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Barriers to and Determinants of the Choice of Crop Management Strategies to Combat Climate change in Dejen District, Nile basin of Ethiopia

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Introduction

- We are already bound to some level of climate change, which can no longer be prevented even by the most ambitious emission reductions (*Füssel and Klein 2006*).
- The effect of emission reductions takes several decades to fully manifest,
- Whereas most adaptation measures have more immediate and sustainable benefits (*Rahman 2013*).
- Adaptations can be effectively implemented on a local or regional scale such that its efficiency is less dependent on the actions of others,
- Whereas mitigation of climate change requires international cooperation.
- Due to climate change and variability almost one billion people experienced hunger in 2010 globally (*FAO,2010*).

Introduction...

- Most adaptations to climate change also reduce the risks associated with current climate variability, which is a significant hazard in many world regions.
- There are two adaptation assessment approaches namely, top-down and bottom-up assessment approaches ([Gbetibouo, 2009](#)).
- The top-down approach starts with climate change scenarios, and estimates impact through scenario analysis, based on which possible adaptation practices are identified.
- Most of the top-down adaptations represent possible or potential measures, rather than those that have been used ([Gbetibouo, 2009](#)).

Introduction....

- Studies eg. (*Segele and Lamb, 2005, NMA, 2005, You and Ringler, 2010*) carried out in Africa including Ethiopia using top-down approach predicted the impact of climate change on agricultural sector with adverse effects on crop yields.
- The bottom-up approach takes a vulnerability perspective where adaptation strategies are considered more as a process involving the socio-economic, and policy environments, and elements of decision-making (*Gbetibouo 2009*).
- In line with this notion (*Schröter, Polsky, and Patt 2005*) argue that in choosing adaptation options to climate change and developing policies to implement these possibilities the affected community should actively participate.

Methods

- **Study design** : Cross-sectional
- **Study population**: Rural communities who was engaged in farm & off-farm activities
- **Sample size** : 398 households were selected at the six *kebeles* of the district.
- **Sampling Procedures** :Multi-stage stratified sampling
- To get female-headed households snowball sampling was employed.

Data

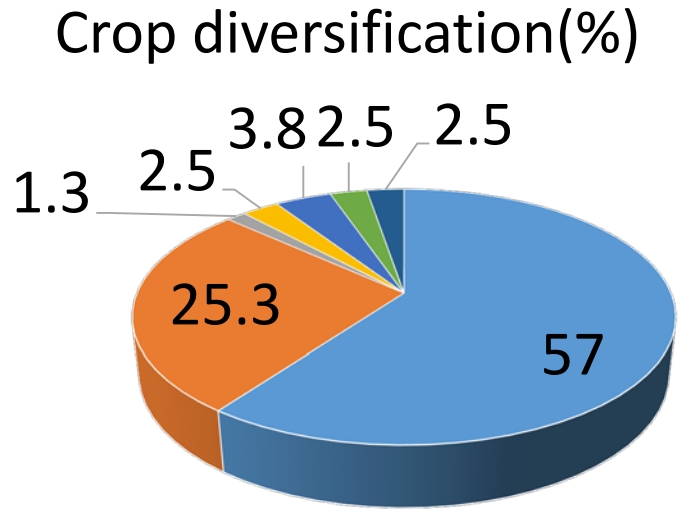
- The study adopts the bottom-up approach that seeks to identify actual adaptations at the local level
- Data collected through household survey, focus group discussions and key informants interviews were used.

Data Analysis

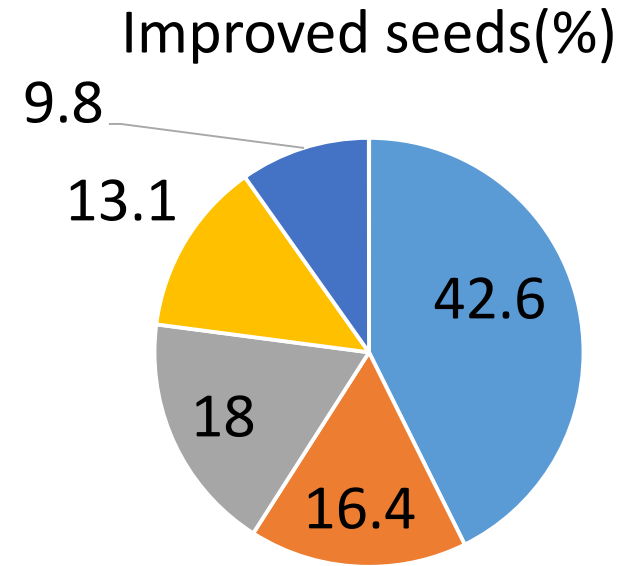
- Descriptive statistics, and logistic regression(at $p \leq 0.05$).
- Model fitness was checked by Hosmer-Lemeshow test
- Collinearity among predictor variables was checked using multicollinearity statistics

Results and Discussion

Barriers to the choice of adaptation Strategies



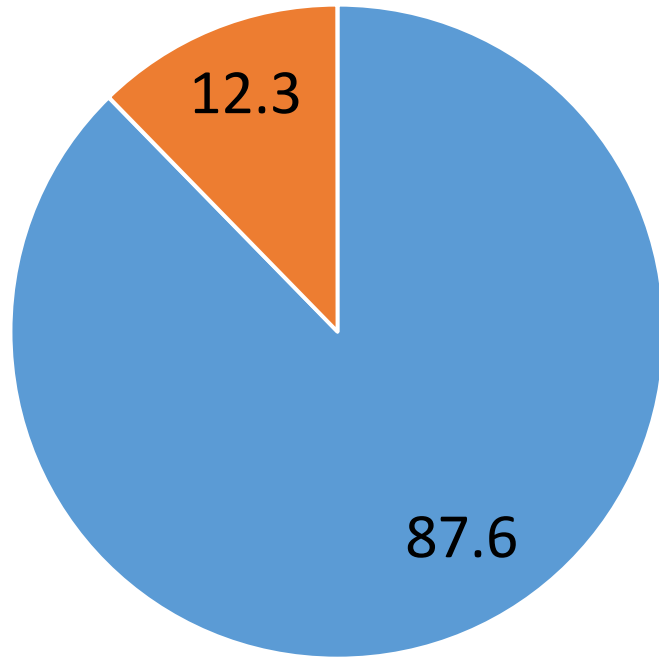
- Small land size (57)
- low soil fertility
- Shortage of money
- Shortage of labour
- Lack of skills
- Farmland location
- noland



- Financial const
- Suitability of land
- Lack of skills
- Small/no land
- Lack of info

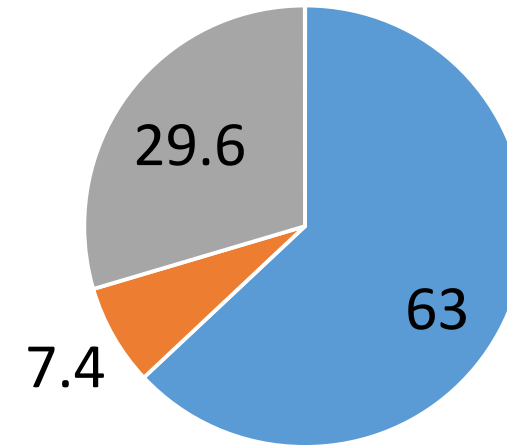
Results and Discussion... barriers

Changing planting date(%)



■ Lack of skills ■ no/small land size

Replanting damaged crops(%)



■ Lack of skills
■ Suitability of land for cropping season
■ noland

Results and Discussion ...barriers....

- Weather events such as flooding, hailstorms, disease outbreaks can damage previously planted crops in all or a portion of farm fields. This requires technical assistance for decision making in replanting.
- Besides, financial constraints was also barrier to choose appropriate adaptaion strategies. Lack of access to information, and
- *Bryan et al 2009, Kithia2011, Peterson2013* stated that financial constraints are one of the barriers that restrict implementation of adaptation strategies.
- This implies every form of adaptation requires some direct or indirect costs.

Results and Discussionbarriers

- Eg, when improved seeds varieties are available, their price may be prohibiting making it difficult for many rural households to access.
- Thus, framers have often sought to use their own saved seeds.
- One of the possible causes of financial barriers in the study area could be due to lack of credit facilities to rural communities.
- Access to information is important for Africa (*IPCC 2007*) and Ethiopia in particular, where there are few climate projections due to lack of appropriate climate data. Thus, lack of appropriate climate information could be barrier for the study communities' to adopt adaptation strategies.

Results and Discussion..... Determinants

Predictor variables	Crop diversification		Improved seed		Changing planting date		Replanting	
	Sig	Exp(B)	Sig	Exp(B)	Sig	Exp(B)	Sig	Exp(B)
Age_(18-35)	0.035		0.039		0.102		0.008	
Age_(36-55)	.010*	3.506	.011*	4.115	0.092	2.36	.005*	5.416
Age_(>55)	0.11	3.662	0.111	3.886	.038*	5.985	.014*	32.143
Farm_exp_(<10yrs)	0.233		0.004		0.046		0.603	
Farm_exp_(10-20)	0.108	2.384	.000*	10.166	0.12	0.428	0.261	2.246
Farm_exp_(21-30)	0.884	0.917	0.238	2.1	.007*	0.209	0.496	1.796
Farm_exp_(>30)	0.533	0.636	0.078*	3.943	.018*	0.19	880	0.864

Results and Discussion..... Determinants....

Results and discussion..... Determinants

Predictor variables	Crop diversification		Improved seed		Changing planting date		Replanting	
	Sig	Exp(B)	Sig	Exp(B)	Sig	Exp(B)	Sig	Exp(B)
Income_(<10,000)	0		0.013		0.097		0.697	
Income_(10001-30000)	.000*	8.481	.012*	3.408	0.639	1.378	0.558	1.49
Income_(30001-50000)	.000*	17.51	.029	3.632	0.051	4.163	0.241	2.701
Income_(>50000)	.000*	18.539	.002*	9.064	0.281	2.275	0.444	1.998
Family size_(>4)	0.82	0.902	N/C	N/C	0.416	1.49	.002*	0.101
Government ext.(No)	.003*	0.271	0.635	0.815	0.124	0.52	0.064	0.29
Agro_ecol(highland)	0.005		0		0		0.022	
Agro_ecol_(Midland)	.036*	4.082	0.055	5.446	.002*	5.412	0.2	2.922
Agro_ecol(lowland)	0.093	0.496	.002*	0.218	.000*	145.815	.006*	11.247
Farmlandsize(>1.2ha	.001*	4.286	0.865	0.931	.000*	0.15	.02*	4.57
Crop failure(Yes)	N/C	N/C	0.205	1.656	.044*	0.345	0.211	0.146

Results and discussion...determinants...

Age of households head significantly determined crop diversification, improved seeds, changing planting date, and replanting failed crops.

Crop diversification and replanting of the failed crops requires more energy and experience.

Thus, adult household heads are more matured and active in sowing different crops than old and young household heads.

The probable reason is due to the fact that age is the proxy indicator that may likely to endow the farmers with the required experience that enables them to make a better decision.

Results and discussion...determinants...

- This is in line with studies by ([Deressa et al. 2009](#)) which found that an increase in age does mean an increase in farming experience which would increase rural communities' local knowledge to respond to hazards resulted in climate change and variability.
- Like crop diversification, the middle age farmers(36-55) have ability and willingness to adopt improved seeds.
- This implies as one become more experienced in farming, the probability of one to use improved seeds increases more than a farmer with less farming experience.
- On the other hand, farming experience has an inverse relationship with changing planting date.

Results and discussion...determinants...

- The reason for an inverse relationship might be that experienced farmers will have access to irrigation and water harvesting for their agricultural activities and plant their seeds without changing the planting date.
- A farmer with more experience would know when climate variability is occurring in the area and which method of adaptation strategies works well for that specific agro-ecology zone.
- **Income** is positively and significantly associated with the household decision to pursue crop diversification and improved seeds.

Results and discussion...determinants

This means crop diversification and purchasing of improved varieties of seeds requires money. This implies the rate of using crop diversification and improved seeds is increased as income of households increased.

Family size is inversely and significantly associated with the households' decision to pursue replanting failed crops.

Studies eg ([Deressa et al. 2009](#), [Zelege and Aberra 2014](#)) argued that large family size is associated with higher labor endowment which would enable a household to accomplish various agricultural tasks.

Results and discussion...determinants

- The possible reason for an inverse relationship might be due to the fact that community's expectation of the gains of using adaptation strategy.
- In this regard, ([Barungi and Maonga 2011](#)) based on the rational choice theory; argue that the behavior of human beings is motivated by the possibility of gaining benefit.
- The possible explanation could be households who have large family size have the possibility to engage in off-farm activities, and they will ignore the failed crops to replant.

Results and discussion...determinants

- Therefore, communities are rationale consumers of new technologies, and they will only adopt technology as they foresee it will result in increased productivity.
- Access to government extension services has an inverse and significant effect on the choosing crop diversification as adaptation strategy.
- (*Maddison 2007, Nhemachena and Hassan 2007*) noted that farmers who obtain agricultural extension services through extension workers are more likely informed about the climatic situation and the responses followed.
- The Contributing factors for this inverse relationship could be barriers to adopting crop diversification.

Results and discussion...determinants

- The midland and highland agro-ecologies have a positive and significant effect on adoption of crop diversification.
- This is because the suitability of highland agro-ecology to sow different types of crops and access to government extension services due to proximity to the administration.
- For instance, in this study finding, the midland agro-ecology has got more access to extension services(77%) than the lowland agro-ecology (47%) communities by the government experts in the past cropping season.

Results and discussion...determinants

- The lowland agro-ecology has an inverse and significant effect on the choice of improved seeds.
- The lowland households did not use improved seeds because of agro-ecology and topography suitability problem to their farmland.
- This was confirmed by households report on the barriers to choose adaptation strategies.
- On the other hand, the lowland agro-ecology has a positive and significant effect on pursuing changing planting date.

Results and discussion...determinants..

- The mid and lowland agro-ecologies have a significant effect on employing replanting failed crops as climate change adaptation measures.
- This is due to the fact that, the midland and lowland households are characterized by climate variabilities such as erratic rainfall than the highland agro-ecology zones.
- The exposure of climatic variability led them more experienced in adopting replanting their failed crops than highland households.
- Farm size has a significant and positive effect on adopting crop diversification.
- Households with larger farm sizes are more probably to diversify their crops.

Results and discussion...determinants...

- Whereas, larger farmland size has an inverse and significant effect on using changing planting date as climate change adaptation measures.
- This implies households who have small land size took care of their farmland and changed their planting date when there is a change in weather conditions.
- "A hunter who has only one arrow does not shoot with careless aim."

Conclusions and recommendation

- The study communities have tremendous ideas to adapt for current and future climate change impacts.
- However, the mere willingness to adopt climate change adaptation strategies was not enough.
- Their ability to adapt is constrained by many internal and external factors.
- Age, farming experience, income, agro-ecology, and farmland size are the most significant and determinant factors in most of adaptation strategies..

Conclusions and recommendation....

- In the process of diffusion of adaptation strategies, adaptation process should require close collaboration and active participation of climate change researchers, decision makers, policy analysts, the community, and partners.
- The less adopted adaptation strategies due to financial constraints should be subsidized by government and aid organizations.

Cooperation with PAUWES

As researchers or practitioners what are the possible interactions/collaboration with practitioners resp. researchers to improve/upscale your activities

- Experience sharing in climate Change adaptation process
- Collaborate in research publication,
- Financial support to diffuse bottom-up adaptation approach.
- Facilitate rapid uptake of research results by policy makers
- Alert policy makers and/or practitioners about the bottom-up adaptation approach

FROM RESEARCH TO PRACTICE

What are the potential aspects of the research that can be transformed into practice?

- Adaptation Strategies Should follow a bottom-up approach (Participatory)
- Adaptation strategies such as improved seeds should be provided based on soil type and agroecology suitability.
- Conducting workshop at local and regional level is important to share the findings.

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Thank you for listening