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Reference:

Van Aelst Katrien, Holvoet Nathalie.- Intersections of gender and marital status : in accessing climate change adaptation: evidence from rural Tanzania

World development - ISSN 0305-750X - 79(2016), p. 40-50

Full text (Publishers DOI): <http://dx.doi.org/doi:10.1016/j.worlddev.2015.11.003>

Handle/Permalink: <http://hdl.handle.net/10067/1296410151162165141>

Intersections of Gender and Marital Status
in Accessing Climate Change Adaptation:
Evidence from Rural Tanzania

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Abstract

Climate scholars are increasingly recognizing the importance of gender in climate change vulnerability, but often either dichotomize men and women as homogeneous categories or limit themselves to comparing male- and female-headed households. We use an intersectionality framework to examine how the adaptive strategies of Tanzanian farmers are mediated through their gender and marital statuses. Drawing on focus group discussions and using logistic regression to analyze questionnaire data, we compare the relative adoption of the different adaptive strategies of single, married, divorced and widowed men and women. Our study shows that, while a woman's marital status is a vital factor in determining her access to adaptive strategies, it is a less important factor in the case of men. We show that, compared with other women, widows and female divorcees are disadvantaged in the field of agricultural water management, and divorced women assume relatively more income earning activities outside the farming sector. Finally, we find evidence of livelihood diversification at the household level through specialization by individual household members. Based on the empirical evidence, we develop a typology with which to synthesize the linkages between gender, marital status and adaptive strategies; and we subsequently emphasize the importance of an intersectionality approach to gender and climate change policy and practice.

Keywords: climate change adaptation, gender, marital status, livelihood diversification, Africa, Tanzania

Acknowledgements

We would like to acknowledge that the Research Fund of the University of Antwerp and the VLIR-UOS Institutional University Cooperation with Mzumbe University provided the funding for this research. For their helpful feedback, we would also like to thank the participants at the University of East Anglia's International Gender Conference (July 2015), where the principal author presented a version of this article.

Intersections of Gender and Marital Status in Accessing Climate Change Adaptation: Evidence from Rural Tanzania

1. Introduction

(a) Adapting to a changing climate

The contribution of this article to the climate change literature is to improve our understanding of how gender and marital status intersect in determining the access that different types of households have to various adaptive strategies. Although an increasing number of climate scholars acknowledge the importance of gender, they often do so merely to note the different impacts of climate change on women and men, or on female- versus male-headed households. Here we analyze how weather related changes might affect women and men differently in terms of their access to resources and adaptive strategies, such as livelihood diversification and agricultural water management. We argue that, while a comparison between male- and female-headed households is a valuable first step in climate change analysis, it is also important to try and transcend this level of analysis and to recognize the diverse positions of different types of female-headed households (Bhattarai et al., 2015; Huynh & Resurrección, 2014), as well as the different positions of women and men in male-headed households. Consequently, the relevance of this research to policy lies in its conclusion that it is unwise to assume that homogeneity exists among 'women', 'men' or 'female-headed households', for these categories

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consist of individuals with varying degrees of access to climate change adaptation strategies.

In the research presented here, we focus on intersections of gender and marital status and compare married (or cohabiting), divorced (or separated), widowed and single (having never married) men and women. Based on academic literature reviews and on the focus group discussions that one of us (Katrien Van Aelst) conducted during field research in the Morogoro Region of Tanzania, we select two dimensions of climate change adaptation for discussion – livelihood diversification and agricultural water management (irrigation and valley farming).¹ We combined the data from the focus groups with those from a questionnaire derived from 845 respondents across four villages to answer the following two research questions. First, to what extent does a person's gender and marital status determine his or her adoption of adaptive strategies in both the fields of agricultural water management and livelihood diversification? In other words, how do the statuses of being married, divorced, widowed or single affect a person's access to these adaptive strategies? We develop a typology to illustrate the intersections between gender, marital status and access to adaptive strategies. Second, given that a person's marital status has a bearing on his or her level of vulnerability and ability to adapt to climate change, what constraints and opportunities work towards determining the differential paths to adaptation of the various marital categories?

We have structured the article as follows. Section 2 starts with a brief discussion of climate change and adaptation in Tanzania, followed by an introduction to the intersectionality approach we use. Subsequently, we give an overview of, first, the literature that compares adaptation across male- and female-headed households and, second, research

that has taken the analysis a step further by using an intersectionality perspective. Then, after a brief description of our data collection and research methods, we embark on a description of the study site (section 3). Section 4 comprises the empirical analysis, followed by a discussion (section 5), then summary of the main results and concluding remarks (section 6).

(b) Gendered vulnerability and adaptation in Tanzania

Tanzania, like many other sub-Saharan African countries, is facing the challenge of having to adapt to a changing climate. The impacts of the projected climate change for Tanzania range from growing incidences of natural hazards like droughts, earthquakes, floods and storms (World Bank, 2014: 302), rising temperatures and changes in river flows to less predictability of already highly variable rainfalls. Likely manifestations of the latter are shifts in the onset of the rainy season, as well as more concentrated and heavier rainfalls (IPCC, 2014; United Republic of Tanzania, 2014). The consequences of this are dire for local farmers, who mostly depend for their survival on small-scale, rain-fed agriculture (United Republic of Tanzania, 2014). The changing climatic conditions threaten their livelihoods and food security (Arndt et al., 2011; Kakota et al., 2011) because they are causing reductions in the yields of, among other crops, maize, sorghum and rice (Rowhani et al., 2011).

Adaptation to climate change refers to a strategy to reduce and manage the risks associated with the phenomenon (IPCC, 2014). Among the adaptive strategies that small-scale farmers² use in the Morogoro Region are livelihood diversification, migration, agricultural intensification – for example, irrigation and switching to ‘fast crops’ that produce a larger number of harvests per year – and coping strategies such as selling assets and livestock to purchase food and applying for

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government food assistance (Below et al., 2012; Eriksen et al., 2005; Goldman & Riosmena, 2013; Paavola, 2008; Ponte, 2002; van Donge, 1992). Adaptation strategies can thus take many different forms and they often reflect local development strategies (such as practices that also improve livelihood security or increase agricultural production). Livelihood diversification and agricultural water management are thus strategies that respond not only to climate change but also to the other environmental, social and economic drivers that the changing climate exacerbates and reinforces (Eakin, 2005).

Tanzania's climate change policies (Smucker et al., 2015) largely neglect the interplay between climate change and the various socio-cultural, institutional and political dimensions of development that influence an individual's vulnerability, namely the exposure to risk as well as the ability or inability to deal with risky events (Ellis, 2006). More specifically, Tanzania's National Adaptation Programme of Action (NAPA) (United Republic of Tanzania, 2007) and the National Climate Change Strategy (United Republic of Tanzania, 2012) ignore the fact that different categories of farmers might be differentially exposed to climate change risks, for instance because they are more dependent on natural resources. These policies also fail to acknowledge that some categories of farmers may find it more difficult than others to handle risky climate change events. For example, a lack of resources such as cash, credit, land, networks, education or time may lower their adaptive capacity (Adger, 1999; Below et al., 2012; Berman et al., 2015). Along the same lines, Tanzanian climate policies are insensitive to gender issues and treat women as one homogeneous group; in other words, they disregard the fact that some of the adaptation strategies discussed above might be less available to specific categories of women, such as female household heads. As Smucker et al. (2015) point out, this neglect of differentiated vulnerability and

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adaptive capacity alongside the existing cultural, institutional and political drivers of inequality does not entirely come as a surprise; it is in keeping with Tanzania's development policies, which tend to seek system stability by strengthening the status quo.

If anything, such simplified diagnoses and the policies arising from them, which treat rural communities as undifferentiated, run the risk of exacerbating rather than addressing existing inequalities. This is exactly why we decided to adopt an intersectionality approach to this research, which focuses specifically on the intersections of 'gender' and 'marital status'.

(c) Intersectionality

Intersectionality addresses the relationships between the multiple dimensions of social identities and subject formations (Crenshaw, 1989; McCall, 2005). It denotes the various ways in which categories such as race and gender organize social relations, as well as reinforce and mutually constitute each other (Shields, 2008). In this article, when we use the word intersectionality, we mean that gender and other social categories such as marital status interact to shape people's experiences of climate change. Marital status is a non-static social category that structures the social (gender) relations, rights and duties, especially of women. We understand gender, intersecting with the category of marital status, as discursively produced (Butler, 1990; Francis, 2008) and manifested in women's and men's concrete actions (Nayak and Kehily, 2006). While women and men discursively produce and reproduce their gender subjectivities through everyday practices, they are nevertheless able, as subjects, to negotiate these subjectivities through subversive acts and speech (Foucault, 1978).

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Although climate scholars do take gender into account, most do so in a way that differentiates the climatic impacts on allegedly homogeneous categories of women and men, rather than analyzing how weather-related changes are likely to affect different types of women and men. Gradually, however, more research is emerging that addresses gender in a more nuanced way. In what follows we give an overview of studies on agricultural water management and livelihood diversification, starting with those that analyze differences between male- and female-headed households, then followed by those that address the differences among female-headed households.

Chant (1997) argues that women in female-headed households experience poverty – and we could argue vulnerability – differently from women in male-headed ones. While women in female-headed households often have to endure the problem of a limited asset base, women in male-headed ones have less access to and control over the assets *in* the household. Upperman (2000) illustrates how female-headed households are unable to compete with male-headed ones in accessing irrigation water in northern Tanzania mainly because they lack certain resources, such as time, and have weaker social relations with the male water guards. The evidence on land titling, however, shows female-headed households occasionally able to reap the benefits of their greater independence. Englert (2008) illustrates this point in her study on land access among the Luguru people (Morogoro Region). She found that even when women are aware of their rights to joint land registration,³ they tend to be hesitant about claiming these rights in case their husband takes it as a sign that they plan to leave the marriage. In other words, women are likely to prioritize marital harmony over their individual land rights. Englert's findings illustrate, first, that since unmarried, divorced and widowed women find it *easier* to buy land in their own right, marital status indeed plays a crucial role

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in women's access to land rights and, second, that a married woman's access to resources such as land depends on the nature of her relationship with her husband.

The literature also examines livelihood diversification from the vantage points of male- as opposed to female-headed households. As an adaptive strategy, livelihood diversification can take many different forms: for example, it can be seasonal or permanent; it can entail non-farm income earning activities; or it can take the form of casual work on other people's farms. Ellis & Mdoe (2003) describe how the proportion of non-farm income and overall household welfare seem to go hand in hand in contemporary developing countries. They find that the better-off households generally diversify their activities into salaried employment or small-scale enterprises such as brick making, shopkeeping and transport, while the poorer households tend to engage in casual wage labor on other people's farms and remain more dependent on agriculture. Also, evidence among the Maasai in northern Tanzania suggests that men are generally supportive of their wives' business efforts and help their spouses secure the required start-up capital (Smith, 2014). This is a form of material support that female-headed households often lack.

Taking the analysis deeper by comparing different types of female-headed households (Chant, 1997; Handa, 1994) offers us an intersectional gaze into climate change research, which in turn helps us to guard against overgeneralizing or simplifying complex local realities, so consequently wrongly informing policy (Arora-Jonsson, 2011; Holvoet & Inberg, 2014). Some studies have analyzed how women's marital status – one level of intersection – influences their access to land, water, jobs and other resources. Rwebangira (1996), for instance, argues that Tanzania's laws in practice penalize women

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for remaining in a marriage until their spouse's death. A divorcee can expect a division of matrimonial assets of up to 50 per cent, while a widow often gets nothing at all because she can only inherit in the event of there being no male children or male relatives (see also Dilger, 2006).⁴ A woman's entitlements can also depend on her status as a married woman. For example, a study in western Kenya found that widows still benefit from their status as *once-married women* to access marital resources (Mutongi, 1999). Mutongi found that widows displayed their grief in public as a way of emphasizing their (past) marital achievements and thus their claim to the (marital) support to which they are still entitled. Elderly single women, however, could not rely on such a strategy. Marital status – especially for women – automatically brings certain entitlements and socio-economic returns that have repercussions in terms of adaptive capacity. We also recognize the importance of differentiating between *de facto* and *de jure* female-headed households, for the former can often rely on male labor remittances to mediate their vulnerability (Klasen et al., 2015). However, in this research we cannot take into account the category of *de facto* female-headed households because temporary labor migration was fairly rare in the villages we studied because they are sufficiently close to Morogoro Town and to other sites (for example Mzumbe University) where there is a demand for casual and permanent wage labor.

Scholars have looked at the intersections of gender, poverty and landlessness in relation to gaining access to water (Harris, 2008), and of class, age, education, credit and household headship in terms of broadening or narrowing women's attempts to diversify their livelihoods (Huynh & Resurrección, 2014). Huynh and Resurrección found that well-off women were more likely to enter self-employment, while those who were poor were more likely to engage in less lucrative and

irregular waged labor activities. Not all female-headed households are equally well adapted, so it is therefore crucial to distinguish between the different types of female-headed households (Klasen et al., 2015).

One study undertaken in Tanzania and Kenya, which focused specifically on the position of married women in male-headed households, found evidence of the use of an increasing level of intra-household specialization as an income diversification strategy at the household level (Eriksen et al., 2005). It worked as a successful coping strategy to ensure a steady income during periods of drought, especially if the husband engaged in casual labor or charcoal production. Women were often unable to devote longer periods of time to specialized non-farm activities because of their domestic duties and because they had to bear the brunt of responsibility for many agricultural tasks. Moreover, custom precludes women from engaging in certain economic activities (Smith, 2014). Consequently, married women in male-headed households risk becoming more dependent on men. This is because 'if an individual who had specialized in one activity ceased to contribute to the household economy, the remaining members become more at risk' (Eriksen et al., 2005: 301).

2. Research Methodology and Context⁵

In this study we use a mix of qualitative and quantitative methods to triangulate the data and research findings. We draw on both primary and secondary sources, including meteorological data obtained from the Tanzania Meteorological Agency and academic literature. One of us (Katrien Van Aelst) undertook the primary data collection, which occurred in three stages and involved the collection of both qualitative and quantitative data. The first round of exploratory field research, which took place between September and November 2013, included

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interviewing key informants and experts, as well as consulting local researchers to ensure construct validity of the research findings and to elicit input for the design of the questionnaire. The second phase involved qualitative data collection, namely focus group discussions (held between March and May 2014). The 41 focus group discussions, which were either women-only or men-only with three to seven participants per group, were held in the local language and facilitated by trained local university graduates. Using participatory approaches such as drawing, Venn-Diagram ranking and scoring, the participants aired the livelihood challenges they faced in their villages and discussed what strategies they could appropriately employ to respond to those challenges. The selected participants were made up of a range of household types and marital statuses and all were at least partially engaged in farming. To ensure spatial representation of the participants, focus groups were organized in all the administrative sub-villages, each providing a local chairperson to assist in the selection procedure. The qualitative data provided input for the household questionnaire organized in July–August 2014 (the third phase of data collection). The household survey consisted of a random sample of households from each of the four villages being studied. Apart from the requirement that the respondents had to be involved in farming, the selection also entailed proportional representation across sub-villages by estimated number of inhabitants. The aim was to include about 65 per cent of married or cohabiting households among the respondents.⁶ Where the household consisted of a couple, the husband and wife were interviewed separately. A total of 845 respondents were included in the questionnaire, of whom 686 were married (343 couples) while 159 (114 females and 45 males) comprised single-headed households. Six local enumerators received a five-day training and undertook the questionnaire interviews in Swahili. Furthermore, participants received

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a small payment as compensation for the time spent participating in the research. Qualitative data were coded (open and axial) and analyzed using Nvivo-software. Questionnaire data were analyzed statistically in SPSS via cross-tabulation, t-tests and logistic regression.

From the focus group discussions, we selected two adaptation strategies for discussion in this article; these were livelihood diversification and agricultural water management (with the latter including both irrigation and valley farming). Our respondents saw both strategies as important responses to climate unpredictability, dry spells and drought. We asked the focus group participants, differentiated by gender into 16 male and 25 female groups, to identify what problems threatened their livelihoods. Only one group (a male one) disagreed that weather or climate-related issues presented a problem. The other 40, however, went on to discuss potential and actual solutions to, or strategies for coping with, climatic threats. As a group, the participants attributed a score of 0 to 10 to each of the different strategies available to protect themselves from the effects of climate change (the higher the score the greater its perceived effectiveness). During their discussions, the participants used beans or small stones to tot up the scores, which gave them the flexibility they needed to alter them as the talks progressed (Chambers, 2008), though of course the final scores were more illustrative of a particular viewpoint than an objective number.

Table A1 in the Appendix provides detailed information on the basic characteristics of the sample, which includes the frequencies of the relevant explanatory socio-economic variables in each given marital status. The table shows that the widows in the sample, in particular, tended to lack education, whereas the majority of the other categories

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had at least passed Standard 7 (that is finished primary school). Furthermore, the never-married women (23.10 per cent), never-married men (40 per cent) and divorced women (17.50 per cent) were the households most likely to depend *exclusively* on rented farmland. The commercial farmers, on the other hand, tended to be single men (13.3 per cent), divorced men (10 per cent) and married women (8.70 per cent).

(a) Study site and context

The four villages we studied belong to the Ngerengere sub-catchment of the Ruvu River Basin and they are located in the Morogoro Region of Tanzania (Mvomero and Morogoro Rural Districts). We selected two neighboring rural villages (Kiwege and Sinyaulime) and two neighboring semi-rural ones (Vikenge and Changarawe). The latter pair are located closer to Morogoro Town and a local university (Mzumbe University). We used a cluster sampling procedure to select the villages, with the location of both clusters representing the villages' access to infrastructure and the labor market, as well as the degree of heterogeneity in the composition of their populations (in terms of ethnicity, occupation and wealth). We chose the four villages for the purpose of comparative analysis along the lines of 'ruralness', access to labour markets and heterogeneity of the population. It is possible to extend the study findings to other rural areas in Tanzania that show similar socio-economic and gender relations and face comparable climatic challenges. Our research findings are therefore especially relevant (in terms of external validity) to other rural areas of the Morogoro Region and the Wami-Ruvu River Basin. Below, we describe the study area and its climatic data in greater detail.

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The future effects of a changing climate are uncertain in the Morogoro Region of Tanzania. Given the bimodal rainfall pattern in at least part of the region, the potential exists for an increase in rainfall. However, it is also possible that the area will evolve towards a more unimodal rainfall pattern and therefore see a decrease in rain (Paavola, 2008; United Republic of Tanzania, 2014: 21). Generally, the region is expected to experience a warmer, longer dry season and worsening periods of drought. Moreover, the flow of water in the Ruvu River is likely to diminish; its minimum flow during the dry season is expected to be less than half of what it is today (IPCC, 2014; Paavola, 2008; United Republic of Tanzania, 2007).

Table 1: Decrease and increase in rainfall (mm) in Morogoro Town (1971–2013 and 2004–2013)

Period	J	F	M	A	M	J	J	A	S	O	N	D	Yearly
1971–2013	-		+		-	-	--		-				-
2004–2013	-	-	---	-	++	-	---	-		-	-		--

- and + if R^2 is between 0.01 and 0.1; -- and ++ if R^2 is between 0.1 and 0.2; --- and +++ if R^2 is bigger than 0.2.

Source: Authors' analysis based on rainfall data from the Tanzania Meteorological Agency; reporting format based on Huynh and Resurreccion, 2014.

The rainfall data for Morogoro Town (see Table 1) indeed indicate increasing climate variability. Between 2003 and 2013, the meteorological agency measured both the two lowest and the highest yearly rainfall readings since recordings started in 1971. Furthermore, the data show a declining trend in mean yearly rainfall since the 1970s. Paavola (2008) observed the same trend. Moreover, Table 1 suggests that changes in rainfall were more pronounced in the last decade (compared with the 1971–2013 period), especially decreasing in March

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and July, increasing in May and slightly decreasing in the other months (except September and December, which remained constant). The data suggest more concentrated rainfall in a shorter period of time; a later onset of both the short (Vuli) and main (Masika) rainy seasons, which usually start in October/November and February/March respectively; and decreasing rainfall during the Vuli rainy season. The following quotation from a participant (Sinyaulime, FG2m) in a focus group discussion illustrates this point:

I don't know what God is thinking of our village. We used to have short rain and long rain. Now, the short rain has disappeared and the long rain has turned into short rain. Only one rainy season is left. ... Even when it rains, it rains very heavily and all that was being cultivated is carried away.

Focus group discussions conducted at the study site show that farmers defined the weather related problems they faced as climate variability; unpredictable rainfall; increased occurrence and severity of drought; less rainfall during the October–December rainy season (Vuli) and, to a lesser extent, higher temperatures ('strong sun') and increased occurrences of floods and heavy rainfall.

3. Findings and Analysis

In this section, we first outline the reasons for and importance of the two climate change adaptation strategies we selected. Next, we rely on statistical analysis to differentiate the farmers by gender and marital status and compare their adoption of agricultural water management and livelihood diversification strategies. From these results, we develop an adaptation typology to demonstrate access to adaptive strategies by gender and marital status.

(a) Farmers' adaptation preferences

In this section, we draw attention to the respective weights given during focus group discussions to the two preferred adaptation strategies. The farmers emphasized the importance of using valley land for *agricultural water management* because it is both where irrigation is possible through digging traditional wells and where the soil holds more moisture.⁷ As one farmer (Changarawe, R1m) explained, 'I am going to the valley to grow short seeds. In the valley water will be available for these 60 days. When the last month of the rainy season gets dry, at least in the valley the maize will not be destroyed.'

Of the 40 focus groups (see Table 2) operated in the four villages, 11 and 12 respectively raised questions about irrigation and valley farming. The female groups raised the question of valley farming slightly more frequently (36 per cent) than the male groups (20 per cent), but men and women mentioned irrigation equally often. On average, these groups gave the agricultural water management strategies scores of 8.36 and 6.41 respectively out of a perceived effectiveness scale of 10. Men and women ranked the practices similarly, but women gave lower scores, especially to irrigation (5.79 compared with an average 7.50 among the men). Valley farming was the strategy that scored highest, with men and women attributing it 9.33 and 8.00 respectively. The groups that gave high scores to valley farming generally argued that it was the longest standing and most tried and tested method of farming in the area – you have to farm in the valley to ensure at least some harvest. Low scores for valley farming generally meant that such land was inaccessible to some farmers and that even in the valley crops wither during periods of extreme drought. The groups that gave lower effectiveness scores to irrigation generally did so on the grounds of its high cost, insufficient

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availability of water and because the practice was not accessible to everyone, or at the times when it was most needed. High scores for irrigation were mainly given by those who had access to it and they emphasized enjoying the security of getting a good harvest.

Table 2: Frequencies and scoring of adaptive practices

	FGs that mentioned the adaptation practice (absolute number and %)			Average perceived effectiveness score attributed to the practice (out of 10)		
	Total ^a	Female ^b	Male ^c	Total	Female	Male
Non-farm activities	20 50%	16 64%	4 27%	7.32	7.07	8.25
Valley farming	12 30%	9 36%	3 20%	8.36	8.00	9.33
Irrigation	11 27%	7 28%	4 27%	6.41	5.79	7.50

Notes: ^a as a percentage of the total of 40 focus groups that considered the climatic condition as problematic; ^b out of 25 female focus groups; ^c out of 15 male focus groups. Source: Authors' analysis based on focus group discussions.

With respect to *livelihood diversification*, the participants in the focus groups drew attention to the fact that rainfall patterns were becoming less and less predictable and that having to depend solely on farming was becoming increasingly risky. As one farmer (Kiwege, FG1m) pointed out, 'there used to be two seasons of rainfall, but these days you don't know when to cultivate anymore. The cultivation season can just pass by [without you growing anything].' In other words, the importance of (at least seasonal) livelihood diversification is becoming increasingly evident. In half of the focus groups, non-farm income-earning activities were mentioned as an adaptation strategy; however, significantly more women (64 per cent) than men (27 per cent) favoured that option. The overall average score out of 10 given for the

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perceived effectiveness of this strategy was 7.32. The women on average rated it at 7.07, while men placed it slightly higher at 8.25. This might be because men can expect higher returns than women from their involvement in non-farm activities. Those assigning a higher mark tended to do so because they believed that the potential pay-off would be more lucrative and that it was the way forward. Those choosing a lower one usually did so because they thought that non-farm activities earned them less money than agriculture and because the kinds of small businesses available to them rarely attracted more than a few customers. This was especially pertinent to the female respondents, who complained of the high levels of competition among women offering the same or very similar products and services. The women, however, often admitted that, if they wanted to improve their livelihoods, they had no alternative but to try their luck with alternative work.

A farmer's appreciation of these strategies does not, of course, automatically lead to their adoption. Because some types of farmers find it more difficult than others to implement these practices, we shall now, in the next few paragraphs, look at their discrepant adoption rates through the lens of the farmers' various marital statuses.

(b) Adaptation through agricultural water management

Valley farming

The questionnaire data from the four villages showed that 78 per cent of female household heads had access to valley land versus 84 per cent of male single-headed households and 89 per cent of married couples. Compared to married households, of which 66 per cent use the combination of lowlands and highlands, single-headed households are disadvantaged in terms of concurrent access to both types of

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farmlands (47 per cent for both male and female heads). Logistic regression (a in Table 3) controls for the extent of a respondent's farming involvement (occupation) and shows that female divorcees and widows are respectively 71 and 66 per cent less likely than married women to have access to valley land. There are no significant differences in the likelihood of using valley land between either married and single women or married women and the male categories. This indicates that certain categories of female-headed households – namely widows and female divorcees – have less flexibility in choosing where to plant their crops. Their lower adaptive capacity in terms of agricultural water management thus makes them more vulnerable to the impacts of climate change. Moreover, hardly surprisingly, the respondents who did not consider agriculture their primary occupation were 63 per cent less likely than subsistence farmers to use valley land.

[LANDSCAPE TABLE 3 AS NEAR TO HERE AS POSSIBLE]

Irrigation

Furthermore, questionnaire data show that unmarried (single) men have the highest likelihood of irrigating (46.70 per cent), followed by married (27.10 per cent) and then divorced (25 per cent) men. Of those indicating that they irrigate their farms, 67.4 per cent claim to do so with buckets, 21 per cent with a pump and hose, and 11.6 per cent with irrigation channels. Married men are the most likely to use a pump and hose, while unmarried men are most likely to use buckets. Logistic regression b in Table 3 investigates in more detail which groups of men and women are more likely to irrigate their farm, controlling for a respondent's type of land ownership and village. The results suggest that the difference in use of irrigation between men and women is mainly because divorced and married women are significantly less

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likely to use it than married men (the latter being the reference category in the logistic regression). More specifically, divorced women are 65 per cent less likely and married women 47 per cent less likely to irrigate their farms than married men. While we expected to see evidence of a disadvantage in female-headed households, the results show no significant differences between the different female groups (when taking married women as the reference category). Nevertheless, it is reasonable to assume that when married women are not irrigating, their household plot is being irrigated by their husband (as household plots are the dominant type of land use in Morogoro). This assumption was confirmed in focus group discussions and it is therefore likely that the statistical analysis underestimates the differences between married women and female-headed households.

Finally, the regression analysis shows that the more commercial farmers (defined as those selling at least half of their harvest) are 2.6 times more likely to irrigate their farms than subsistence farmers (who sell less than 50 per cent of their harvest). This is hardly surprising given that commercially directed farmers usually have more means at their disposal and can therefore more easily afford irrigation (for example by buying a pump). The village in which a farmer lives is also an important predictor of the use of irrigation and can be understood as a proxy for the irrigation infrastructure (for example there is a river nearby, pumps are available and the Irrigation Board functions). Finally, respondents who live in a household that both owns and rents land are more likely to irrigate their farms, while respondents living in households that use land for free (but land that others, such as relatives or the military, own) are less likely to irrigate their farm. The existence of restrictions on the use of land they do not own or where, for example, they are not allowed to dig a well, or an unwillingness to invest in the land because there is uncertainty about its future use

might explain the latter finding. It is thus clear that, in terms of irrigation, major intersections cut through the lines of marital status, commercial-mindedness of the farmer and the type of land ownership.

(c) Adaptation through livelihood diversification

Non-farm activities

In keeping with the literature, we found evidence of differences between men and women in the field of livelihood diversification, especially in terms of access to non-farm income-earning activities, including wage labor, casual work in maintenance or the transport sector, business, shopkeeping and charcoal production. In the four villages more than half the respondents (53.9 per cent) engaged in non-farm activities. Cross-tabulation showed men especially likely to do so – in fact, 80 per cent of unmarried men, 75 per cent of both divorced and married men, and 40 per cent of widowers. The figures are lower among women – 50 per cent of divorced and unmarried women, 35 per cent of married women and only 28 per cent of widows. Logistic regression (c in Table 3) shows that, compared with married women, controlling for age and educational level, all the male categories, with the exception of widowers, are more likely to engage in non-farm activities – with male divorcees, unmarried men and married men respectively 5.9, 9 and 6.6 times more likely. However, the regression results indicate no significant differences between married women and widows or unmarried women. Only female divorcees are significantly more likely than married women to engage in non-farm activities – or more specifically, they are 1.8 times more likely. Although female divorcees are more vulnerable in terms of access to valley land and irrigation, these women protect their families' welfare by undertaking activities outside farming.

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Furthermore, our analysis shows that respondents without any formal education are 60 per cent less likely to engage in non-farm income-earning activities than those who have completed their secondary education or gone on to a higher level. This suggests that education increases a person's option to diversify his or her livelihood. Moreover, the respondents in the reproductive age group, those aged between 26 and 49, are most likely to be involved in non-farm income-earning activities (1.2 times more likely than those aged 25 or younger). Conversely, respondents aged 70 or above are significantly (60.3 per cent) less likely to engage in such non-farm activities. Since the other socio-economic dimensions made no significant contribution towards explaining why respondents engage in non-farm income-earning activities, we must infer that intersectionality for this practice is mainly manifested through social differences in education, marital status and age (life cycle).

Off-farm casual labor

We also find differences between men and women when we shift the focus to off-farm casual labor – that is working on other people's farms in return for money or food. This tends to take place either during the preparation of the farm, which is very labor intensive because of dependence on the hand hoe, or during harvesting. The questionnaire results revealed that men are more likely than women to engage in off-farm casual labor. More specifically, logistic regression showed that, compared with married women (the reference category), only widowers and male divorcees are significantly more likely to engage in casual farm labor. In other words, we found no evidence of significant differences among the different categories of women or female-headed households. Furthermore, we found that compared to the over 70s, all other age categories are more likely to work on other people's farms.

4. Discussion

Figure 1 is a synthesis of the influence of the intersections of gender and marital status on a farmer’s positioning in terms of adaptive strategies. In this section, we depict how the interplay between gender and marital status constrains and facilitates a person’s access to each of the two adaptation strategies. We also confirm previous research that shows that while marital status is highly relevant for women, it is less so for men.

Figure 1: Typology of access to adaptive strategies by marital status

	LOW agricultural water management	HIGH agricultural water management
LOW livelihood diversification	Widows	Widowers Married women Unmarried women
HIGH livelihood diversification	Divorced women	Divorced men Married men Unmarried men

Source: Authors’ own analysis.

We based Figure 1 on the results of our logistic regressions to show two adaptation dimensions – adaptation in agricultural water management (a combination of valley farming and irrigation) and in livelihood diversification (both non-farm income-earning activities and off-farm casual work). For each adaptation dimension we distinguish relatively high and low levels of adoption by gender and marital

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category. We assume that farmers who invest in both practices have a higher adaptive capacity because they are more effectively able to spread the risks induced by climate change. The typology illustrates the typically vulnerable position of widows on the 'low–low' spectrum and men's strong position, with the exception of widowers, at the 'high–high' end. The latter, together with unmarried women, are typically found on the 'high agricultural water management' but 'low livelihood diversification' spectrum, while female divorcees find themselves in the opposite compartment. We find married women's position more ambiguous in terms of agricultural water management, while their individual levels of livelihood diversification are clearly lower than those of their husbands.

Agricultural water management

Female divorcees and widows, who are the most likely to face challenges in the area of agricultural water management, have less access to valley land largely because they cannot depend on a husband to secure their land rights (see Rwebangira, 1996). Focus group data showed that they were not foregoing their land or irrigation rights by choice, for they displayed a distinct interest in these safety nets and opportunities to improve their harvests. As one participant in a focus group comprised of female divorcees (Sinyaulime, FG9f) put it, 'irrigation is very helpful to us: it works as our husband and gets us something to eat.'

Unmarried women, by contrast, take on relatively more agricultural water management, but this is more to do with their being valley farmers than with them engaging in actual irrigation activities. The position of wives is more ambiguous, however, because their relationship with their husband mainly determines their access to agricultural water management. Although they are often the ones who

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implement the farm work, through for example irrigating, they lack independent access to, or control over, the household resources. The male is generally the legal owner of the land, with joint titles being rare in the sites of our study. This is hardly surprising given that only a few households (approximately 10 per cent of the 178 respondents who owned land) reported having a land title at all.

Livelihood diversification

For most of the women, who work under domestic labor constraints and bear the brunt of responsibility for agricultural tasks, it is a challenge to find time to embark on specialized non-farm activities (Eriksen et al., 2005). Our adaptive capacity typology shows that *widows* are disadvantaged not only in the area of agricultural water management but also in terms of their access to non-farm activities. There are several reasons for their lack of involvement in non-farm and off-farm activities, including old age and lower educational attainment (see Table A1, which shows that their average age is 60 years and 51 per cent are without formal education). Furthermore, the questionnaire revealed that, while an average of 18.2 per cent of all respondents received food support, widows and widowers (38.3 per cent and 40 per cent respectively) are the groups most likely to have to depend on support from government and relatives for food. In focus group discussions, widows and widowers said that their children mainly supported them, both financially and in kind. In line with earlier findings for Kenya (see Mutongi, 1999), elderly parents usually saw it as their right to receive support from their children. For instance, one elderly woman (Vikenge, hh61f) when asked 'who bears family responsibilities when there is a drought?', replied 'all of my children ... cooperate and ... do it several times, *but you do not see us asking them for help*. Still,

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they send us stuff like food or money. Even as they work hard and have their own duties, they tend to remember us.'

Elderly respondents mentioned that they would find it embarrassing to have to ask for support, but nonetheless considered it their legitimate right to receive it and in fact readily depended on it. We can thus assume that the legitimate claims of widows and widowers for support from their children and the government partly compensate for their compromised position; in fact, this key adaptive strategy utilized mainly by widows is less open to other groups. The *unmarried women*, like the widows, also depend mostly on farming, but cope with agricultural water management more successfully. Also like the widows, though to a lesser extent, the unmarried women stated that the material support and food that they occasionally received from their parents and/or the father of their child or children (23.1 per cent relied on food donations) played an important role in their capacity to cope.

While the *female divorcees* coped less well with climate change in terms of agricultural water management, they engaged more in non-farm activities than the other categories of women. Huynh & Resurrección (2014) reached a similar conclusion when they established that, in attempting to support their families, female household heads were more likely than women in male-headed households to diversify their livelihoods through wage labor. Here, factors other than access to money also play a part; in particular level of education or individual skills. For instance, one entrepreneurial female divorcee (Vikenge, int.7f) spoke proudly of her very successful business in Changarawe village:

I used to trade cotton, bringing it from the local farmers. Then I shifted to my business of selling vegetables. Now I am also

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paying some laborers in Konga village to help me in producing and selling bricks and I am keeping chicken. There are not many people selling clay bricks now, so it is a good activity. I am always changing my activity according to the environment. If there are too many people doing the same business, it won't work and you don't gain much.

However, qualitative evidence suggests that the accomplishments of female divorcees are often less profitable than the more diverse activities of men, probably because they have less capital to invest in a small business. This is in contrast to women in male-headed households who, if they engage in non-farm activities, can often rely on financial support from their husbands (see Smith, 2014). This tradeoff between the advantages of financial support within marriage and decision-making autonomy outside marriage, which often encourages independent business activity, is illustrated by one female divorcee (Changarawe, hh.102f) who had a small business selling food and spoke about being in charge of decision-making:

It is easier for me because I am living alone and I am free. But at other times it is difficult for me to handle all of my family problems alone, this can also make decisions more difficult. ... For other women [married women] it is more difficult because they need to ask permission from their husband if they want to sell anything.

The logistic regression results on *married women* confirm the earlier findings of diversification at the household level and specialization at the individual level. The men typically diversify into non-farming ventures (usually in addition to their agricultural activities), whereas the women usually become or remain the main farmers within the

household (Eriksen et al., 2005). The constraints that child care and domestic labor impose on a married woman's time (see average number of children in Table A1), as well as the reluctance of some husbands to allow their wives to work outside the home, can explain why married women are less involved in non-farm work. Several female interviewees spoke of their husband's reluctance to allow them to work away from the farm and their attempts to change their minds by using 'sweet words' and conjuring up images of a future with improved welfare provisions.

5. Conclusions

In this article, we have drawn some conclusions about how small-scale farmers in the Morogoro Region of Tanzania are adapting to climate change. First, because the interplay between gender and climate change is so complex, it is important to guard against any temptation to view 'men', 'women', and 'female-headed households' as homogeneous categories and fail to recognize their differential interests and/or access to adaptive strategies. We found that the farmer's marital status was an important factor in determining how various socio-economic and gendered entitlements, such as access to resources and receiving material support from family members, were likely to play out. For example, married, unmarried, divorced and widowed men and women each confront different barriers and opportunities in their attempts to adapt to climate change. We also noted that a woman's position within the adaptation typology (that is her access to adaptive strategies) depends more on her marital status than does a man's, for a married man's adaptation position does not typically worsen when he leaves the marriage.

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This article has made several contributions to existing writings and practices. It adds a critical understanding to the gender and climate change literature by emphasizing that, if we are adequately to capture and understand farmers' differentiated needs and capacities, it is not enough to focus on a simple gender-based dichotomy. Borrowing from feminist scholars such as Crenshaw (1989), we argue in favor of a 'differentiated' gender approach that simultaneously studies the interplay of gender and other categories such as age, class and marital status (see Huynh and Resurrección, 2014; Smith, 2014). Our findings are particularly relevant and timely in the face of a growing plea for gender mainstreaming in climate change policies and implementation (see for example UNDP, 2011). In this context, it is important to warn against an overly narrow version of gender mainstreaming that disregards intersections with other dimensions, for that might eventually lead to ineffective policies and the further marginalization of certain groups of women and men. More specifically, our proposed typology can help policy makers broaden their understanding of farmers' differential needs and allow for more precise targeting. Furthermore, by unveiling intersecting drivers of vulnerability and adaptive capacity, an intersectionality perspective can feed into more 'transitional forms of adaptation' that move beyond technological fixes and seek to address the social equity dimensions of climate change (Pelling, 2011; Smucker et al., 2015).

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Endnotes

¹ This is not to say that there are no other relevant dimensions of adaptation besides agricultural water management and livelihood diversification. However, we have chosen to select these two because, in our focus group discussions, they systematically proved to be the most relevant for the villages being studied.

² We use the term 'small-scale farming' to refer to farming that is family based, where output and input are relatively low and the scale of operation is too small to attract the services that would be needed to increase productivity significantly. In the Morogoro Region, this for example means that small-scale farmers rarely own tractors and use a considerable portion of their harvest for family consumption (see Kirsten & van Zyl, 1998).

³ In accordance with Tanzania's National Land Policy and Village Land Act of 1999 (see also McAuslan, 2010; and Peterman, 2011).

⁴ Tanzania's inheritance law is legally pluralistic, consisting of customary, Islamic and statutory law, and including specific ordinances such as the Indian Succession Act and the non-Christian Asiatic Succession Ordinance. The country's Law of Marriage Act (LMA) of 1971 regulates the division of matrimonial assets and the custody of children in cases of separation or divorce. Section 114(2) prescribes that marital property must be divided according to a spouse's contributions – that is, property acquired through joint effort must be divided equally. However, there is a lot of discussion on the interpretation of this section (Rwebangira, 1996).

⁵ COSTECH (Tanzanian Commission for Science and Technology) granted us permission to undertake the research.

⁶ This share of 65 per cent was a target applied for reasons of sample size. In villages where more single-headed households were encountered, relatively more of them were interviewed and vice versa. On average, across the four villages, 68.3 per cent of households interviewed consisted of married or cohabiting respondents.

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⁷ Valleys are the preferred areas for planting crops during seasons when drought is expected, while highlands are the preferred option when floods are expected.

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Table 3: Logistic regressions with dependent variables: valley farming, irrigation and non-farm activities (1= adoption of the practice)

		a. Farming land in the valley			b. Irrigation of farm			c. Non-farm income-earning activities		
		B	S.E.	Exp (B)	B	S.E.	Exp (B)	B	S.E.	Exp (B)
Constant		2.127***	0.180	8.392	-1.215***	0.256	0.297	-0.391	0.447	0.676
Household type	Married female				-0.634**	0.199	0.530			
	Married male	0.287	0.265	1.332				1.936***	0.204	6.932
	Unmarried female	-0.439	0.577	0.644	-1.223	0.658	0.294	0.307	0.444	1.359
	Unmarried male	-0.241	0.788	0.786	0.737	0.601	2.090	2.027**	0.690	7.588
	Widowed female	-1.084**	0.380	0.338	-0.432	0.391	0.649	0.314	0.375	1.368
	Widowed male	-0.616	0.819	0.540	-1.138	1.093	0.320	0.983	0.749	2.671
	Divorced female	-1.240**	0.390	0.289	-1.049*	0.490	0.350	1.049**	0.383	2.855
Divorced male	-0.803	0.588	0.448	-0.441	0.668	0.643	2.303***	0.566	10.003	
Occupation	Commercial farmer	0.783	0.611	2.187	1.294***	0.317	3.646			
	Non-agricultural	-0.991**	0.365	0.371						
Village	Vikenge				0.383	0.247	1.467			
	Kiwege				-0.969**	0.327	0.380			
	Sinyaulime				0.897**	0.265	2.451			
Land ownership	HH rents land				0.253	0.264	1.288			
	HH owns & rents				0.942***	0.237	2.566			
	HH uses land for free				-0.977*	0.484	0.377			
Age	26–49 years old							0.780**	0.290	2.182
	50–69 years old							-0.305	0.331	0.737
	70+ years old							-0.901*	0.402	0.406
Education	Primary finished							-0.568	0.380	0.567
	Primary not finished							-0.649	0.452	0.522
	No formal education							-0.923*	0.410	0.397

R² = 0.035 (Cox & Snell); 0.066 (Nagelkerke). Model chi² = 29.56 (p < 0.01**).

R² = 0.139 (Cox & Snell); 0.206 (Nagelkerke). Model chi² = 117.86 (p < 0.001***)

R² = 0.217 (Cox & Snell); 0.289 (Nagelkerke). Model chi² = 191.07 (p < 0.001 ***)

Respondents with non-agricultural activities as their primary occupation were excluded from the analysis (regression b and c).

Significance: *** if p < 0.001 ; ** if p < 0.01 ; * if p < 0.05

Reference categories: Household type: married women for regression a and c, married men for regression b; Occupation: small-scale, subsistence farmer; Village: Changarawe; Land ownership: household that only owns land; Age: 15–25 years; Education: secondary education or higher.

Source: Authors' own analysis based on questionnaire data.

APPENDIX

Table A1: Some socio-economic characteristics of sampled households by marital status and gender

	Married female	Married male	Single female	Single male	Widow	Widower	Divorced female	Divorced male	Total
Average age of respondent	41,30	49,10	34,30	27,30	59,90	74,50	51,20	54,30	46,20
Average number of household members	4,95	4,93	3,96	1,40	4,04	2,90	3,52	3,00	4,66
Average number of children younger than 18 in household	2,40	2,39	2,15	0,00	1,91	1,00	1,95	1,20	2,25
No formal education (%)	30,30	16,30	11,50	6,70	51,10	20,00	38,50	30,00	25,10
Primary not finished (%)	7,00	10,90	3,80	13,30	12,80	30,00	10,30	15,00	9,50
Primary finished (standard 7) (%)	59,50	62,70	65,40	60,00	34,00	50,00	48,70	55,00	58,80
Secondary or higher (%)	3,20	10,10	19,20	20,00	2,10	0,00	2,60	0,00	6,60
Household owns land only (%)	63,60	57,10	61,50	46,70	68,10	80,00	62,50	63,20	61,00
Household rents land only (%)	15,20	15,50	23,10	40,00	8,50	10,00	17,50	5,30	15,40
Household owns and rents land (%)	18,10	19,20	15,40	13,30	19,10	0,00	15,00	26,30	18,30
Household uses land owned by others (for free) (%)	3,20	8,20	0,00	0,00	4,30	10,00	5,00	5,30	5,30
Subsistence farming (%)	88,60	84,00	92,00	80,00	95,70	90,00	92,50	90,00	87,30
Commercial farming (%)	8,70	4,40	4,00	13,30	4,30	0,00	2,50	10,00	6,30
Main occupation is not farming (%)	2,60	11,70	4,00	6,70	0,00	10,00	5,00	0,00	6,40

Source: Authors' analysis based on questionnaire data; percentages are column %.