services officers: Minimum qualification of a Bachelor's degree by 2010.

Comment on shortcomings in Extension skills and Agricultural Science training among field-level Extension practitioners in S. Africa by Terblanche, Koch and Lukhalo (2013).

Cont'd.

Purpose of the study:

- To determine the technical competency of Extension agents of the Limpopo Provincial Department of Agriculture Extension service to support smallholder dryland grain farmers' production in light of climate variability and the effectiveness of strategies promoted in this regard.

Cont'd.

CENTRAL STUDY HYPOTHESIS

- Field-level Extension agents of the Limpopo Department of Agriculture lack the requisite technical competencies to effectively support farmers' production to cope with climate variability.

STUDY OBJECTIVES

To:

1. Assess field-level extension agents' academic qualifications needed to support smallholder grain farmers' production in light of climate variability.

2. Determine the climate variability coping and adaptation strategies promoted by the public extension service to support farmers' crop production.

3. Assess the effectiveness of public extension support including the climate variability coping and adaptation strategies promoted for dry-land smallholder grain producers' crop production.

LITERATURE REVIEW

Competencies serve as the foundation of organisations such as Agricultural Extension to deliver needed programs and improve its value to communities (Maddy, Niemann, Lindquist & Batemen 2002).

Cont'd.

- Convergent views exist on core competencies being critical for the success of various professionals and the future of Extension (Garst Hunnings, Jamison, Hairston, & Meadows 2007; Gregg & Irani 2004).

Cont'd.

- Technical capabilities (TC) are amongst the critical competencies needed by entry-level extension professionals (Harder et al. 2010)
  - TC needed by Extension agents for climate variability mitigation to support SHP agricultural production.

A wide acclaim exists of positive impacts of conservation agriculture (CA) on crop production in both developed and developing countries (Rochecouste et al., 2015; Rochecouste & Crabtree, 2014; Tullberg, 2009; Knowles & Bradshaw, 2007).

Cont'd.

- Impacts of CA include:
  - improved soil moisture retention;
  - increased soil fertility;
  - improved crop yields; and
  - financial rewards.

Giller et al., (2009) however, indicate negative impacts of CA on yield and less adoption in sub-Saharan Africa.

High competency is required to establish soil and water conservation structures

- given the complexity of CA management packages (Lahmar &Triomphe, 2008; Mukadasi, 2007).

CONCEPTUAL FRAMEWORK

IPCC (2001) definition of vulnerability to climate change and variability was used to assess smallholder crop farmers' grain production system.

- embodies vulnerability as a function of the character, magnitude and rate of climate variation
  - to which a system is exposed;
  - its sensitivity; and
  - its adaptive capacity.

Cont'd.

Given constant levels of hazard over time, (i.e. exposure) the effectiveness of a household's adaptation measures will allow a system to reduce the risk associated with these hazards by reducing its social vulnerability.

Cont'd.

Following Nelson et al. (2010b), this study therefore, used the Sustainable Rural Livelihoods Framework (Department for International Development, 1999) as the conceptual framework to analyse the adaptive capacity of farmer households to climate variability.

METHODOLOGY

Sampling approach: A multi-stage random sampling

- To select two districts; four municipalities; and
- 194 Smallholder maize and sorghum farmers from 20 villages of Limpopo province, South Africa, in January, 2014.

Cont'd.

Data collection instrument:

- Semi-structured questionnaires:
  - personal interviews to collect data from smallholder grain farmers.
  - Self-administered questionnaires: to collect data from field-level extension agents (24) and Extension managers (11) from four municipalities of Limpopo province.

Cont'd.

Data collected from respondents include amongst others:

- **Farmers:** their capital assets, e.g. extension support received, in the last 10 years of the study (adaptive capacity);
- **Extension agents**: demographic information, climate variability coping and adaption strategies promoted; and

Cont'd.

- **Extension managers**: Views of the technical competency of the field-level extension agents under their supervision, regarding climate variability coping strategies promoted to support farmers' crop production.

Cont'd.

The effectiveness of the coping and adaptation strategies promoted by public extension agents to support crop producers' food production: measured by publi extension's contribution to the household's grain production.

- Achieved by:
  - A comparison of crop yields (ton/ha) obtained by respondents
    - who received some public extension support including climate variability and
    - those who did not, in the year before the study.

Empirical model specification

A linear multiple regression model was used to assess the influence of several independent variables including public extension climate variability information support to farmers' crop production (yield/ha).

Model specification

$Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 ... \beta_n X_n + \mu_i$..........(1

Where,

Y = Yield (tons/ha)

β_0 .... = the intercept or constant term

β_1, β_2 ,.... β_n = regression coefficient

X_1, X_2..... X_n = independent variables

μ_i .... = error or disturbance term.

The independent variables were specified as follows:

- X_1= Natural capital
- X_2= Social capital
- X_3= Human capital
- X_4= Financial capital
- X_5= Physical capital

Natural capital

- Proportion of cropping lands suitable for crop production

Social capital

- Access of extension support, market and food aid

Human capital

- dependency ratio
- years of schooling
- number of climate variability training attended
- years of schooling

Financial capital

- Access to credit
- Livestock ownership
- insurance owned

Physical capital

- Ownership of cell-phone, radio, television, computer, irrigation water.

FINDINGS

Availability of qualified climate variability personnel (N= 11)

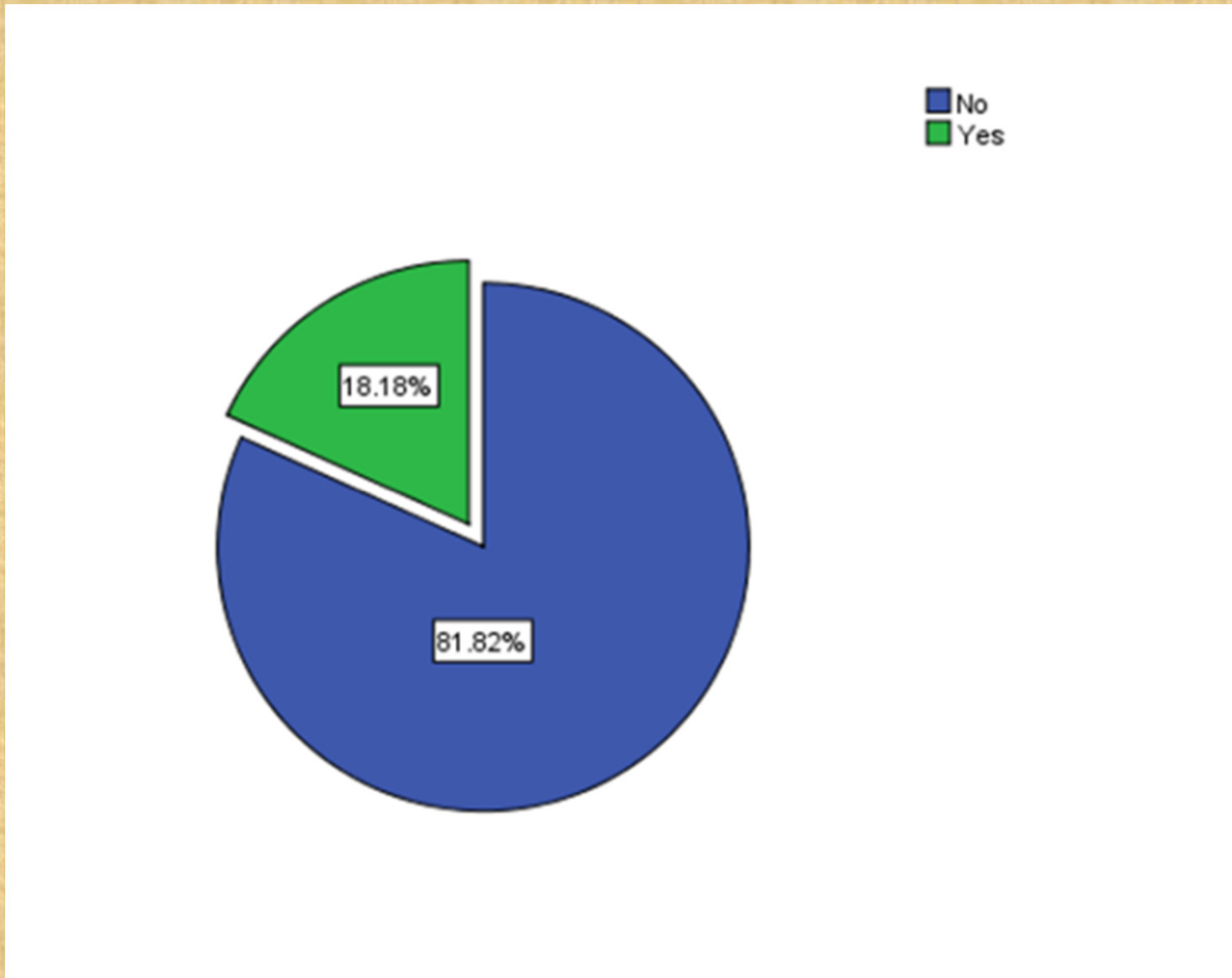

Figure 1: Managers' views on availability of agents with climate variability knowledge

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xtension Managers' indication of training for Field-level Extension gents (N= 8)

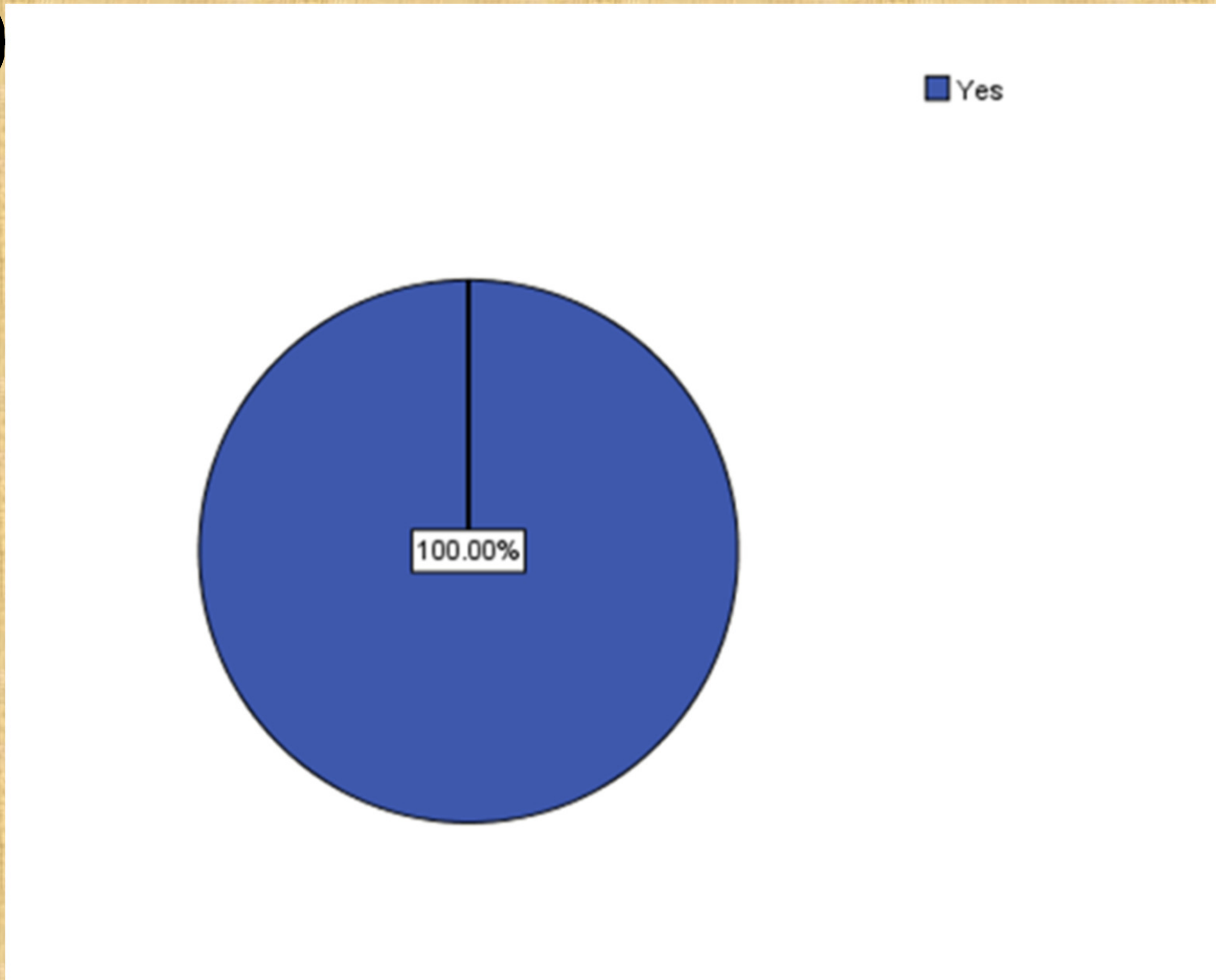

Figure 2: Extension Managers' support for agents' climate variability training

Cont'd.

xtension agents' academic qualification and knowledge of climate ariability

Table 1: Percentage distribution of field-level extension agents' qualifications (N= 24)

Qualification	Percentage
Master's degree	8.3
Honours degree	33.3
Bachelor's degree	8.3
Diploma certificate	50.0
Total	100

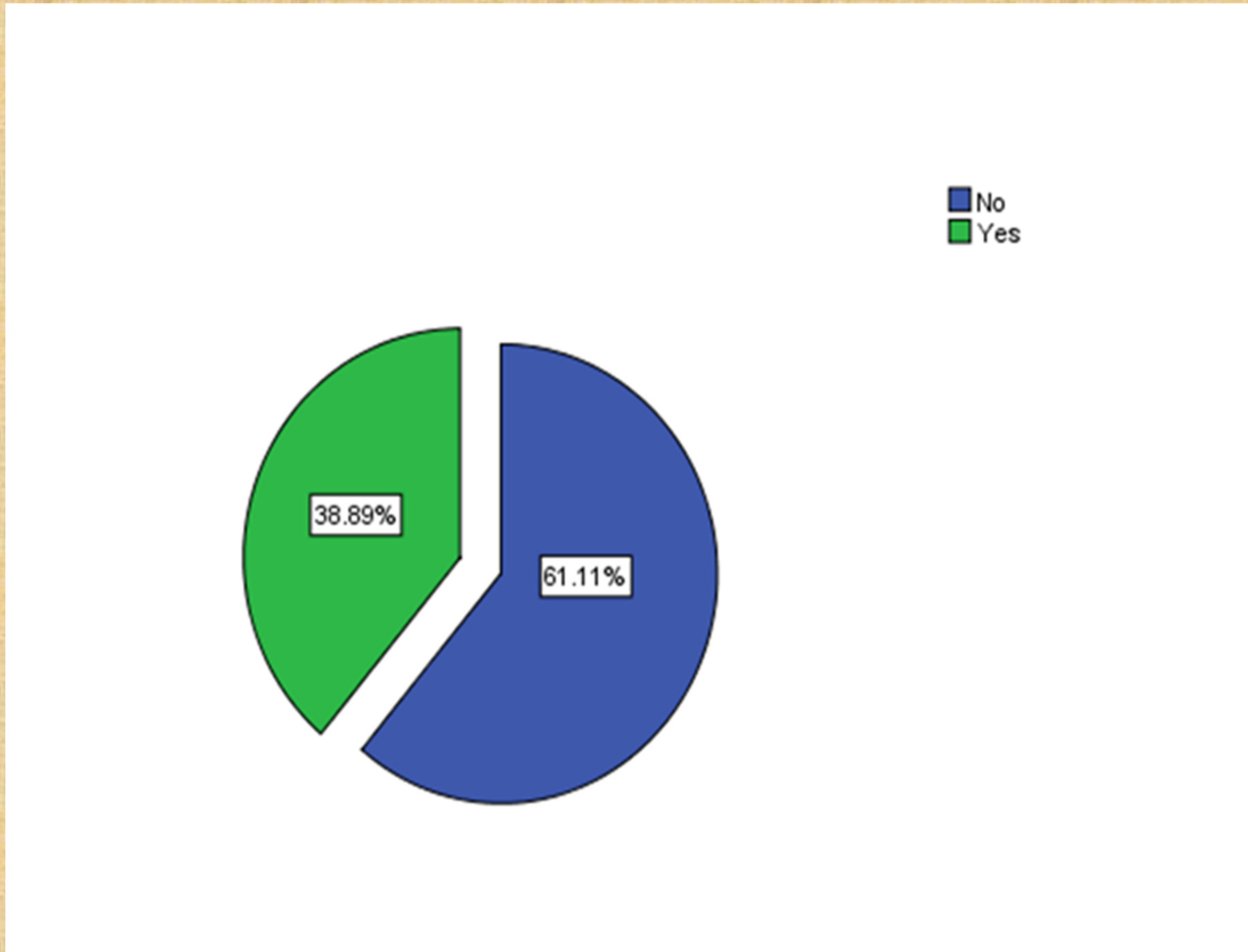

Figure 3: Field-level extension agents' knowledge of climate variability coping and adaptation issues

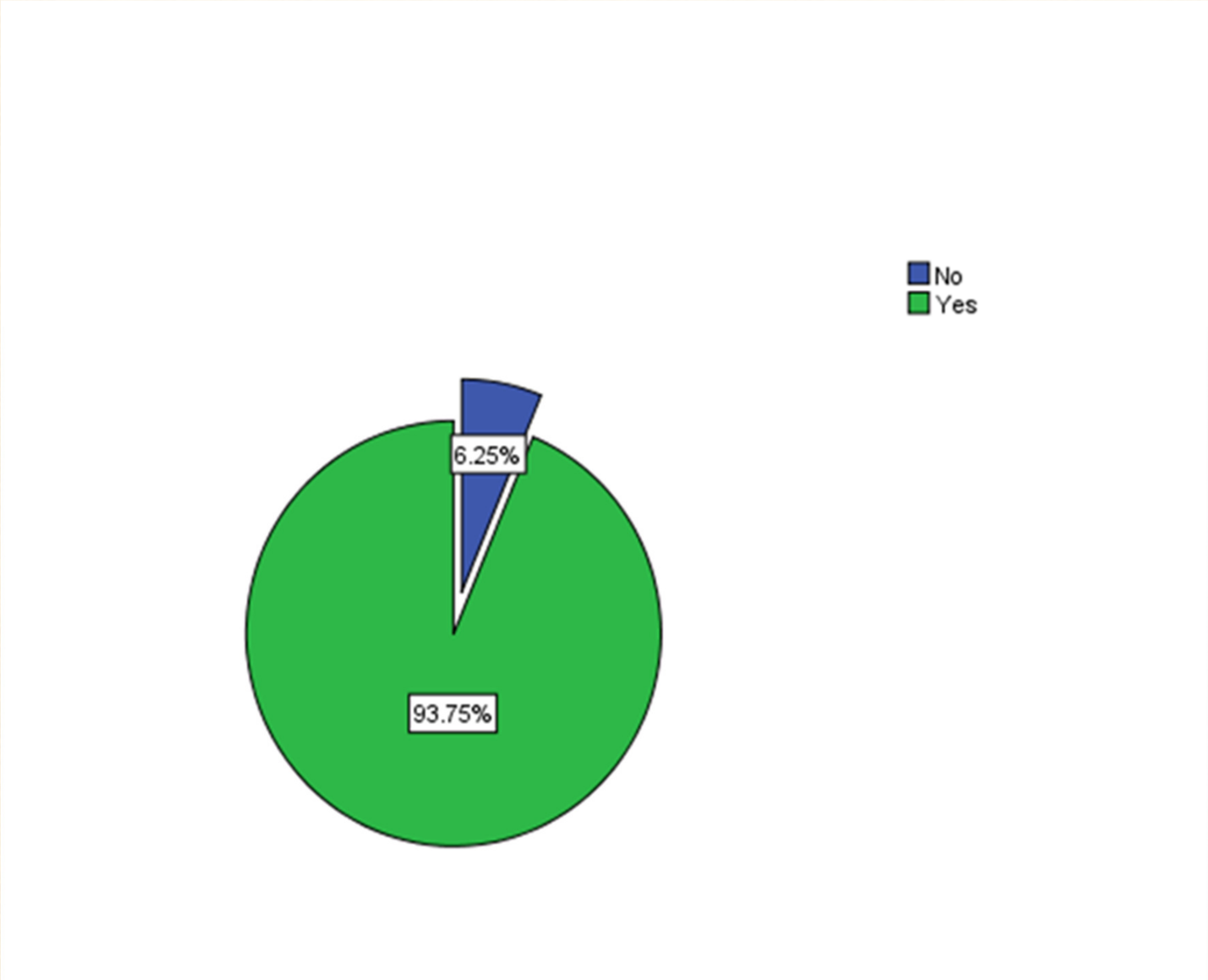

Figure 4: Field-level extension agents' need for training in climate variability

Cont’d.

CLIMATE VARIABILITY COPING AND ADAPTATION STRATEGIES PROMOTED

Table 2: Coping and adaptation strategies promoted by public extension

Strategy	Percentage of Respondents
Coping strategy	
Conservation agriculture (n=24)	67
Use of improved/certified/hybrid seeds (24)	21
Do climate change awareness campaign (24)	08
Encourage farmers to listen to and /or watch television broadcasts on climate change (n=24)	04
Promote water harvesting (n=24)	08
Rehabilitate project structures to prevent strong winds (n=24)	04
Application of pesticides (n=24)	04
Adaptation strategy	
Discourage deforestation (n=17)	35
Plant indigenous trees/agro-forestry (n=17)	12
Control invasive, alien plants (n=17)	12
Control veld fires (n=16)	06
Discourage planting of exotic plants (n=16)	06
Construction of irrigation dams (n=17)	06

EFFECTIVENESS OF EXTENSION SUPPORT INCLUDING CLIMATE VARIABILITY COPING AND ADAPTATION STRATEGIES

Table 3: Percentage distribution of respondents' crop yields according Extension support

d (t/ha)	Use of Public Extension	
	Used (N= 68)	Did not use (N=113)
than 1	66.0	79.0
99	32.0	20.0
99	1.5	0.9

Cont'd.

Table 4: Mean yield (ton/ha) differences according to Extension support

ublic extension for variability information	Number	Mean	Std. Dev.
d climate variability tion from public extension	68	.845	.747
receive climate variability tion from public extension	113	.548	.607

omparing statistical significance of yield differences in Table 4:

dependent samples t-test results:

- Show a difference in the yields for those who received extension support including climate variability information and those who did not:

  t (113.378) = 3.147, p = .002 (two-tailed).

- The magnitude of the difference in the mean yields (mean difference = .36, 95 CI: .13 to .58) was, however, small (eta squared = .05) (Pallant 2007 citing Cohen, 1988).

his finding is similar to:

- AL-Sharafat, Altarawneh and Altahat (2012) found no difference in production of olive producers in Jordan who received extension support and those who did not.

FURTHER EVIDENCE OF EFFECT OF PUBLIC EXTENSION SUPPORT NCLUDING CLIMATE VARIABILITY INFORMATION ON FARMERS' FOOD PRODUCTION

- Results of the multiple regression analysis (Table 5) showed that contrary to the null hypothesis, receiving public extension including climate variability information, makes a contribution to the yield of survey respondents (p= .011). The model is significant at 1% level (F=2.822; p= .019).

Table 5: Multiple regression estimates of the effects of the independent variables on the yield of respondents (N=181)

Predictor	Coefficient	P-value	Part
Constant		.146	
NATURAL CAPITAL			
Percentage of cropping land suitable for crop	.049	.579	.048
SOCIAL CAPITAL			
Access to markets for Production	.132	.131	.132
Use of extension services for climate variability information	.227	.011*	.225
HUMAN CAPITAL			
Dependency ratio	.114	.102	.143
FINANCIAL CAPITAL			
Access to production credit	.074	.402	.073

*1% significant level $R^2 = .107$

CONCLUSIONS

- Even though a small proportion of field-level Extension agents took part in the study, our findings provide some indication that:
  - Fifty per cent of field-level extension agents of the Limpopo Department of Agriculture are not qualified to provide farm management advice including climate variability support to farmers (National Dept. of Agriculture, S. Africa, 2005).

Cont'd.

- Most field-level Extension agents of the Limpopo Department of Agriculture indicated promoting
  - conservation agriculture as climate variability coping strategy and
- Few discouraged deforestation as adaptation strategy amongst farmers.
- The effect of measures promoted on producers' crop yields, however, is minimal.

Cont'd.

RECOMMENDATIONS

- A need for further training of current field-level agents in prope application of conservation agriculture through adaptive research tha involves scientists, agents and farmers.
  - To provide new technical competencies such as, integrated management of available soil, wate and biological resources.
  - To assess the local ecological and socio-economic conditions under which CA is best suited for smallholder farming.

Cont'd.

- Extension managers and policy makers should be motivated to improve the performance of agents
  - adopt a competency approach to human resource management.
  - encourage further training for unqualified extension agents to acquire at least a 4-year BSc degree.

Cont'd.

- Extension educators could also adopt a competency-based approach to curriculum development and intervention measures to prepare entry-level Extension professionals for the practice in the real world of work.
  - e.g. how to deal with climate variability issues.

Cont'd.

- Finally,

  The widespread agreement on the positive relationship between employees' competencies and organizational or individual success makes it impossible for Extension human resource managers, Agricultural Extension curriculum developers and Extension in-service trainers to ignore a competency approach to doing business.

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Thank you