Farmers' intrinsic values for adopting climate-smart practices in Kenya: empirical evidence from a means-end chain analysis

Article *in* Climate and Development · March 2018

DOI: 10.1080/17565529.2018.1442786

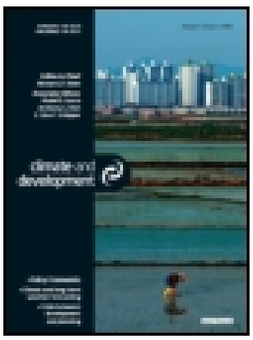
CITATIONS
0

READS
81

3 authors, including:

Marther W. Ngigi
Machakos University
21 PUBLICATIONS **112** CITATIONS

SEE PROFILE



Climate and Development

ISSN: 1756-5529 (Print) 1756-5537 (Online) Journal homepage: http://www.tandfonline.com/loi/tcld20

Farmers' intrinsic values for adopting climate-smart practices in Kenya: empirical evidence from a means-end chain analysis

Marther W. Ngigi, Ulrike Müller & Regina Birner

To cite this article: Marther W. Ngigi, Ulrike Müller & Regina Birner (2018): Farmers' intrinsic values for adopting climate-smart practices in Kenya: empirical evidence from a means-end chain analysis, Climate and Development, DOI: 10.1080/17565529.2018.1442786

To link to this article: https://doi.org/10.1080/17565529.2018.1442786

Published online: 03 Mar 2018.

Climate and Development, 2018
https://doi.org/10.1080/17565529.2018.1442786

climate and development

RESEARCH ARTICLE

Farmers' intrinsic values for adopting climate-smart practices in Kenya: empirical evidence from a means-end chain analysis

Marther W. Ngigi[a], Ulrike Müller[b]* and Regina Birner[c]

[a]*Center for Development Research (ZEF), University of Bonn, Bonn, Germany;* [b]*GFA Consulting Group, Berlin, Germany;* [c]*Chair of Social and Institutional Change in Agricultural Development, University of Hohenheim, Stuttgart, Germany*

(*Received 30 May 2014; accepted 13 February 2018*)

This study assesses intrinsic values and motivations farmers have for adopting various climate-smart agricultural practices in Kenya. The qualitative method of laddering was employed as an interview technique, and means-end chain analysis was used for hierarchical mapping in order to depict farmers' decision-making processes concerning the adoption of climate-smart agricultural practices as well as their envisioned goals and values underpinning these actions. The findings show that farmers decided on measures that improved farm productivity, food security and household income. The study highlights that an irreconcilable conflict between values exists due to changing climate conditions. It will be difficult for women attached to conservative values to pursue achievement or benevolence values. Similarly, male-differentiated values suggest a need for a trade-off of their self-enhancement values that oppose universalism values related to environmental sustainability and welfare for all. The findings call for the design of climate change policies and adaptation interventions that take into account farmers' fundamental values and their gendered preferences.

Keywords: climate-smart agricultural practices; means-end chain analysis; values; gender; Kenya

1. Introduction

Climate change entails increased weather variability and incidences of extreme weather conditions, which affect people's livelihoods and undermine the sustainable development goals (IPCC, 2012). In Kenya, between 1960 and 2006, the minimum temperature rose by 0.7 to 2.9°C, while the maximum temperature escalated by 0.1 to 2.1°C. This variation depends on the prevailing seasons and agro-ecological zones in the country (GoK, 2013). Rainfall has become uneven and erratic, which has resulted in increasing incidences of floods. Moreover, recurrent and prolonged periods of dry spells are one of the contributing factors to hunger, water scarcity and loss of livelihood assets, hence increasing the vulnerability of rural subsistence farmers (GoK, 2010; SEI, 2009).

Given that they depend on natural resources and rain-fed food production, subsistence farmers are extremely sensitive to climate change and variability (World Bank, 2013). Further, weather- and climate-related shocks particularly affect individuals, households and communities below the poverty trap threshold[1] (World Bank, 2013). In order to improve resilience to extreme weather events, farmers take up climate-smart agricultural practices (Volenzo, Singoro, & Wakhungu, 2013). Climate-smart agricultural strategies include the use of measures that sustain agricultural productivity and incomes, enable climate change adaptation and reduce greenhouse gas emissions (FAO, 2013). A successful adaptation strategy is any adjustment that moderates risks and vulnerability related to climate change, takes advantage of beneficial opportunities that may arise, and takes into account socio-economic and environmental sustainability (Doria, Boyd, Tompkins, & Adger, 2009).

Adaptation initiatives need to consider the knowledge and priorities of smallholders in their frameworks. Most of the previous studies on drivers for adapting to climate change focused on socio-economic, political, biophysical, institutional and governance factors (see for example Below et al., 2012; Bryan et al., 2013; Löf, 2013; Thorlakson & Neufeldt, 2012). However, despite the fact that weather shocks and climate variability affect assets owned by men and women differently (Angula, 2010; Quisumbing, Kumar, & Behrman, 2011), there is limited but growing evidence that gender perspectives influence adaptive behaviours, uptake of climate-smart choices and community-level adaptation initiatives (Nelson, 2011; Ngigi, Mueller, & Birner, 2017; Patt, Daze, & Suarez, 2009). Empirical evidence suggests that female and male

*Corresponding author. Email: ulrike.muellerPM@gfa-group.de

farmers have different adaptation behaviours based on gendered access to resources, risk perceptions, institutional arrangements, gender relations and different roles and responsibilities (Farnworth, Sundell, Nzioki, & Davis, 2013; Ngigi et al., 2017). Hence, failure to consider gender relations may negatively affect the effectiveness and sustainability of adaptation interventions and policies (Holvoet & Inberg, 2014; Kakota, Nyariki, Mkwambisi, & Kogi-Makau, 2011). Although the role of actors' cognitive processes, such as attitudes, belief systems, and perceptions about environmental shocks and climate change, has been increasingly acknowledged (Frank, Eakin, & López-Carr, 2011; Grothmann & Patt, 2005; López-Marrero & Yarnal, 2010), there is still limited empirical evidence on how gender-differentiated values and beliefs at household or community levels influence adaptation behaviours. This study therefore goes beyond existing research by examining intrinsic values and motivations men and women have for adopting various climate-smart agricultural measures in crop management.

While the motivations of different actors may have a positive effect on adopting climate-smart measures, their values may also represent barriers for sustainable adaptation and development in general (Eriksen et al., 2011; O'Brien, 2009). Although there is research examining values and socio-psychological aspects with respect to climate risk and adaptation (Lorenzoni, Leiserowitz, De Franca Doria, Poortinga, & Pidgeon, 2006; O'Brien, 2009; Rogers, Curtis, & Mazur, 2012; Webber & Stern, 2011), these studies mainly focus on industrialized countries. Thus, there is a need for studying intrinsic values that influence climate-smart choices of female and male actors in developing country contexts. Values are desirable goals that drive the selection of actions or strategies to achieve desired outcomes. Hence, the major research question of this study is what intrinsic values male and female Kenyan farmers have for adopting climate-smart strategies. To promote the sustainability of adaptation interventions, the study therefore suggests the need to consider intangible and intrinsic motivations of men and women. Although it could be expected that adaptation programmes or policies increase productivity, food security or mitigate effects of climate change, these interventions should be geared to address the needs for men and women. For instance, women farmers are likely to take up measures that address their concerns of agricultural productivity, labour loads and food security in the household (Ngigi et al., 2017). However, as shown in this study, interventions should not compromise the intrinsic values of food security like taste, nutrition and health or trade-off their labour efforts. Since women uphold a benevolence value that strengthens social cohesiveness and group-based approaches, targeting interventions through social groups built on trust, altruism and sharing of knowledge can have far-reaching implications on women's uptake of climate-smart strategies. The study also suggests the need to better understand gender-differentiated values in adaptation frameworks and their trade-offs in order to trigger the formulation of effective policies. Interventions targeting men should consider the trade-off of their self-enhancement values that oppose universalism values through promoting environmental sustainability that in turn protect the welfare of all.

1.1. *Conceptualization of means-end analysis in climate change adaptation*

There are several operational approaches to derive actors' motivations for behaviour. The Schwartz Value Survey (SVS) and the Portrait Values Questionnaire (PVQ) are commonly used tools to elicit human values (Schwartz, 1992, 2012). SVS utilizes a scale of 'importance values' to reveal values, while PVQ involves the use of short verbal portraits, where the respondents equate the portraits to their values (Schwartz, 1992, 2012). In-depth interviews have been employed for eliciting public values in relation to climate change adaptation (Wolf, Allice, & Bell, 2013). The priorities and preferences for actions and values, which motivate the behaviour to achieve a targeted goal can also be revealed through a so-called means-end chain (MEC) analysis (Reynolds & Olson, 2001). Hence, the study chose the MEC approach because it enables a systematic understanding of farmers' values for taking up a climate-smart strategy.

The MEC approach is widely used to better understand a consumer's goals, attitudes and desires as well as the structure of such relations in his or her mind. It assumes that consumption follows a structural mental association between means (product attributes) and ends (values or goals) (Olson & Reynolds, 2001). Further, the MEC approach draws on a hierarchical framework of attributes, consequences and values (A-C-V). Since the study is not interested in qualities or characteristics inherent in a strategy/choice, we modified the hierarchical framework by replacing 'attributes' with 'strategies' to match our conceptualization of the MEC in adaptation research. Hence, our hierarchical framework consists of strategies, consequences and values (S-C-V).

Strategies are plans of actions or solutions to challenges that result in consequences leading to fulfilment of certain personal goals or values. The desired and adopted strategies are instrumental in achieving anticipated consequences and values. The more imperative a particular strategy (attribute) is, the more significant are the consequences as well as the personal values attached to it (Gutman, 1997). Indeed, farmers maximize their utility in adopting strategies involving mental links between means (agricultural strategies) and ends (personal goals/values). In the adaptation domain, strategies represent the climate-smart practices that farmers have adopted, while the consequences

represent the related positive (or negative) outcomes. Further, the aptitude of individuals to cope and adapt to a changing climate is embedded in a vulnerability context that interacts with S-C-V (see Figure 1). The vulnerability context consists of user characteristics, information and technology, institutional arrangements and physical characteristics (Bryan & Behrman, 2013). Gender is one example of user characteristic that is likely to influence the S-C-V framework. Due to their different roles and responsibilities, men and women are likely to have diverging preferences for climate-smart practices (strategies), which in turn lead to different outcomes (consequences) and ultimate values (ends) that motivate their adaptive behaviour. According to Schwartz, values are desirable goals that motivate action and they guide selection of actions, whereas people choose what is good or bad based on consequences it will have on the desired outcomes (Schwartz, 2012). The study therefore conceptualizes values to imply the motivations for adopting a specific climate-smart agricultural strategy. In the MEC approach, values present the end position and are cognitive exemplifications of abstract goals. The Schwartz theory of basic values identifies ten types of basic personal values that are classified into four motivational dimensions. These include self-enhancement (achievement and power), self-transcendence (benevolence and universalism), conservation (security, tradition and conformity), and openness to change (stimulation, hedonism and self-direction) (Schwartz, 2012). This study highlights the irreconcilable conflict between values due to changing climate conditions. Female farmers embrace an early planting strategy to enhance food security promoting the achievement of goals. However, traditions dictate that male family members are the ones responsible to initiate land preparation and early planting practices. This implies that due to changing climate conditions, it will be difficult especially for female farmers to pursue 'achievement' values while at the same time upholding 'conservation' (tradition) values.

The interlinkages of climate-smart practices, their consequences and end-values represent a knowledge network, referred to as hierarchical value map (HVM). The HVM represents a number of links, widely known as ladders, which connect the strategies and values at different levels of concepts. Further, the HVM illustrates the association of S-C-V by presenting a cognitive or motivational structure, which depends on the underlying strength of connections between the S-C-V (Bagozzi, Gürhan-Canli, & Priester, 2002). The stronger the preferred S-C-V, the more stimulated the decision-maker will be and the more strongly he or she will be motivated to take a particular action. The appropriate and effective adaptation efforts depend on peoples' goals that are linked to their personal values (Adger et al., 2009; O'Brien & Wolf, 2010; Wolf et al., 2013). Personal values are therefore indispensable elements, which may lead to decisions to adopt (or not to adopt) climate-smart agricultural practices. However, adaptive behaviour that is motivated by values and interests could lead to increased vulnerability of individuals and unsustainable practices with changing climate conditions.

A systematic understanding of the decision-making processes concerning the adoption of climate-smart agricultural practices is therefore instrumental to developing effective and responsive adaptation initiatives and policies. In order to interpret the prevailing decision-making processes

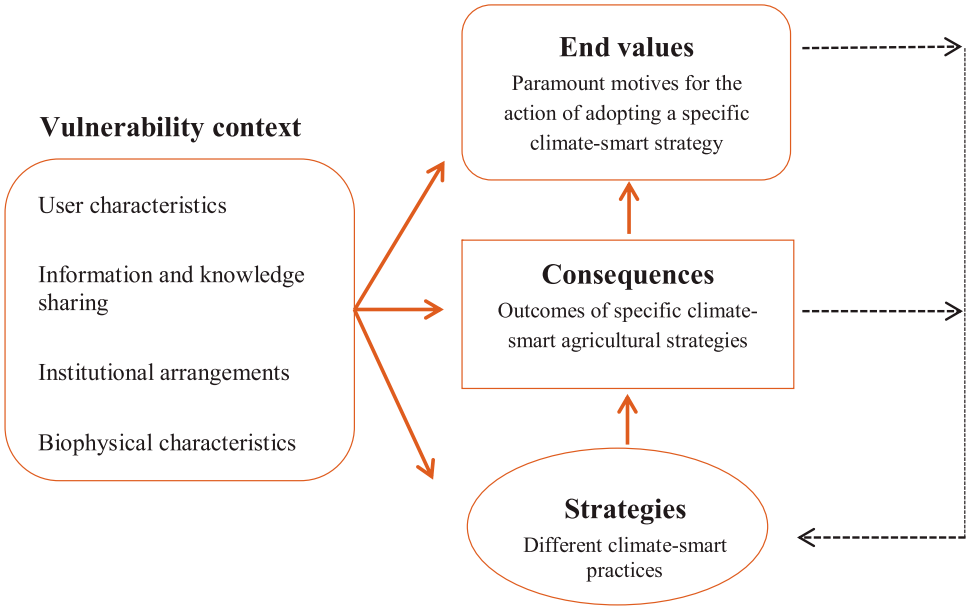


Figure 1. Conceptualization of the MEC approach with respect to climate change adaptation.

in the domain of crop management in a gender-disaggregated manner, the qualitative technique of laddering was employed in combination with a MEC-analysis.

2. Research approach

2.1. *Data and sampling procedure*

This study was part of a joint research project of the International Food Policy Research Institute (IFPRI), the Kenya Agricultural Research Institute (KARI), Center for Development Research (ZEF) and the University of Hohenheim. The data stems from six districts including Mukurue-ini, Nyeri, Gem, Siaya, Mbeere South and Njoro. These districts represent diverse climatic, agro-ecological, socioeconomic, and cultural conditions, policy and institutional arrangements, and susceptibility to climate change prevailing in Kenya. Mukurue-ini and Nyeri districts are located in the humid regions that experience an increase in temperature, unpredictable rainfall, floods, invasive species, and frost mainly affecting tea and coffee. The regions have good access to local and urban markets. Siaya and Gem districts represent the sub-humid regions, where the average rainfall is 1100 to 1800 mm per annum. These districts normally experience low agricultural productivity due to declining soil fertility, soil erosion, and climate variability. These areas are also characterized by high poverty incidences (35–44%) and high incidences of malaria and HIV/AIDS (Kenya National Bureau of Statistics, 2014). Mbeere South and Njoro districts are located in semi-arid regions that experience an average annual rainfall of 500 to 1300 mm and 600 to 1400 mm respectively. Marginal farming and livestock keeping are the main agricultural activities in these districts. However, dry spells and climate variability adversely affect economic activities in this agro-ecological zone.

The study relied on a simple random sample derived from a list of 360 farmers who had taken part in a household baseline survey carried out in the first phase of the overall research project. The process generated a random sample of 60 farmers, relative to the population of farmers in the given zones, whereby 19, 21 and 20 farmers were sampled in the humid, sub-humid and semi-arid zone, respectively. The interviews were conducted between June and August 2012. The sample size used in this work follows the recommendations of other MEC studies. Russell et al. (2004) and Reynolds and Gutman (1988) suggest a sample size of about 50 respondents in order to incline approximately 125 ladders, while Santosa and Guinard (2011) recommend at least 20 participants for a sub-group investigation, such as gender-disaggregated analysis.

The interviewed male farmers had more access to agricultural extension services and more livestock and assets[2] as compared to their female counterparts (see Table 1). Male farmers had also higher levels of schooling and literacy levels (*t*-test *P*-value <0.10). Female farmers were found to be younger (55.71 years) than male farmers (64.25 years). It could be expected that older farmers are more inclined to conservation values especially security and tradition, whereas younger farmers may be attached to values linked to openness to change like stimulation and self-direction. Similarly, gender relations could also dictate values, where women are attached to benevolence and conservation values, whereas men are inclined to a sense of responsibility and power.

2.2. *Empirical methods*

In-depth interviews are a commonly employed method for eliciting public values in relation to climate change

Table 1. Summary statistics of male and female respondents in the laddering interviews.

	Male farmers ($N = 34$)		Female farmers ($N = 26$)		
Variables	Mean	Std. Dev.	Mean	Std. Dev.	Diff. in Mean (*T*-test)
Age (years)	64.25	13.04	55.51	13.07	8.74*
Schooling (years)	8.05	3.56	6.12	3.96	1.93*
Read/Write (1 = yes, 0 = no)	0.91	0.21	0.82	0.39	0.09*
Farming experience (years)	31.17	13.67	29.75	13.89	1.42
Entrepreneurship experience (years)	3.25	6.65	3.46	6.45	−0.21
Household size	4.69	0.22	4.29	0.21	0.4
Total annual household income (Ksh)	149,759	114,954	119,689	112,345	30,070**
Asset index	0.58	0.11	0.41	0.14	0.17
Tropical livestock unit	4.21	3.7	3.21	3.63	1.00*
Land size (acres)	5.09	6.67	4.06	6.43	1.03*
Access to credit (1 = yes, 0 = no)	0.61	0.4	0.57	0.5	0.04
Access to extension services (1 = yes, 0 = no)	0.84	0.35	0.62	0.49	0.22***
Number of observations	34		26		

Notes: Ksh represents Kenya shillings. At the time of the survey, 1 US dollar was equivalent to Ksh 84.20. Superscript * presents significance at the 10% level, ** at the 5% level, ***at the 1% level of t-test estimates of mean comparisons.

adaptation (Wolf et al., 2013). This study goes beyond existing research, as it follows an innovative methodological approach that relies on laddering interviews[3] to visualize means-end-chains in the domain of climate change. The laddering procedure is extensively applied in marketing studies to evaluate people's purchase and consumption behaviour (Kangal, 2013; Reynolds & Gutman, 1988; Santosa & Guinard, 2011). The technique is also used in personal construct psychology (Walker & Crittenden, 2012), organizational and management studies (Bourne & Jenkins, 2005; Rugg et al., 2002), and research on acquisition of knowledge (Corbridge, Rugg, Major, Shadbolt, & Burton, 1994). Laddering and MEC have likewise been applied, though not widely, to the domain of sustainable ecosystem conservation (López-Mosquera & Sánchez, 2011). Conversely, the application of the MEC approach in conjunction with laddering to examine farmers' motivational structures in decision-making with respect to agricultural practices is scarce and partial (see few examples in Lagerkvist, Ngigi, Okello, & Karanja, 2012; Okello, Lagerkvist, Ngigi, & Karanja, 2014; Salame, 2004). However, none of these existing studies considered gender-specific differences in motivational structures in the uptake of agricultural practices or actions.

The laddering technique makes use of individual in-depth interviews, whereby respondents are encouraged to identify prominent A-C-V (S-C-V) of distinctive alternative practices in a hierarchal manner (Reynolds & Gutman, 1988). The laddering technique follows either a pencil-and-paper or a face-to-face set-up. Moreover, there are two forms of laddering approaches, namely 'hard' and 'soft' laddering. Hard laddering uses a sequence of an *a priori* list of S-C-V. In contrast, soft laddering allows the respondents being more flexible, as they develop the S-C-V themselves (ibid.). The latter approach is most appropriate for revealing complex motivational behaviour of individuals (Olson & Reynolds, 2001), especially in adaptation contexts.

This study employed a consistent semi-structured interview technique by combining the components of hard and soft laddering. This approach involved the use of a two-stage laddering procedure. During the first stage, researchers requested the respondents to identify the supreme strategies taken up to cope with changing climate. The researchers were interested in what motivates male and female farmers' decisions to adopt new practices in crop management. Using the soft laddering technique, researchers in the second stage probed a sequence of questions to respondents, such as: 'Why is this particular practice/strategy or consequence of importance to you?' In this way, respondents revealed consequences and personal values for taking up climate-smart measures in the wake of climate change. This methodological approach facilitated the assessment of farmers' intrinsic values for amending agricultural practices and taking up climate-smart measures.

2.3. *Documentation and data analysis*

During the process of data collection, the researchers audio-recorded interviews and sketched the ladders in a notebook. The research team appraised this documentation after every single interview session to ensure that the hierarchal form of S-C-V was followed and that no important aspect was omitted. After transcription of the interviews, the emerging S-C-V were coded in a systematic manner, and the ladders were analyzed according to the protocol developed by Reynolds and Gutman (1988). The production practices listed by farmers were sorted into similar and broader categories guided by the classification of climate-smart agricultural strategies according to the Food and Agricultural Organization (2013).

This classification process yielded seven categories of agricultural strategies related to crop management, namely (i) water conservation practices (diversion ditches, benches, irrigation, water harvesting-dams, ponds and tanks for water conservation practices), (ii) soil conservation practices (use of composite manure, mulching, cover crops, crop rotation, terracing and conservation tillage), (iii) change in crop variety (adoption of certified and fast maturing varieties), (iv) crop diversification (root crops, cassava, sweet potatoes, legumes, sorghum, finger millet and indigenous vegetables), (v) agroforestry (woodlots and fruit orchards), (vi) change in planting dates (early planting), (vii) diversified livelihood activities (off-farm employment, entrepreneurship ventures). Schwartz's classification of values guided the identification of intrinsic values elicited by farmers.

During data analysis, a so-called 'cut-off point' was determined to develop the HVM for illustrating the motivational structures of farmers adopting climate-smart agricultural strategies. Concepts were considered for analysis if the threshold of the chosen cut-off point was attained. According to Costa, Dekker, and Jongen (2004), a cut-off level allows for a better presentation of information in the HVM. However, the decision on the cut-off point normally implicates a compromise between quantity of data representation and pellucidity of the HVM. It is advisable to opt for a cut-off point that takes into account the prevailing variety of information but also creates maps, which are easy to interpret (López-Mosquera & Sánchez, 2011). Data was analyzed with the *MECanalyst Software* (available at: www.skymax-dg.com), which facilitates the display of MEC data into HVM.

3. Results

3.1. *Men's motivations for adopting climate-smart practices in crop management*

The HVM in Figure 2 presents male farmers' decision-making processes for adopting various climate-smart practices in the domain of crop management. A threshold of eight was selected to display data for the HVM. Five fundamental practices highlighted by male farmers include water

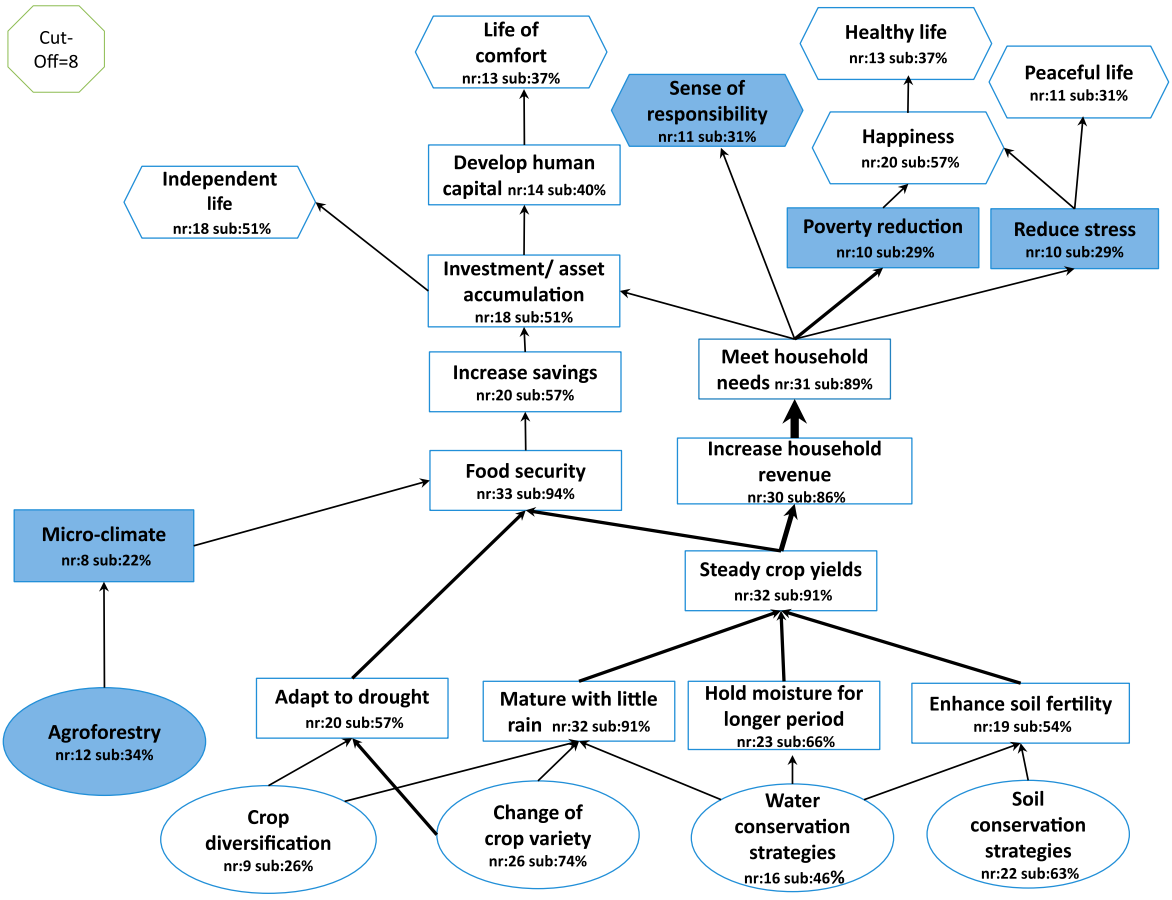


Figure 2. HVM for men's decision-making processes in adopting climate-smart practices in crop management ($N = 34$). The *nr* and *sub* present frequency and percentage of responses, respectively. The oval, rectangle and hexagon shapes present the respective S-C-V. The shapes highlighted in blue present male-specific differences.

conservation measures (46%), soil conservation strategies (63%), change in crop variety (73%), crop diversification (26%), and agroforestry (34%).

Due to changing climate and land degradation, men take up water and soil conservation strategies like water harvesting and use of composite manure. Consequences allied with these strategies include the ability of soils to retain moisture for a longer duration, improvement of soil fertility, and substantial crop growth in the event of little rainfall. Steady crop yields translate into household food security and increased income. Climate variability is likely to affect the four spheres of food security including availability, access, utilization, and stability (FAO, 2008). Farmers enhance food availability in the household through increased agricultural productivity or ability to buy food from local markets because of a rise in income. Households' saving capacity or access to resources enhances access to food in sufficient quantity and quality and stability in food supply all times. The ability to attain sufficient nutrition for all household members throughout the season is important because the household will not deprive long-term savings on food consumption. The findings suggest that increase in income help the household to meet family needs (86%), which in turn reduces stress (26%). The core value associated with this MEC is leading a peaceful (31%), happy (57%) and healthy life (37%).

Change of crop variety involves adoption of certified and fast maturing types, while crop diversification involves producing various crops, such as drought resistant ones, including orphan crops, legumes/pulses, indigenous and exotic vegetables. Men's motivation for changing crop variety and diversifying crops is that these crops are drought tolerant, adapt to harsh conditions, such as pests and disease infestation (57%), and mature with little rains (91%). This guarantees steady crop yields translating into food security for the household.

The findings also show that men adopt agroforestry practices in order to improve the microclimate of the region (22%). Agroforestry systems with a mixture of perennial and seasonal crops may reduce vulnerability to weather shocks and provide various benefits for food security and biodiversity. Fruit orchards contribute directly to nutritional security through the provision of food or

indirectly through raising farmers' income. Agroforestry also provides other ecosystem services, such as regulating flooding and acting as carbon sinks, which ultimately mitigates climate change. However, a point to note is that farmers emphasized the use of appropriate tree species[4] for agroforestry systems, such as *Grevillea robusta*.[5] Male farmers reported that eucalyptus trees that are fast growing and more profitable are harmful to water catchment areas leading to water scarcity.

Food security figures prominently as a consequence of the adopted crop management practices (mentioned by 94% of respondents), as it leads to increased household savings, which in turn enable investments or entrepreneurial activities, i.e. income-generating enterprises or reinvestments in farming. Investments in short and long-term enterprises and accumulation of assets enable households to educate their members and reduce poverty levels. Finally, poverty reduction leads to a comfortable life because of improved infrastructure facilities, such as electricity connections and piped water.

The development of human capital is also associated with the personal value of leading a comfortable life. Male farmers revealed that provision of a good education allows children to be independent in the future. In summary, the values that motivate male farmers to adjust crop production systems include happiness (57%), independence (51%), comfort (37%), good health (37%), peace (31%), and a personal sense of responsibility (31%).

3.2. *Women's motivations for adopting climate-smart practices in crop management*

The HVM in Figure 3 presents female farmers' decision-making processes for adjustments in crop production. Compared with the HVM for men, it is characterized by unique female-specific ladders.

Change in planting date constitutes a unique strategy preferred by female farmers (19%). Women highlighted that early planting allowed for faster germination of seeds because these benefitted from soil moisture. The direct consequence of a shorter germination is the fast growth of crops, which increases yields. For instance, a female farmer in Siaya region explained:

> We [women] know the benefit of early land preparation and planting, and most of the farmers do practice it. This is because the crops take advantage of the first drops of rain that ensure faster germination of seeds. However, women are disadvantaged because in this culture men ought to initiate some farming practices (…).

This statement exemplifies the perceived benefits of early planting that enhances fast growth of crops, steady crop yields and food security based on women's role in the household as food producer. Indeed, all women (sub: 100%) cited the importance of food security achievable through adopting various climate-smart strategies. The cultural context in which women operate could however hinder their uptake of adaptation strategies, especially early land preparation and early planting. According to Schwartz's basic and universal values, under changing climate conditions, women's attachment to traditional values could conflict with other values, such as benevolence, peaceful life and achievement of goals that are enabled through taking up strategies like early planting and crop diversification that promote food security.

Further, women prefer switching to crop varieties that mature faster and are tolerant to drought. However, there seems to be a trade-off between fast-growing, high-yielding varieties and consumption attributes regarding sensory preferences. Female farmers indicated that the high-yielding varieties of sorghum were less tasty compared to the local low-yielding variety. They also revealed that fast-growing and high-yielding varieties of maize were prone to pest infestation especially weevils, making it difficult to store maize for longer durations, considering the importance of food stocks as one of the coping strategies to protect against climate change and food insecurity.

Contrary to men's HVM, another unique consequence in women's HVM includes the control of soil erosion and flooding by the use of appropriate soil and water conservation strategies, cited by 26% of female farmers. The consequence of control of soil erosion implies that there is minimum run-off of soil nutrients, thus ensuring steady crop yields. Steady crop yields relate to food and nutritional security, which in turn increase household income and savings. This facilitates investment and asset accumulation of human, physical and social capital. Female farmers also emphasized the need to invest in water harvesting technologies in order to enhance resilience to climate change. They perceived that water harvesting could improve water availability in all seasons and reduce labour burdens for women and girls, as they no longer need to walk long distances to fetch water. This represents a female-specific concern.

Taken together, female farmers were motivated to adopt climate-smart agricultural strategies in order to achieve food security, increase their household income, and invest in human capital development. Specific female values include benevolence (22%) and achievement of goals (22%). Other values similar to men's are independence (74%), happiness (52%), comfort (41%) and good health (26%), but a higher proportion of women than men put more emphasis on the value of an independent life.

4. Discussion

While previous studies in Kenya showed that financial and institutional constraints may hinder adaptation to climate change (Bryan et al., 2013; Silvestri, Bryan, Ringler, Herrero, & Okoba, 2012), the present study employed a

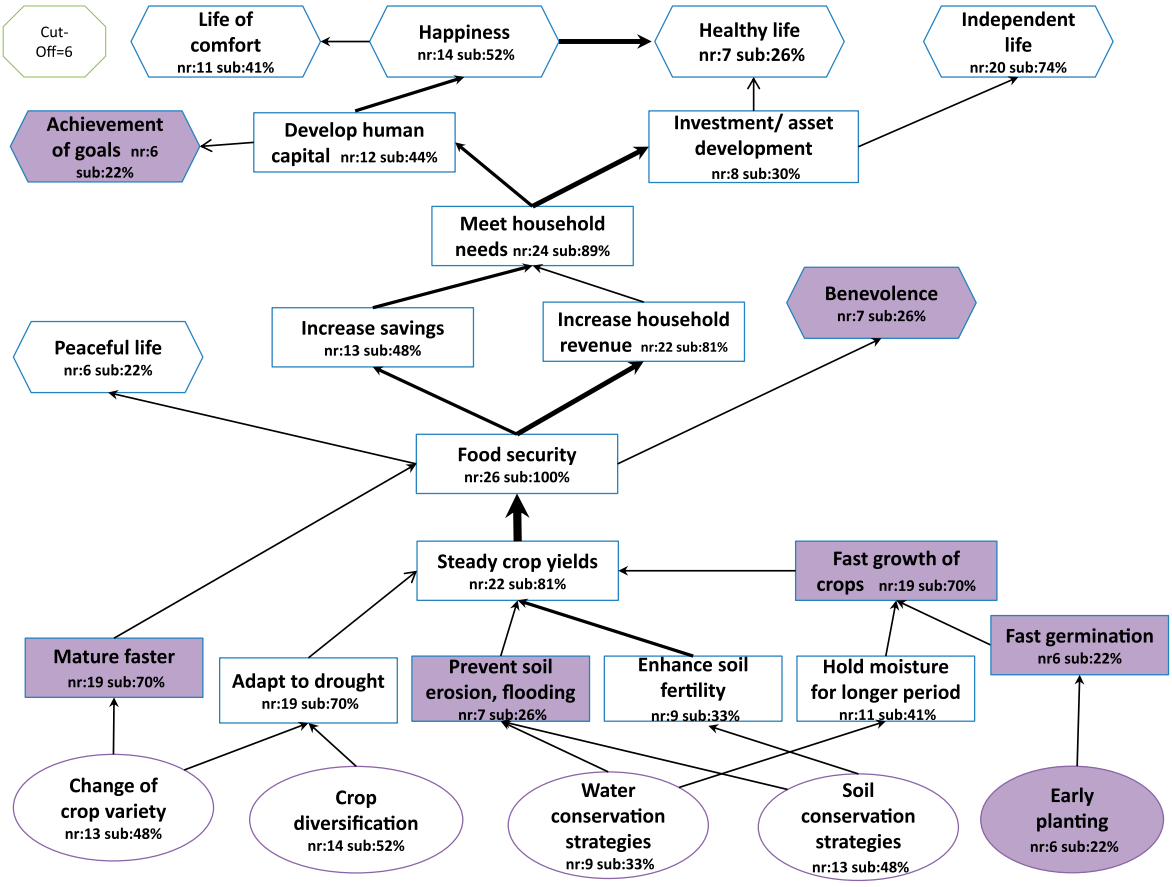


Figure 3. HVM for women's decision-making processes in adopting climate-smart practices in crop management ($N = 26$). The *nr* and *sub* present frequency and percentage of responses, respectively. The oval, rectangle and hexagon shapes present the respective S-C-V. The shapes highlighted in purple presents female-specific differences.

gender lens in order to analyze the role of intrinsic values as a barrier to the adoption of climate-smart agricultural practices. In particular, it turned out that gender norms and traditions hinder early land preparation and planting among female farmers because of women's role in household decision-making. It is basically the male household members (husbands, sons, brothers or brothers-in-law) who initiate these agricultural measures. This corresponds to Jones and Boyd (2011) who found that mental beliefs, traditions and norms might represent an obstacle for the uptake of new practices in response to a changing climate. This implies that under climate change, it will be difficult for women attached to traditions to pursue climate-smart strategies such as changing planting date or early land preparation that are perceived to be a male responsibility to initiate these essential measures.

While early planting prevailed as an adaptation strategy for female farmers, the development of agroforestry systems was a preferred practice of male farmers in this study. Kiptot and Franzel (2012) argue that women's participation in agroforestry systems is comparably low because this enterprise is typically a male domain. Women tend to have low access to and control over agroforestry benefits due to a lack of *de facto* property rights, which usually provide incentives for long-term investments on land. In Kenya's Siaya district, Oloo, Makenzi, Mwangi, and Abdulrazack (2013) show that traditions and norms hinder women from making decisions concerning tree planting at the household and community level.

The major similarity between men's and women's motives for adopting climate-smart agricultural practices were steady crop yields, food and nutritional security, increased income and savings, and accumulation of assets. This finding upholds that of Wolf et al. (2013) who conclude that farmers adapt to climate change to be food secure. Men and women have a desire to build resilience by investing in income generating activities, reducing poverty and lessening their dependence on agriculture. These findings concur with the overall goal of climate-smart agricultural practices to build resilience and alleviate poverty (FAO, 2013; Thorlakson & Neufeldt, 2012).

There are mixed results in the literature on gendered intrinsic values. Giacomino and Eaton's (2003) study

shows that men ascribe greater value to independence, a sense of responsibility, freedom and family security. Contrary, Olson and Currie (1992) show that a higher percentage of women ascribe family security as a core value. Rokeach's (1973) findings suggest that women are oriented towards religious values, such as happiness, benevolence, harmony and peace. In this study, men and women were motivated by similar intrinsic values to adapt to climate change, namely independence, happiness, comfortable life and good health. However, male-specific values included a sense of responsibility, whereas female-specific values related to the achievement of goals and benevolence. These gender-differentiated values exist because of gender roles in the household. Traditionally, it is men's role to provide basic needs to the family triggering the values of independence and family security. To satisfy these personal values, farmers took actions that minimized the negative consequences of climate change, such as crop loss. These findings are reinforced by protection motivation theory, which asserts that human beings change their behaviour to reduce the magnitude of threat (O'Brien & Wolf, 2010).

The values of leading a happy and healthy life are also recognized in the Human Development Index. However, there are mixed results on measures of happiness concerning economic growth, income and life expectancy (Blanchflower & Oswald, 2011). The realization of a minimum level of income allows households to ensure basic nutrition, housing, education, security levels as well as self-perceived happiness. This implies that climate change will affect physiological and economic needs, which in turn affect human values, such as health and happiness.

A deeper look into the elicited values revealed that security values could help in avoiding conflicts and promote harmonious social relations in the communities. Security may also nurture investments that diversify income necessary to cope with a changing climate. Further, benevolence values could promote cooperation and social capital, which are essential for sharing weather-related information, which in turn could stimulate adaptation to climate change. This corresponds to Schwartz's (2012) finding that self-enhancing values, such as achievement of goals, may motivate individuals to invest in practices, which further help to realize these values. However, as the findings of this study indicate, it is important to note that self-enhancing values may also result in unsustainable adaptation practices such as unsuitable but profitable tree species for agroforestry systems, which foster soil degradation and cause other harmful effects for ecosystems that affect the entire community. Interventions targeting men should consider the trade-off among competing values that influence their attitude or action they take under climate change. For example, the trade-off between men's self-enhancement values that oppose universalism values through promoting environmental sustainability that protect the welfare of all. Besides, it turned out that in changing climate conditions, it is sometimes a challenge for female farmers to pursue the achievement of goals, while sustaining tradition, hence forcing the revelation of an irreconcilable conflict between two absolute intrinsic values.

5. Conclusions and policy implications

This study employed an innovative MEC approach in order to elicit the cognitive structure of Kenyan farmers' decision-making processes underpinning their adaptation strategies to climate change. The findings show that farmers adopt several climate-smart agricultural practices to minimize the negative consequences of weather variability. These practices include changes in crop variety and type, early planting, soil and water conservation strategies as well as agroforestry measures.

The fact that differences exist in the intrinsic values of men and women in relation to climate change implies that gender and other social considerations on preferences need to be factored into national adaptation plans. A major concern is how gender norms, which often have asymmetric effects on different groups (Van Staveren & Odebode, 2007), could be transformed into equitable institutions. In Kenya, cultural obstacles to climate change adaptation would require that traditional leaders support the empowerment of women at the household and community level. Further, it would be useful to establish public fora to discuss and disseminate gender-specific adaptive strategies. Institutional innovations especially group-based approaches provide opportunities for such fora (Ngigi et al., 2017). In this way, both men and women would be encouraged to reflect on their specific gender roles and options in adopting climate-smart agricultural practices on their farms.

The ultimate motivation of farmers for adapting to climate change is the desire to be independent as well as to lead a healthy, happy, comfortable and secure life. Although farmers already pursue various strategies in order to adapt to climate change, there is an urgent need to encourage pro-environmental behaviour in line with the sustainable development agenda. Ultimately, individual agricultural practices need to be turned into collective action in order to attain an adaptable society. Thus, policy-makers should highlight social benefits and not only self-enhancing values when it comes to advancing climate change adaptation.

Disclosure statement

No potential conflict of interest was reported by the authors.

Funding

This work was supported by the Federal Ministry for Economic Cooperation and Development.

Notes

1. The poverty rate in Kenya is between 32% and 42% (World Bank, 2013).
2. The household asset index was generated by conducting a principal component analysis, which included consumable, agricultural and dwelling assets.
3. Hinkle (1965) advanced the laddering technique. Reynolds and Gutman (1988) later developed detailed laddering protocols and guidelines.
4. Farmers perceive that although there is water shortage because of prolonged dry spell, the situation is worsening by *Eucalyptus species*, especially if these tree species are near watersheds. While these tree species are upheld for carbon sequestration programs, they may increase vulnerability to water crisis.
5. *Grevillea robusta* is an evergreen tree suitable for agroforestry systems in the highlands. It is useful for shading, and its leaves are utilized as fodder during dry spells (Muthuri, Ong, Black, Ngumi, & Mati, 2005).

References

Adger, W., Dessai, S., Goulden, M., Hulme, M., Lorenzoni, I., Nelson, D., … Wreford, A. (2009). Are there social limits to adaptation to climate change? *Climatic Change*, *93*(3/4), 335–354.

Angula, M. (2010). Gender and climate change: Namibia case study. Heinrich Böll Foundation Southern Africa, Cape Town.

Bagozzi, R. P., Gürhan-Canli, Z., & Priester, J. R. (2002). *The social psychology of consumer behavior*. Buckingham, UK: Open University Press.

Below, T. B., Mutabazi, K. D., Kirschke, D., Franke, C., Sieber, S., Siebert, R., & Tscherning, K. (2012). Can farmers' adaptation to climate change be explained by socio-economic household-level variables? *Global Environmental Change*, *22*, 223–235.

Blanchflower, D. G., & Oswald, A. J. (2011). International happiness: A new view on the measure of performance. *Academy of Management Perspectives*, *25*, 6–22.

Bourne, H., & Jenkins, M. (2005). Eliciting managers' personal values: An adaptation of the laddering interview method. *Organizational Research Methods*, *8*(4), 410–428.

Bryan, E., & Behrman, J. (2013). Community–based adaptation to climate change: A theoretical framework, overview of key issues and discussion of gender differentiated priorities and participation (*CAPRi Working Paper No. 109*). Washington, DC, USA.

Bryan, E., Ringler, C., Okoba, B., Roncoli, C., Silvestri, S., & Herrero, M. (2013). Adapting agriculture to climate change in Kenya: Household strategies and determinants. *Journal of Environmental Management*, *114*, 26–35.

Corbridge, C., Rugg, G., Major, N. P., Shadbolt, N. R., & Burton, A. M. (1994). Laddering: Technique and tool use in knowledge acquisition. *Knowledge Acquisition*, *6*(2), 315–341.

Costa, A. I., Dekker, M., & Jongen, W. M. F. (2004). An overview of means-end theory: Potential application in consumer-oriented food product design. *Trends in Food Science and Technology*, *15*(7), 403–415.

Doria, M., Boyd, E., Tompkins, E., & Adger, W. (2009). Using expert elicitation to define successful adaptation to climate change. *Environmental Science and Policy*, *12*, 810–819.

Eriksen, S., Aldunce, P., Bahinipati, C. S., Martins, R. D., Molefe, J. I., Nhemachena, C., … Ulsrud, K. (2011). When not every response to climate change is a good one: Identifying principles for sustainable adaptation. *Climate and Development*, *3*(1), 7–20.

FAO. (2008). An introduction to the basic concepts of food security, Italy Rome.

FAO. (2013). *Climate-smart agriculture sourcebook*. Rome: Food and Agricultural Organization of the United Nations.

Frank, E., Eakin, H., & López-Carr, D. (2011). Social identity, perception and motivation in adaptation to climate risk in the coffee sector of Chiapas, México. *Global Environmental Change*, *21*(1), 66–76.

Farnworth, C., Sundell, M. F., Nzioki, A., & Davis, M. (2013). *Transforming gender relations in agriculture in Sub-Saharan Africa*. (S. I. A. N. Initiative, Ed.). Stockholm: Swedish International Agricultural Network Initiative (SIANI).

Giacomino, D. E., & Eaton, T. V. (2003). Personal values of accounting alumni: An empirical examination of differences by age and gender. *Journal of Managerial Issues*, *15*, 369–379.

GoK. (2010). *Government of Kenya. National climate change response strategy: Together we can tackle climate change*. Nairobi: Ministry of Environment and Natural Resources.

GoK. (2013). National climate change action plan 2013–2017. Retrieved from http://cdkn.org/wp-content/ uploads/2013/03/Kenya-National-Climate-Change-Action-Plan.pdf

Grothmann, T., & Patt, A. (2005). Adaptive capacity and human cognition: The process of individual adaptation to climate change. *Global Environmental Change*, *15*, 199–213.

Gutman, J. (1997). Means-end chains as goal hierarchies. *Psychology and Marketing*, *14*, 545–560.

Hinkle, D. (1965). The change of personal constructs from the viewpoint of a theory of implications (*PhD dissertation*). Ohio State University, Columbus, OH.

Holvoet, N. and Inberg, L., 2014. Gender sensitivity of Sub-Saharan Africa national adaptation programmes of action: Findings from a desk review of 31 countries. *Climate and Development*, *6*, 266–276. doi:10.1080/17565529.2013.867250

IPCC. (2012). *Managing the risks of extreme events and disasters to advance climate change adaptation*. *Special report of the Intergovernmental Panel on Climate Change*. Cambridge: Cambridge University Press.

Jones, L., & Boyd, E. (2011). Exploring social barriers to adaptation: Insights from Western Nepal. *Global Environmental Change*, *21*, 1262–1274.

Kakota, T., Nyariki, D., Mkwambisi, D., & Kogi-Makau, W. (2011). Gender vulnerability to climate variability and household food insecurity. *Climate and Development*, *3*(4), 298–309.

Kangal, A. (2013). Means–end chain theory and laddering technique: Applications in consumer behavior research. *Business and Economics Research Journal*, *4*(2), 55–78.

Kenya National Bureau of Statistics. (2014). *Economic survey 2012*. Nairobi, Kenya.

Kiptot, E., & Franzel, S. (2012). Gender and agroforestry in Africa: A review of women's participation. *Agroforestry Systems*, *84*(1), 35–58.

Lagerkvist, C., Ngigi, M. W., Okello, J. J., & Karanja, N. (2012). Means-end chain approach to understanding farmer's motivations for pesticide use in leafy vegetables: The case of kale in peri-urban Nairobi, Kenya. *Crop Protection*, *39*, 72–80.

Löf, A. (2013). Examining limits and barriers to climate change adaptation in an indigenous reindeer herding community. *Climate and Development*, *5*(4), 328–339. doi:10.1080/17565529.2013.831338

López-Marrero, T., & Yarnal, B. (2010). Putting adaptive capacity into the context of people's lives: A case study of two flood-prone communities in Puerto Rico. *Natural Hazards*, *52*, 277–297.

López-Mosquera, N., & Sánchez, M. (2011). The influence of personal values in the economic-use valuation of peri-urban green spaces: An application of the means-end chain theory. *Tourism Management*, *32*(2), 875–889.

Lorenzoni, I., Leiserowitz, A., De Franca Doria, M., Poortinga, W., & Pidgeon, N. F. (2006). Cross-national comparisons of image associations with 'global warming' and 'climate change' among laypeople in the United States of America and Great Britain. *Journal of Risk Research*, *9*(3), 265–281.

Muthuri, C. W., Ong, C. K., Black, C. R., Ngumi, V. W., & Mati, B. M. (2005). Tree and crop productivity in grevillea, alnus and paulownia-based agroforestry systems in semi-arid Kenya. *Forest Ecology and Management*, *212*(1–3), 23–39.

Nelson, V. (2011). *Gender, generations, social protection & climate change: A thematic review*. London: Overseas Development Institute.

Ngigi, M. W., Mueller, U., & Birner, R. (2017). Gender differences in climate change adaptation strategies and participation in group-based approaches: An intra-household analysis from rural Kenya. *Ecological Economics*, *138*, 99–108.

O'Brien, K. L. (2009). Do values subjectively define the limits to climate change adaptation? In W. N. Adger, I. Lorenzoni, & K. L. O'Brien (Eds.), *Adapting to climate change. Values, thresholds, governance* (pp. 164–180). Cambridge, UK: Cambridge University Press.

O'Brien, K. L., & Wolf, J. (2010). A values-based approach to vulnerability and adaptation to climate change. *Climate Change*, *1*(2), 232–242.

Okello, J. J., Lagerkvist, C., Ngigi, M. W., & Karanja, N. (2014). Means-end chain analysis explains soil fertility management decisions by peri-urban vegetable growers in Kenya. *International Journal of Agricultural Sustainability*, *12*, 183–199.

Oloo, J. O., Makenzi, P. M., Mwangi, G. J., & Abdulrazack, A. S. (2013). Influence of traditions/ customs and beliefs/ norms on women in tree growing in siaya county, Kenya. *Global Journal of Environmental Science and Technology*, *1*(1), 1–6.

Olson, J. C., & Reynolds, T. J. (2001). The means-end approach to understanding consumer decision-making. In T. J. Reynolds & J. C. Olson (Eds.), *Understanding consumer decision making: The means-end approach to marketing American marketing association* (pp. 145–162). Mahwah, NJ: Lawrence Erlbaum Associates.

Olson, S. F., & Currie, H. M. (1992). Female entrepreneurs: Personal value systems and business strategies in a male-dominated industry. *Journal of Small Business Management*, *30*(1), 49–57.

Patt, A., Daze, A., & Suarez, P. (2009). *Gender and climate change vulnerability: What's the problem, what's the solution?* In M. Ruth, & M. E. Ibarraran (Eds.), *Distributional impacts of climate change and disasters: Concepts and cases* (pp. 687–716). Cheltenham: Edward Elgar.

Quisumbing, A., Kumar, N., & Behrman, J. (2011). Do shocks affect men's and women's assets differently? A review of literature and new evidence from Bangladesh and Uganda (*IFPRI Discussion Paper 01113*). Washington, DC, USA.

Reynolds, T. J., & Gutman, J. (1988). Laddering theory, method, analysis, and interpretation. *Journal of Advertising Research*, *28*, 11–31.

Reynolds, J. T., & Olson, J. C. (2001). *Understanding consumer decision making: The means-end approach to marketing and advertising strategy*. Mahwah, NJ: Lawrence Erlbaum Associates, Inc.

Rogers, M., Curtis, A., & Mazur, N. (2012). The influence of cognitive processes on rural landholder responses to climate change. *Journal of Environmental Management*, *111*, 258–266.

Rokeach, M. (1973). *The nature of human values*. New York, NY: The Free Press.

Rugg, G., Eva, M., Mahmood, A., Rehman, N., Andrews, S., & Davies, S. (2002). Eliciting information about organizational culture via laddering. *Information Systems Journal*, *12*, 215–229.

Russell, C. G., Busson, A., Flight, I., Bryan, J., van Lawick van Pabst, J. A., & Cox, D. N. (2004). A comparison of three laddering techniques applied to an example of a complex food choice. *Food Quality and Preference*, *15*, 569–583.

Salame, N. (2004). Motivations towards farming in Lebanon: A comparison between organic and conventional farmers (*M.Sc. Thesis*). Mediterranean Agronomic Institute of Bari, Italy.

Santosa, M., & Guinard, J. X. (2011). Means-end chains analysis of extra virgin olive oil purchase and consumption behavior. *Food Quality and Preference*, *22*, 304–316.

Schwartz, S. H. (1992). Universals in the content and structure of values: Theory and empirical tests in 20 countries. In M. Zanna (Ed.), *Advances in experimental social psychology* (pp. 25–65). New York, NY: Academic Press.

Schwartz, S. H. (2012). An overview of the Schwartz theory of basic values. *Online Readings in Psychology and Culture*, *2* (1). doi:10.9707/2307-0919.1116

SEI. (2009). Stockholm environmental institute. Economics of climate change in Kenya. *Report submitted in advance of COP15*. Retrieved from http://www.unep.org/dec/support/Atmosphere/CC_Outreach.asp

Silvestri, S., Bryan, E., Ringler, C., Herrero, M., & Okoba, B. (2012). Climate change perception and adaptation of agro-pastoral communities in Kenya. *Regional Environmental Change*, *12*(4), 791–802.

Thorlakson, T., & Neufeldt, H. (2012). Reducing subsistence farmers' vulnerability to climate change: Evaluating the potential contributions of agroforestry in western Kenya. *Agriculture and Food Security*, *1*(1), 15. doi:10.1186/2048-7010-1-15

Van Staveren, I., & Odebode, S. (2007). Gender norms as asymmetric institutions: A case study of yoruba women in Nigeria. *Journal of Economic Issues*, *41*(4), 903–925.

Volenzo, T., Singoro, B., & Wakhungu, J. (2013). Managing climate change risks for sustainable food security in Kenya: Prospects and options. *International Journal of Disaster Risk Reduction*, *5*(1), 13–30.

Walker, B. M., & Crittenden, N. (2012). The use of laddering techniques in personal construct methodology. In P. Caputi, L. L. Viney, B. M. Walker, & N. Crittenden (Eds.), *Personal construct methodology* (pp. 71–87). Chichester: John Willey and Sons, Ltd.

Webber, E. U., & Stern, P. C. (2011). Public understanding of climate change in the United States. *American Psychologist*, *66*(4), 315–328.

Wolf, J., Allice, I., & Bell, T. (2013). Values, climate change, and implications for adaptation: Evidence from two communities in Labrador, Canada. *Global Environmental Change*, *23*(2), 548–562.

World Bank. (2013). Turn down the heat: Climate extremes, regional impacts, and the case for resilience. *A report for the World Bank by the Potsdam Institute for Climate Impact Research and Climate Analytics*. Washington, DC, USA.