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Reference:

Ou-Salah Loubna, Van Praag Lore, Verschraegen Gert.- Feminisation of agriculture and the role of environmental changes : 'It's already a tough job and it's getting tougher due to weather changes'

The geographical journal / Royal Geographical Society [London] - ISSN 1475-4959 - 190:1(2024), e12542

Full text (Publisher's DOI): <https://doi.org/10.1111/GEOJ.12542>

To cite this reference: <https://hdl.handle.net/10067/1990910151162165141>

'Feminisation of agriculture and the role of environmental changes: 'It's already a tough job and it's getting tougher due to weather changes'

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1. Introduction

In Morocco, climate change, such as a warmer and drier climate, is expected to accelerate, particularly in rural areas (IPCC, 2022). Despite ample research on the economic and social challenges posed by this evolution (Wodon, 2014), little is known about the effects on gender relations and land ownership (Baada and Najjar, 2020; Berriane, 2015). This study focuses on the Souss-Massa region, a predominantly agricultural area in Morocco, to explore how slow-onset environmental changes impact the position of women in the family and, particularly, the gendered division of agricultural labour. Women's participation in farming activities is increasing in Morocco, but rural women still face poorer education and more limited access to economic opportunities than men (Boutkhil, 2019). Furthermore, they often work without a contract or social security coverage (Bossenbroek & Ftouhi, 2021). The lack of social security and access to land for women is deeply rooted in national factors (Thompson-Hall et al., 2016), including the land inheritance system (Price-Smith, 2001). This paper presents insights from 38 in-depth interviews conducted with both male and female farmers in the Souss-Massa region in Morocco to understand how they perceive and cope with slow-onset environmental changes, social security and land inheritance systems, as well as the available resources within households.

Firstly, this paper contributes to the literature on gender relations in agricultural contexts by emphasizing how local gender dependencies, expectations, and gender-specific land inheritance system all shape the subordinate position of women. It argues that both complex everyday negotiation processes and more structural forces play a role in sustaining male domination. The study shows how environmental change, internal migration, and cheaper female labour are transforming labour market structures and gender relations within households. More particularly, it underscores how land inheritance systems that disadvantage women and the absence of a robust social security system impact the appeal and opportunity structures for migration, as well as the economic stability of women. Secondly, the findings highlight the need for more context-specific and intersectional approaches in the existing literature on environmental mobility. The paper demonstrates how slow-onset environmental change increases women's vulnerability, particularly through changes in seasonal work and the shifting roles of women as main breadwinners. Thirdly, this study contributes to the understanding of gendered vulnerabilities in the Moroccan labour market by exploring the social dynamics and stigmas associated with women's work outside the home in rural areas of Morocco. In conclusion, this research significantly contributes to our understanding of gender dependencies and the impact of environmental changes on women's economic, social, and cultural marginalization in rural agricultural settings.

The gendered impact of slow-onset climate change on farmers

Farmers in the global South and Morocco experience severe effects from slow-onset climate changes, such as variations in temperature, rainfall patterns, and soil degradation. Crop yields, food security, and livelihoods are all likely to be impacted by these changes, in different ways. The timing of planting and harvesting, for instance, can be impacted by variations in temperature and rainfall patterns, which may lead to poorer crop yields or even crop failure (Fahad & Wang, 2020). Slow-onset environmental changes occur over a lengthy period of time and in contrast to sudden or acute environmental occurrences like natural disasters (such as earthquakes and hurricanes), take place more gradually and frequently emerge from long-term processes like climate change, deforestation, desertification, or erosion (Koubi, 2016). In this paper, we refer to "slow-onset" to highlight how environmental changes are gradual and cumulative in nature and how they can have a substantial and enduring impact on communities, ecosystems, and way of life. To successfully address the implications for societies and create effective adaptation strategies, it is crucial to study and comprehend the dynamics and effects of slow-onset environmental changes. In addition, farmers who depend on agriculture for their livelihoods can have a hard time adapting to changing conditions, especially if they do not have access to resources, such as irrigation systems or new crop types, that are better adapted to changing climate (Glazebrook et al., 2020). Slow-onset climate change (IPCC, 2022) thus has an impact on various aspects of human life, with farmers in the global South usually adversely affected (Mohammadi & Khanian, 2021).

Environmental change is influenced by a multitude of social processes, leading to differential vulnerability and limited capacity among certain individuals to anticipate and adapt to both abrupt and gradual alterations in the environment. One particular group particularly susceptible to such changes comprises individuals heavily reliant on natural resources and ecosystem services for their sustenance, such as farmers. Consequently, these individuals demonstrate heightened sensitivity to environmental change compared to those not reliant on such livelihoods (Adger et al., 2018). While the consequences of slow-onset environmental change are different for everyone, women are particularly vulnerable to its negative effects (because, for example, they have less access to resources such as land, water and credit) (Bossenbroek & Ftouhi, 2021; Gioli and Milan, 2018). Given the extensive agricultural production in Morocco, and the increasing desertification and droughts due to climate change, people's adaptive capacities are largely related to land ownership, sales, mortgages or products of land (Adger et al., 2018). According to Bossenbroeck (2015), due to the historical trajectories of family farms in the state cooperative, relationships around land ownership have become embedded in broader household, kinship, and community-based gender relations. Moreover, due to the colonial legacy, land ownership

is highly gender-unequal because under the current law, male relatives receive twice the share of a woman, thus increasing economic instability. Women's labour represents over half of agricultural production in Morocco, yet the proportion of land owned by women is still low (El Khalaoui, 2022).

People's ability to anticipate, plan for and adapt to environmental change is highly dependent on the social security they can rely on, as well as on land ownership and the information provided (Barnett et al., 2008; Jha et al., 2018). Environmental change thus affects everyone differently, but nevertheless, gender discrimination makes women especially vulnerable to these negative impacts (Gioli and Milan, 2018). Additionally, rural women play a very important role in addressing environmental change, particularly in efforts to ensure food security in their households and their land, as well as in efforts to adapt to such change. This is particularly true for rural women, whose living conditions and marginalisation put them at greater risk (Kronik and Verner, 2010), and certainly given their increased involvement in agricultural activities (O'Hara 1998; Brandth 2002; Bossenbroeck 2016).

Rural changes are usually intertwined with gender dynamics and hence increasingly studied by feminist rural scholars, who analyse the ways in which gender subjectivities help bring about hierarchical orders and processes of change (O'Hara 1998; Brandth 2002; Bossenbroeck 2016). As a result of urbanisation and structural change, gendered labour patterns have been shifting in rural areas. These changes are frequently referred to as the 'feminisation of agriculture', whether they involve women making up a larger proportion of the agricultural work force or managing smallholder farms more frequently (Kawarazuka et al., 2022). Through the connection between family life and farms, the centrality of women in farming activities emerged as farm work became an extension of domestic activities, although most land use rights were registered in the name of men. 'Feminisation of agriculture' is generally used to denote a significant demographic change in rural, agrarian communities, including women's growing involvement in agricultural labour or decision-making as a result of male outmigration and the diversification of livelihoods (Leder, 2022). Nonetheless, it should be noted that this term may be misleading, suggesting that agricultural systems were previously 'masculinised,' and that women are now forced to perform duties that were previously construed as belonging to men, such as making decisions about agricultural plots, handling money, irrigating, ploughing, and attending meetings of resource user groups (Leder, 2022). Because of this, attention should be paid to the fact that women are active agents who make deliberate decisions and face structural barriers. In the agricultural industry, there are hierarchies between men and women as a result of the intersection of gender and other social identities. Marginalised women who face many disadvantages as a result of their social identities are frequently the most susceptible to household food insecurity, hence it is important to document and accurately reflect their experiences in the change-processes in the global food security agenda (Kawarazuka et al., 2022).

Rural women's increasing role and challenges in the Moroccan context

According to Baada and Najjar's study (2020), there is also a growing trend towards the 'feminisation of agriculture' in the Moroccan context. Here, the concept of the "feminization of agriculture" pertains to a notable demographic transformation characterized by the growing involvement of women in agricultural activities and decision-making processes. This shift occurs due to factors such as the migration of men away from rural areas and the diversification of livelihood strategies. Consequently, women are assuming a more prominent role in agricultural labor and taking on greater responsibilities in agricultural production and management (Leder, 2022). Particularly, men are leaving agricultural dryland areas in greater numbers than they used to, which forces women to do more agricultural work. Also, compared to men, women have fewer options for employment outside of agriculture in arid farming areas. Other studies (Abdelali-Martini et al., 2003; Caretta & Börjeson, 2015; Najjar et al., 2018) demonstrate how female farmers are excluded from agricultural extension services and training programmes designed to meet the needs of male farmers, participate less in local institutions, have limited access to credit, and lack access to land rights. In rural villages where women are included in cooperatives, these women are employed as cheap or even free labour under the direction of educated people who are in an excellent position to establish cooperative structures. In the broader context of Morocco, rural women make a significant contribution, accounting for approximately two-thirds of the overall female labor force. And even though they take on significant responsibilities in agricultural decision-making and labour, their work often goes unacknowledged and remains uncompensated (Chauffour, 2017). A substantial portion, approximately 80 percent, of actively engaged rural women in Morocco are classified under the vague designation of "family help," reflecting the scarcity of satisfactory employment opportunities in rural regions (Skalli, 2001).

Moroccan public policies have tried to tackle the challenges facing women affected by slow-onset environmental changes, in terms of women's employment and social inclusion in the Green Morocco Plan (GMP, 'Plan Maroc Vert'). Between 2008 and 2020, the GMP included this issue in its two 'pillars' of reform. This is done through conversions, intensification and diversification of local natural resources, with a view to sustainable use of natural resources and employment of women in the most isolated parts of the country. While the GMP may appear promising in principle, its implementation has given rise to significant concerns. In terms of women's participation, scholarly investigations by Berriane (2011) and Damamme (2014) have revealed that illiterate rural women assume a subordinate position within cooperatives when compared to women holding higher social status and responsibilities. Likewise, the research conducted by Montanari and Bergh (2019) suggests that only individuals with educational attainment in the region are able to reap the benefits of projects under Pillar II, due to the administrative burdens and initial financial contributions involved. As a result, Montanari and Bergh (2019) argue that the GMP guidelines have failed to empower women in expressing their needs and aspirations. Apart from this, Bossenbroek (2016) shows how behavioural codes in rural Morocco can limit women's ability to respond to environmental changes. Different codes apply to married, unmarried,

divorced, and single mothers, with strict control over unmarried women's behaviour, to prevent gossip. Deviating from the dominant female ideal can lead to harsh judgment and gossip, which can hinder reflection on how to respond to environmental changes.

This research in the Moroccan Souss-Massa region focuses on the situation of Amazigh women in rural areas. The Moroccan Amazigh women are an interesting case of marginalization in rural settings, as they face triple marginalisation due to their gender, indigenous identity, and rural location, which makes it hard for them to access education and healthcare. In particular, the majority of Amazigh women live in rural areas or other isolated regions, leading to difficulties in accessing public services such as education due to poor infrastructure and rural illiteracy (Guerch, 2015). In contrast, Amazigh women in urban areas have better access to education and public services, as well as being more proficient in Moroccan Arabic, the language primarily used in the administration, next to the Amazigh language (Berriane, 2015; Ennaji, 2014). The patriarchal system is another factor hindering educational opportunities for rural Amazigh women, as girls are often not sent to school due to traditional beliefs about gender roles and limited family resources (Laghssais & Comins-Mingol, 2021). While many studies represent them as illiterate and in need of assistance, they already contribute actively to civil society. They not only care for their families but also work towards the development of their community and the preservation of their culture through their knowledge and practices (for example, working in cooperatives dedicated to carpet weaving, argan oil production etc.) (Laghssais & Comins-Mingol, 2023).

2. Exploring Migration and Environmental Factors in the Souss-Massa Region, Morocco

Study setting

Morocco has a total population of 36,825,431, of which 50.4% are women (Trading Economics, 2020; World Population Review, 2020). According to the World Bank, the percentage of the total female population living in rural areas in Morocco was approximately 47% in 2020 (Trading Economics, 2020). This study focuses on the Souss-Massa region in Morocco. The Souss-Massa region plays a significant role in supporting the Moroccan economy, primarily attributed to the revenue generated from its marine resources, tourism, and agricultural sector, all of which are heavily reliant on the region's climatic conditions. Despite the presence of the Atlantic coast and the lofty mountains, this southern region of Morocco is characterized by an arid climate, primarily influenced by the Azores Anticyclone (Abahous et al., 2018). Subsequently, regional agricultural systems have experienced many transformations in recent decades, such as changes in the social and environmental context and in government policy (Bouchaou et al., 2011). Recently, Morocco has witnessed a trajectory of agricultural development wherein the utilization of female labor has emerged as a predominant feature (Bossenbroek, 2019; Théroux-Séguin, 2016). Presently, farmers in Morocco exhibit a preference for employing women due

to the advantages associated with their cost-effective labor, perceived docility, and presumed attentiveness in handling fruit and vegetable produce (Bossenbroek & Ftouhi, 2021). As a global player and leading nation in the North African region, Morocco has become a prominent player on the international economic and foreign policy stage in recent years.

Research sample

During the period of October and November 2021, qualitative semi-structured interviews were conducted with inhabitants of the Souss-Massa region in Morocco, particularly in Houara, Tiznit, Belfaa, Tamraght, Tagadirt, Tikouine, Taliouine, Taroudant and Imouzer (which are small hamlets with only a few households).

Respondents were selected through snowball sampling, starting from connections made through associations such as Dar Si Hmad and 'Migrations & Development'; they were selected based on region (Souss-Massa), gender (balanced), age (variation) and their dependence on agricultural tasks for their livelihood. Dar Si Hmad promotes local culture and creates sustainable initiatives through education and the integration and use of scientific innovation within the communities of southwest Morocco. Migrations & Development was founded in 1986 by migrants to carry out development actions in the villages of their region of origin, the Moroccan Atlas and Anti-Atlas. In total, 38 interviews were conducted, with 15 female and 23 male respondents (all respondents identified themselves as male or female so there are no other gender minorities involved in this study). The age of interviewees ranged from 19 to 82 years old. The participants were all dependent on agricultural tasks for their livelihood (either on a self-employed basis or as employees on larger farms). This is because communities that rely heavily on agricultural activities are more vulnerable to water scarcity and suffer more from drought than other communities. In such a context, migration is often seen as a potential adaptation strategy to deal with environmental changes (Smit and Wandel 2006; Gemenne 2010).

Pseudonym	Gender	Age	City of birth	Occupation
Agida	Female	67	Tagadirt	Retired. Before, she also worked in agriculture with her husband
Batoul	Female	60	Tamraght	After the death of her husband she worked as a housekeeper, now she is retired
Fadna	Female	82	Tamait	Retired // used to be a small farmer
Fatima	Female	48	Tamait	Household + agricultural tasks
Fatouma	Female	38	Houara	Household + agricultural tasks
Fedoua	Female	45	Houara	Works at a strawberry farm
Hafida	Female	43	Taroudant	Small farmer
Nawal	Female	31	Tiznit	Raspberry farm
Salma	Female	25	Taliouine	Works for a saffron farmer
Warda	Female	28	Belfaa	Child of farmers // Student
Yosra	Female	35	Taroudant	Small farmer
Zahra	Female	42	Tamait	Raspberry farm
Zaina	Female	84	Tamait	Retired + used to be a small farmer
Kaltoum	Female	51	Tiznit	Small farmer
Soraya	Female	36	Tiznit	Worked for her parents in agriculture and is now unemployed
Abdelkarim	Male	63	Houara	Small farmer
Ahmed	Male	51	Tamait	Treasurer of the agricultural cooperative 'igran and tamait'
Bacher	Male	56	Tikiouine	Small farmer
Bilal	Male	51	Skoura	Small farmer
Boujamaa	Male	50	Tikiouine	Used to have a farm, now he is unemployed because he lost his land
Cherki	Male	42	Tamait	Beekeeper
Daoud	Male	40	Tikiouine	Small farmer + beekeeper
Hassan	Male	58	Tamait	Cattle breeder
Houssein	Male	37	Tikiouine	Farmer + cattle breeder
Mustapha	Male	58	Imouzzer	Small farmer
Karim	Male	29	Houara	Shepherd
Khalid	Male	34	Taroudant	Farmer and employer
Lahcen	Male	64	Tikiouine	Gardener
M'barrek	Male	56	Tamait	Small farmer
Abdelah	Male	27	Massa	Student MFR (Maison familial rural)
Aissa	Male	19	Agadir	Student MFR (Maison familial rural)
Amine	Male	20	Belfaa	Student MFR (Maison familial rural)
Mohamed	Male	22	Belfaa	Student MFR (Maison familial rural)
Mouloud	Male	39	Skoura	Used to be a farmer, now works in tourism
Rachid	Male	45	Taliouine	Saffron farmer
Said	Male	48	Tikiouine	Agricultural technician
Zaki	Male	47	Tikiouine	Salesperson for farmers + used to be a farmer
Zuhair	Male	32	Houara	Employee of a citrus fruit farm

The rural women in the Souss-Massa region are more often uneducated and in some cases illiterate, so many refused to participate in the fieldwork as they did not feel entitled to be interviewed. To ensure that respondents did not feel intimidated, the first author who conducted the fieldwork briefed them

clearly, yet simply, about the objectives of this research, and invested some effort and sufficient time to develop a relationship of trust. This often included asking for a tour of their fields, cooking and eating together. A second difficulty during the fieldwork was related to the language barrier between the respondents and the interviewer. The interviews were conducted in Berber, Arabic and French. However, most of the women spoke only Berber, which the researcher did not understand, so a local translator was needed. This can sometimes cause miscommunication, since translation between languages also implies interpretation: the message communicated in the source language must be transferred in such a way that the recipient of the message understands what was meant.

Data collection and analysis

Our starting point when developing our research and preparing our fieldwork was to build further on existing theoretical insights, without letting our fieldwork be overly guided by existing conceptual frameworks and theoretical debates that mainly stem from policy debates and actions. In the first phase, we started by familiarising ourselves with the data. This involved immersing ourselves in the data by listening to the audio recordings again and transcribing them. In addition, we were making extra memos while writing out the transcripts and reading the transcripts. This was necessary in order to become familiar with the contents of our data set. To formulate the codes, we focused on the data that were potentially relevant to the research question, and tried to provide concise summaries describing some of the data or their content by using these codes. To code the data, we used the qualitative analysis software NVivo. This allowed the coding process to be fast and orderly and enabled us to code different pieces in different ways, which helped us to better analyse things that were initially unclear. Moreover, it also gave us the possibility to use sub-codes and head codes through a hierarchical organization of the data. In the next phase, we moved from codes to themes. In doing so, we again went through our coded data to identify areas of similarity and overlap between codes. In this way, the themes could then reflect and describe a coherent and meaningful pattern in the data. After the themes were formed, we also looked at the relationship between the themes and considered how they would work together to tell an overall story about the data.

3. Gendered Vulnerabilities and Livelihood Shifts in Rural Areas

Gendered social relations and dependencies

Amin et al. (2019) demonstrate in their research how rural women play an increasing role in agricultural production, yet their contribution continues to be largely overlooked in development plans, conventional agricultural and economic analysis and policies. While gender equality in rural areas is becoming a more important point on the agenda of the Moroccan government, women still barely benefit from projects organized to support them because of the administrative burden and the initial financial contribution that must be made (Montanari and Bergh 2019). Furthermore, women's involvement in agriculture is still

held back by a lack of education, status and employment opportunities. Batoul, a 60-year-old woman from Tamraght, also spoke about the many effects illiteracy can have on vulnerability in society. She, then, was completely dependent on her husband. After his death, it was very difficult for her to sort out all the administration which had to be done:

I know for a fact that I was 15 when I got married, but when my late husband died, he left me with no papers, no family registry, I wanted to sign up the boys for school, but I had no family registry, so legally speaking, it's like they don't exist, I took them to a school, and they asked me for the family registry to get their birth certificates, I didn't even have a marriage certificate, it wasn't even a month after my husband died, I had to go to the market to see this man who used to write wedding documents for people, but the only paper I had was a small piece of paper or receipt that my late husband gave my father as proof of marriage, they used to do that back then, so that man in the market told me to give him 2000 Rial, which was a lot of money back then (it's worth about 100dhs/ 10 euros now), but I didn't have the money at the time, I had to sell my silver jewellery [...]. I didn't know what to do, I was illiterate, as well as all the women in the village at the time.

The limited opportunities for women in education and training directly affect the pattern of employment, the cycle of exploitation and underpayment of women in Morocco (Skalli, 2001). Although Moroccan women's participation in the labour market has increased significantly over the past two decades (from 14.6% in 1984 to 23.3% in 1987 and 32.5% in 1999), recent research on women's employment is not reassuring about the general working conditions of women (Skalli, 2001; Najjar et al., 2018). This was also confirmed by Bilal, a 51-year-old man from Skoura, who said that his daughters always helped with the agricultural tasks, but that they could not finish their schooling because of this and are therefore less aware of their rights and opportunities:

It was difficult to take away my daughters' education, but we were really struggling and needed their help. Before, you could hire workers for 30 dirhams [approximately 3 euros] but now it is easily 100 dirhams and we just couldn't afford that. I think they blame us now because they are therefore less able to protect themselves. But at that time we also thought it was safer for them because then they didn't have to travel all that way without guidance.

Several women also indicated that the lack of ownership is one important reason why they are largely overlooked in agricultural development plans and policies, and it strongly impacts their life decisions. Women's economic instability can also be reinforced by the family law provisions on inheritance in Morocco. These rights are particularly unfavourable to female children and surviving female spouses, as they give male relatives double the share of women (Yavuz, 2016).

We women start off at a disadvantage compared to our brothers, for example. Here, men still prefer to have sons so that they can pass on everything. It is very difficult for us women to inherit

and especially in agriculture, this is a big disadvantage because then it is literally all about what we have put so much work into that then goes to brothers or sons who often invest much less time in it. But I know that the law will never change, but because I only have daughters, I am sometimes afraid of what the future will bring (Fedoua, 45 years old, Houara).

Yes at the moment my husband is seriously ill, so I am responsible for everything. That does bind me and I have a lot of fears because of that. I myself am not the owner of land, just as it is rarely the case here in Morocco. We simply gain access to land through male relatives, such as a spouse, brother or father. Because of this arrangement, we are always very vulnerable; a death, divorce, or simply a change of mind on the part of a man can leave us without land and therefore no income. (Yosra, 35 years old, Taroudant)

Mustapha, a 58-year-old man from Imouzzer, is also trying to prepare for a time when his daughters will no longer work on his piece of land (which he shares with his brother). Because of this, he has already encouraged them to find a job with an agricultural employer in order to be independent.

Mustapha: *I have only two daughters and their mother and I have taught them everything about agriculture from childhood. They now work together on the road to Marrakech on a farm. It is better for them to earn their own money and it is also easier for them to get a job there as young women. I myself work here with my brother with whom I have always shared our land and his son will probably continue it later. I hope so, because the younger generation of men are not so keen on the agricultural sector anymore, which is a pity because they inherit the land where a lot of time, passion and work has been invested and they neglect it.*

Interviewer: *You are talking specifically about the new generation of men?*

Mustapha: *Yes, they inherit most of the land and women who marry often no longer live next to their parents but close to their parents-in-law. Therefore, the responsibility lies more with the new generation of men.*

In addition, women's lack of property, due to the gender-specific land inheritance system, makes women in rural areas more dependent on the decisions of male family members concerning their livelihood and activities. Since, according to most male farmers, the younger generation of men, who inherit their land and are expected to take over the responsibility to maintain and cultivate the land, no longer want to be involved in the agricultural sector, this also affects the farming activities of women who have invested in this land for many years. Salma, a 25-year-old woman, also explains how her father sold all his land in advance because this way he could protect his family from the dividing up of the inheritance and still provide them with the necessary means.

My father had decided to sell it because it became too expensive for him because of drought and costs of water. So he sold it also because he felt like he was too old and then he could leave the

money. But if he had sons he would have kept it, but now he still thinks that is too big a risk to invest in it and afterwards make us responsible for it because of the inheritance distribution (Salma, 25 years old, Talioune).

Thus, her father's decision to sell his land has had an impact on Salma's future, as the sale was mainly to ensure a future for his daughters. This again shows the vulnerable position women occupy in the agricultural sector in particular, and by extension in rural areas where more people are dependent on agricultural work. In addition, the quote from Salma shows how drought, and thus environmental factors, exerted additional pressure on top of these concerns. Increasing environmental changes make people think more about their safety, needs, rights and values. In the next section, we aim to demonstrate how environmental changes interact with other societal factors in this rural context and how this impacts the vulnerable position of rural women in society and dependencies of rural women on men.

Slow-onset environmental changes, living conditions and dependencies of rural women

Uncertainties about environmental change can affect many social processes, and can lead some people who are more sensitive to such environmental changes to seek ways to prepare to address vulnerabilities. Salma, a 25-year-old woman from Talioune, for instance, recalled that her father did not want to risk keeping their land because he was already older and was no longer earning much from it due to the (increasing) difficulties caused by drought. Moreover, his daughters would not inherit his land, so he opted to sell it and continue to make ends meet with the proceeds: *My father had decided to sell it [their land] because it became too expensive for him because of drought and costs of water.* Thus, in this case, Salma's father realized that because of enduring droughts, he would have to invest more in his land, which afterwards would no longer be owned by his daughters because of inheritance agreements. As a result, by selling his land, he would be able leave more resources to his family. Daouad, a 40-year-old man from Tikiouine, also speaks about how 'the next generation' [of men] and women no longer continue their agricultural work as there is no longer enough work. He states that this trend has been partially influenced by the weather changes:

The weather has definitely changed here, rain used to already start this month, the climate has changed even for the bees, it's sometimes surprising because you get to the orange blossom season, but there are strong winds that prevent the flowers from blossoming and disperse everything before the bees ever get a chance to feed, even after we've prepared everything for the season, and after we spent money on it. [...] we prepare for 6 months for that one particular season, and it's only one month of orange blossom, it's that month where we make the most profit of the entire year, and if anything goes wrong with it we lose a ton of money, so it is a big risk [...] These risks also mean that our children or for example my wife can't continue to work with me. It is already a tough job and it is getting tougher due to weather changes, which means we have to make choices as to what to put money into.

Although there are fewer work opportunities on family-owned agricultural land, our results show that it is women who have to look for ways to generate additional income, while men continue to use the remaining opportunities on their own land. Fedoua, a 45-year-old woman from Houara, for example, explains how for several years now, the region has been affected by extreme rainfall after long periods of drought, which has a major impact on farming activities and their household income:

I actually started looking for a job three years back when this region began to be threatened by floods as there are cases of heavy rains that go on for more than 3 or 4 months. Then we have to stop farming, we are brought to a halt, and sometimes it takes all of our produce and leaves the land drowning in 1 metre of water and sometimes it can reach one metre and a half. The floods even destroy our wells. During those periods, nothing could really be done and the men are always playing chess. But of course we could not survive with that, so then it was most logical that my husband would take care of the farming and that I would look for an external income (Fedoua, a 45-year-old, Houara).

The impact of these environmental changes should not be underestimated, as they are the context for fathers' decision making, especially concerning their daughters' future lives. Unpredictable weather conditions and increasing drought result in smaller areas being cultivated. Thus, the decreasing profits gained from agriculture for small land owners, due to land inheritance systems and the adverse consequences of environmental changes, reduce the land that is suited for agriculture and make it less attractive to invest in, prepare and adapt to more environmental change. As we have already argued, this also impacts the position of rural women, especially because of their dependencies on men and because they cannot inherit land, altering some household decisions and resulting in a shift away from agriculture. As a consequence, wages of women workers – outside the household and in more formal settings – are essential for households to make ends meet and ensure a livelihood.

The growing need for alternative means to secure a livelihood – and especially for women to start taking on formal jobs outside the household – also coincides with other ongoing dynamics in agriculture, with larger land owners increasingly seeking to hire female employees. A large proportion of employers tend to hire and prefer female employees to work on their agricultural land, but without employment contracts (Bossenbroek & Ftouhi, 2021). Women are generally over-represented in lower paid and more time-intensive jobs such as fruit, vegetable and cotton harvesting, product drying, and rice transplanting (Abdelali-Martini et al., 2003). For example, Abdelkarim, a 63-year-old man from Houara, describes how, due to an increase in extreme weather conditions and more expensive labour, he no longer has sufficient income to hire external [male] help. As a result, he prefers cheaper female workers:

Nowadays it is also very rare for the produce to grow perfectly well, because of the weather; the heat for example, has really damaged pumpkins, olive trees, corn, and almost everything else, it really ruined the plants, like that September heat. It is very rare to get good produce

anymore, so now we mainly focus on raising the animals, that's the activity that we lean on to sustain us through those times and you need less external help to do so. Before, water was abundant and so were the workers, we used to pay them 60dhs a day, they would work for the whole day, from 7 until 12 am and after lunch from 1:30 until 6pm, but you can't do that anymore, nowadays when you ask them to work the afternoons they're like 'well, what about the others? The French farmer pays them more for less time'. Therefore, I only have female employees who work for me. They are careful and very precise and complain much less (Abdelkarim, 63 years old, Houara).

Thus we see that smaller farmers seeking help prefer to hire women in lower paid and more time-intensive jobs, rather than men. This is because these female roles are considered to be rather easy jobs that, however, require patience and accuracy (Baada and Najjar, 2020).

Zahra, a 42-year-old woman from Tamait, tells us that after her divorce she moved in with her brother and his wife. Because of her brother's difficulty in making ends meet after some of his cattle fell ill, she started working on a strawberry farm where she picks fruit to make things easier for her brother.

I work without a contract and wake up at 3 am and they pick us up at 4 am, it is a really hard job because of the continuous and heavy workload. Sometimes they give you 15 aisles to pick and clean all of the produce, all by yourself. We work inside greenhouses, which are covered in plastic so it becomes really hard to work in the heat. There are female workers who faint under the effect of that heat pressure. I also see more and more women being recruited. We have no option [...] I have a brother that I help, because he doesn't have much, he's just a shepherd, and so I help him with my salary, we help each other in order to survive. While those firms have a lot of money and always have water even when there's a drought everywhere else. They also use a lot of fertilizers to grow the produce. So we don't have the same resources to survive in the agricultural sector.

Despite these poor working conditions, women continue to take on such hard work (Bossenbroek & Ftouhi, 2021). As Zahra shows, such work is necessary for many to survive and ensure their own well-being and that of their loved ones. However, when we spoke to Zahra's brother M'barrek, he emphasized, strikingly, that he was seeking her help precisely because she was already in a vulnerable position in society. She was asked to work as a hired labourer because she is a divorced woman with anxiety issues and it would therefore matter less if it damaged her reputation:

Being an animal breeder is very expensive, it requires money, especially if there's a drought, and that's hard if you don't get any support. We hear that there's an agricultural cooperative for small farmers but we've seen nothing so far. [...] They used to ring veterinarians to treat our animals and give us the medication they need, but that stopped for some reason. Now we have to buy the animals' meds from our own pockets, whereas in recent years they have been

falling ill more often. Therefore I really needed financial help from my sister. It was also better to let my sister help us by working at the farm instead of my wife. Because after my sister's divorce, she has indicated that she does not want to marry again so it does not matter what others think of her. She also has a nervous disease so she can also save money for emergencies in case she gets sick or needs medication (M'barrek, 55 years old, Tamait).

This illustrates how there are differing rules in rural areas in Morocco around the appropriate behaviour of 'rural women' (Bossenbroek, 2016). Furthermore, such a situation challenges existing gender relations, expectations and roles in the household. The traditional image of women as housewives who take care of their household and raise the children, and men as the main providers for their family, remains prevalent in rural areas, and is increasingly challenged by gender-specific land inheritance rules and environmental change. In addition, given the poor working conditions and the finding that it is precisely those women who occupy the most vulnerable positions in society who are most likely to be in these jobs, their vulnerability increases. Although formal employment is often depicted as a sign of emancipation (De Haas, and Van Rooij, 2010) this trend seems to make rural women even more vulnerable to economic, social, and cultural marginalisation.

4. Understanding Gender Dynamics in Rural Agriculture: Local Context and Inheritance Systems

This study shows how in the specific rural context of the Souss-Massa region – a predominantly agricultural region in Morocco – the gendered impact of slow-onset environmental changes should be understood with reference to the local gender dependencies and expectations and gender-specific land inheritance system. The gradual fall in profits from agriculture due to climate change, internal migration and cheaper female labour is altering the labour market structures and gender relations within households in the Souss-Massa region (Baada & Najjar, 2020). Combined with land inheritance systems that disadvantage women over men, these changing gendered labour market dynamics impact the appeal of migration and the need to migrate, as well as the opportunity structures (Salime, 2016). While existing literature easily mentioned the importance of gender when discussing environmental mobility (Lastarria-Cornhiel 1997; Ahlers, 2010; Bossenbroek, 2016), future research can more carefully consider gender dynamics within households, gendered opportunities and dynamics in labour markets and, more specifically, in the division of agricultural labour. Climate change research has predominantly portrayed gender in a binary framework, focusing on the differences between men and women, while disregarding the influential factors of power, social, and political relationship (Djoudi et al., 2015), so future research on environmental mobility should also include the presence of intersectionalities.

The present paper has examined how environmental change plays differing roles in the daily life of men and women. The gendered challenges faced by men and women in the agricultural sector in Morocco

are influenced by factors such as feminisation of agriculture, access to land, and social security systems, which play a crucial role in determining how they respond to environmental changes (Kawarazuka et al., 2022). Addressing these inequalities and barriers is important to promote gender equity and sustainable development in the agricultural sector (Boutkhil, 2019). Two main conclusions can be drawn from this study.

Firstly, women in our study perceive that their limited opportunities for education and training directly affect their pattern of employment and the underpayment of women in Morocco (Skalli, 2001). Thus, gender roles matter when examining the vulnerabilities of people confronted with slow-onset environmental change, highlighting the need for more gender sensitive analyses able to disentangle gender and the consequences of environmental change. In addition, women's economic instability can be reinforced by the family law provisions on (land) inheritance in Morocco. These rights are particularly unfavourable to female children and surviving female spouses, giving male relatives double the share of women (Yavuz, 2016). Because of the weak and incomplete social security systems in Morocco, individuals are not assured that the basic necessities of life are legally guaranteed, which makes it difficult to develop an open attitude about the future when confronted with slow-onset environmental changes. This reinforces the vulnerability cycle, making the situation more difficult for women and girls than for men. In order to be able to determine one's own life course, access is needed to the right information on options open, and this appears to be closely linked to the social security situation (Authors blinded for review). In addition, because of unequal inheritance rights, rural women's opportunities in terms of adaptive capacity are greatly reduced. Future research should further map out the vulnerabilities of rural women, to provide a contextual background to the adaptation strategies they adopt in response to environmental changes.

Secondly, we studied how perceived slow-onset environmental changes affect and reinforce the vulnerable position of women in society. Our findings demonstrate how uncertainty about environmental change can lead people to pre-empt increasing vulnerability of women (for example, by selling land). As long periods of drought lead to an increase in seasonal work, women's vulnerability has increased. While men continue to make use of the remaining opportunities on their own land, women often have to look for ways to generate additional income. Brandth (1995) argues that men establish and manifest their masculinity through the nature of their occupation, with paid employment serving as a fundamental foundation for masculine identity and authority (Collinson & Hearn, 1996). Consequently, male unemployment can lead to a sense of disempowerment and an identity crisis, often resulting in diminished self-esteem and a profound feeling of hopelessness (Laoire, 2001). This leads more and more rural women to share the responsibility of being main breadwinners with other family members. In addition, both employers on large farms and small farmers prefer to hire women, rather than men, in lower paid and time-intensive jobs, although, in some rural regions, there is still some stigma associated

with women working outside the home. There are different rules and codes of conduct in rural areas in Morocco concerning the appropriate behaviour of 'rural women'. In particular, appropriate behaviour depends on social differences such as marital status and age (Bossenbroek, 2016). So, women who are already in a vulnerable position and are forced to generate extra income become even more vulnerable, as their situation can affect their social reputation. In this way, slow-onset environmental change can cause rural women to become more vulnerable to economic, social, and cultural marginalisation. Future research should situate these gender differences in land inheritance and ownership in wider global dynamics, as this can help to explain gender dynamics in migratory responses to environmental changes.

5. References

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