

Assessment on farmers' choice of maize varieties, awareness
and compliance to GM maize permit conditions in OR
Tambo District, Eastern Cape Province.

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Presentation overview

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- ❖ Background & Problem statement
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Results & Discussion

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Background & Problem statement

- ❖ There are many different maize varieties produced by farmers in Eastern Cape Province.
- ❖ Improved maize varieties have been identified for various agro- ecological zones in Eastern Cape Province.

- ❖ Cropping programmes have been developed and GM maize varieties are being introduced to smallholder farmers.
- ❖ Furthermore, there are factors that affect maize seed selection criteria used by smallholder farmers.
- ❖ Several studies reveal that farmer involvement in varietal selection promotes varietal growth, distribution and sustainability (Halewood et al., 2007; Akankwasa et al., 2013).

Background & Problem statement Cont'd

- ❖ Farmers' knowledge about a particular innovation is fundamental to decision making process and its ultimate adoption (De Groote, 2002).
- ❖ According to GMO Act of 1997, GM maize has improved genetic traits that are patent-protected by the Plant Breeders' Rights Act, Act No. 15 of 1976 and also regulated by the GMO Act 15 of 1997.
- ❖ Growers who want to use GM seed must sign a technology agreement committing to compliance with requirements of the GMO Act and accompanying legislation (SANSOR, 2012; Iverson *et al.*, 2014:2).
- ❖ The Act requires that there should be no replanting or recycling of GM seeds (SANSOR 2012).

Background & Problem statement Cont'd

- ❖ For insect resistant maize, growers are also required to plant refugia around the field or borders (SANSOR 2012).
- ❖ The refuge area should be clearly marked and may not be planted more than seven days apart and the area must be at least six rows wide (SANSOR, 2012; Iverson et al., 2014:2).
- ❖ Despite, the widespread adoption of these crops, little is known about smallholder farmers' awareness and compliance to GM maize permit conditions.

Objectives

- ❖ To identify factors that determine smallholder farmers' maize varieties selection criteria
- ❖ To find out the smallholder farmers' awareness and compliance to GM maize permit conditions.

Material & Methods

- ❖ Semi structured questionnaire was used to collect primary data from smallholder farmers in Mqanduli (Lowest rainfall), Flagstaff (moderate rainfall) Port St. Johns (highest rainfall), under OR Tambo DM.
- ❖ The study adopted Cross sectional design.
- ❖ Multistage sampling was utilised
 - ❖ In stage 1 – LM's were purposively selected.
 - ❖ In stage 2 – LM's was stratified into four wards in each study site
 - ❖ In stage 3 - Twenty two villages were randomly selected in total
 - ❖ In stage 4 -704 smallholder farmers were also randomly selected irrespective of their maize varieties they produced.
- ❖ Statistical Package for Social Sciences (SPSS version 24) was used to analyse descriptive statistics and Multinomial logistic regression model.

Material & Methods Cont'd

❖ Following an approach by Akankwasa *et al.* (2013); Nkohla (2016), the farmer is assumed to want to satisfy his utility:

$$❖ U_{ij} = Q(Z_j, S_i) + \varepsilon(Z_i, S_j) \dots \dots \dots (1)$$

$$❖ P_{ij} = \text{Prob}(U_{ij} > U_{ia}; a = 1, 2, 3 \dots j; a \neq j) \dots \dots \dots (2)$$

U_{ij} – was the perceived utility by household i of maize variety options j and a respectively.

Z - traits of maize

S – were the variables that influence the choice of a maize variety option

Q - The observable component and error term ε , unobservable the researcher.

Material & Methods Cont'd

Model specification

$$Pr\{Y_{i=j}\} = \frac{\exp[B_j'X_i]}{\sum_{j=0}^j \exp[B_j'X_i]} \dots\dots\dots (1)$$

❖ Where; $Pr\{Y_{i=j}\}$ is the probability of farmer's choice of maize varieties which are GM maize only, OPVs and GM maize and OPVs only; j is the number of farmer's choice categories in the choice set; X_i is a vector of the exogenous variables; B_j is a vector of the estimated parameters.

❖ When the Logit equation (1) is rearranged using algebra, the regression equation is as follows:

$$❖ P_i = \frac{e^{(b_0+b_1x_1+\dots+b_vx_v)}}{1+e^{(b_0+b_1x_1+\dots+b_vx_v)}} \dots\dots\dots (2)$$

❖ The equation used to estimate the coefficients is as follows:

$$❖ \ln \left[\frac{P_i}{1-P_i} \right] = b_0 + b_1x_1 + \dots + b_vx_v \dots\dots\dots (3)$$

Variable used in MLR model

Variable name	Explanation/ definition	Type of measurement	Value	Expected sign
Dependent variable	0. GM maize only; 1. GM maize and OPV's 2. OPVs only			
Reference category	OPVs only (Most common maize that was used from the study areas)			
Independent variables				
	Age	Continuous	Actual age in years	+/-
	Gender	Dummy	0 = female, 1 = male	+/-
	Education	Categorical	No education=0 Primary education=1 Secondary education=2 Tertiary education=3	+/-
	Employment status	Categorical	0=unemployed, 1=formally employed, 2=self-employed,3=part time farmer, 4=full time farmer	+/-
	Marital status	Categorical	0=married,1=single,2=window/er,3=divorced,4=other	+/-
	Household size	Continuous	0= 2-5, 1= 6-10, 2= >10	+/-
	Access to credit	Dummy	0 = no , 1 = yes	+
	Access to market	Dummy	0 = no, 1 = yes	+
	Land ownership	Dummy	0 = no, 1 = yes	+/-
	Seed costs	Continuous	Actual no. amount in South African rands	-
	Membership to any group	Dummy	0 = no, 1 = yes	+/-

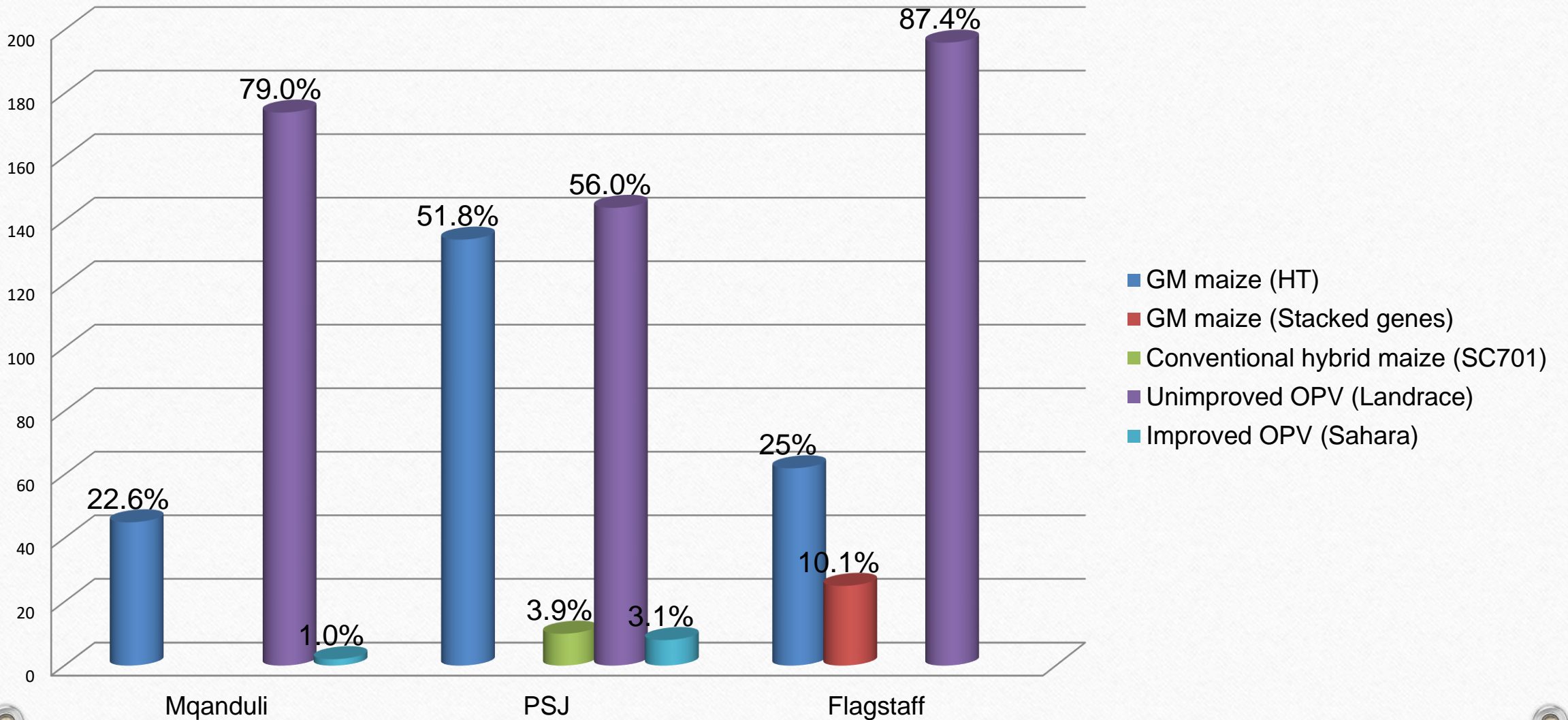
Material & Methods Cont'd

- ❖ Perception on GM permit conditions were assessed by asking respondents whether they agreed with 13 statements, using five – point Likert scale (strongly disagree, disagree, undecided, agree and strongly agree).

- ❖ To analyse respondents' level of agreement with different statements on GM maize permit conditions, respondents were given weight or scores (0 = strongly disagree, 1 = disagree, 2 = undecided, 3 = agree and 4 = strongly agree)
- ❖ The average scores were calculated for each statement.
- ❖ The average scores were then computed into perception indices

Socio economic characteristics	Mqanduli		PSJ		Flagstaff	
	Frequency (N = 199)	%	Freq. (N = 257)	%	Freq. (N = 248)	%
Gender						
Female	130	65.3	173	67.3	177	71.4
Male	69	34.7	84	32.7	71	28.6
Total	199	100	257	100	248	100
Age (years)						
24 -40	27	13.56	12	4.66	36	14.51
41- 65	120	60.30	160	62.25	109	43.95
>65	52	26.13	85	33.07	103	41.53
Total	199	100	257	100	248	100
Highest educational level						
No formal education	144	72.4	58	22.6	38	15.3
Primary education	35	17.6	112	43.6	98	39.5
Secondary education	19	9.5	70	27.2	100	40.3
Tertiary education	1	0.5	17	6.6	12	4.8
Total	199	100	257	100	248	100
Main sources of income						
Agricultural activities	6	3.0	15	5.8	6	2.4
Salaried employment	2	1.0	19	7.4	9	3.6
Trading/ business	3	1.5	11	4.3	9	3.6
Social grants	182	91.5	204	79.4	213	85.9
Remittances	2	1.0	2	0.8	1	0.4
Other	4	2.0	6	2.3	10	4.0
Total	199	100	257	100	248	100

Distribution of respondents by maize varieties



The determinants of variety choice: Multinomial results

Variables	Maize varieties	
	GM maize only β {Sign}	GM maize and OPV's β {Sign}
Gender	0.522 {0.013}***	0.761 {0.008}***
Age	0.000 {0.960}	- 0.012 {1.387}
Marital status	1.198 {1.000}	- 15.020 {0.992}
Highest education	-12.580 {0.986}	1.633 {0.000}***
Household size	0.089 {0.001}***	0.006 {0.885}
Employment status	0.050 {0.001}***	0.372 {0.039}**
Access to land	0.025 {0.120}*	0.264 {0.000}***
Access to credit	1.988 {0.000}***	0.403 {1.000}
Access to market	0.513 {0.011}***	0.476 {0.118}*
Membership to any group	0.729 {0.003}***	1.401 {0.000}***
Intercepts	11.934 {0.995}	13.979 {0.993}

No. of observation : 704; χ^2 (df= 14) : 47.862; (-2) Log Likelihood : 892.112; Nagelkerke R² : 0.488; Reference category: OPV's

***P ≤ 0.01 significant, **P ≤ 0.05 significant, *P ≤ 0.10 significant Source: Field survey (2014/15)

Perceptions of farmers to GM maize permit conditions

Perceptions	Statement	Disagree and strongly disagree			Perception score		
		Mqanduli (N)	PSJ (N)	Flagstaff (N)	Mqanduli (S)	PSJ (S)	Flagstaff (S)
Permit conditions	You sign agreement forms in order to use GM maize	199	257	248	99.5	128.5	124
	You share GM seeds with neighbours or relatives after harvest for planting	199	257	248	99.5	128.5	124
	Extension officers constantly checking if you are complying with P.C	195	170	233	97.5	85	116.5
	You are educated on permit regulations on the use of GM maize	199	257	248	99.5	128.5	124
	You are adequately educated and informed about the correct use of GM maize	199	247	248	99.5	123.5	124
	You can easily obtain objective information on the use of GM maize	199	247	248	99.5	123.5	124
	You have sufficient knowledge of GM maize	199	247	248	99.5	123.5	124
	You are aware of permit conditions guiding the planting of GM maize	199	257	248	99.5	128.5	124
	You replant seeds from the previous harvest	199	257	248	99.5	128.5	124
	You plant BT maize in refugia with herbicide	199	257	248	99.5	128.5	124
	You know how to mix roundup herbicides	199	257	248	99.5	128.5	124
	You get seeds from suppliers	199	257	248	99.5	128.5	124
	Roundup ready maize is sprayed by you	199	257	248	99.5	128.5	124
	Perception index				0.04	0.04	0.04

Conclusions & Policy insight

- ❖ Farmers were mainly choosing unimproved maize (Landrace) than the other maize varieties.
- ❖ Gender, highest educational level, household size, employment status, access to land, access to market, access to credit, membership to farmers group were positive and the most significant variables for variety choices.
- ❖ Extension officers are also not fully knowledgeable about GM maize permit conditions.
- ❖ Although permit conditions are stipulated in South African GMO Act, most of these conditions are not met by smallholder farmers in the three study areas, in the ECP.
- ❖ This means that permit conditions are violated, which is likely to result in development of resistance to the Bt toxin, as well as incorrect use of herbicides.

Conclusions & Policy insight

- ❖ It is recommended that more research is necessary on landrace maize variety to improve land race productivity, since most farmers were mainly producing the landrace maize variety.
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- ❖ Smallholder farmers need more education about GM maize varieties
 - ❖ The education should target farmers' groups and organisations
 - ❖ The extension officers should be trained so that they can monitor compliance of farmers to ensure that there is compliance with permit conditions.

End of presentation

Thank you to TIA - Biosafety