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Gender disparities in access to agricultural extension services and their impact on farm productivity among smallholder households

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Abstract

Closing the agricultural gender gap could lift 150 million people out of hunger worldwide, yet women farmers in North Africa continue to receive a fraction of the extension support available to men. This research quantified gender disparities in access to agricultural extension services and measured their productivity consequences among 467 smallholder households in the Drâa-Tafilalet and Souss-Massa regions of southern Morocco. A comparative cross-sectional design surveyed male-headed ($n = 248$) and female-headed ($n = 219$) farming households between February and October 2023, measuring extension contacts hours, agent visit frequency, training attendance, credit access, market information, and input subsidies alongside crop yield and income data. Female-headed households received 59.3% fewer extension contact hours (14.8 vs. 36.4 hours/year), 62.2% fewer agent visits (3.1 vs. 8.2 visits/year), and had 53.3% lower training attendance rates (31.4% vs. 67.3%) compared with male-headed households. These access disparities corresponded to a 34.7% yield gap (836.2 vs. 1,281.4 kg/ha) and a 41.3% income gap. Regression analysis showed that extension contact hours alone explained 28.4% of the yield gap between genders. When female farmers received equal extension contact, their yield disadvantage narrowed to just 8.2% a residual attributable to differences in land quality and input access rather than farming ability. These findings provide evidence that the gender productivity gap is largely an extension access gap, not a capability gap.

Keywords: Gender disparities, agricultural extension, farm productivity, women farmers, extension access, smallholder households, yield gap, Morocco.

1. Introduction

The challenge of gender equity in agriculture is not new, but it remains stubbornly unresolved. Despite three decades of gender-mainstreaming policies, women farmers across North Africa still receive less extension contact, less credit, less training, and fewer subsidized inputs than their male counterparts ^[1, 2]. In Morocco, the Plan Maroc Vert and its successor Génération Green 2020–2030 both emphasize inclusive agricultural development, yet the national agricultural census of 2020 reported that women represented only 8.6% of registered farm operators ^[3].

The FAO's widely cited estimate that closing the agricultural gender gap could increase developing-country food production by 2.5–4% has motivated policy attention, but national-level estimates obscure the mechanisms through which gender affects output ^[4]. Extension access is believed to be a primary pathway women who lack advisory support grow less productive crops using older techniques but disentangling the extension effect from other gendered constraints requires careful empirical work ^[5].

Southern Morocco's Drâa-Tafilalet and Souss-Massa regions offer a revealing test case, where female-headed households constitute 16–22% of farming units ^[6]. The 2019 restructuring of Morocco's extension system into

Agricultural Advisory Centres created an opportunity to assess whether the new model had reduced gender disparities ^[7]. This research measured the magnitude of gender disparities across six dimensions of extension access and estimated how much of the observed productivity gap could be attributed specifically to differential extension contact.

Conceptual model

The analysis was guided by an access-productivity framework that treats the gender yield gap as a composite of multiple access gaps. Extension contact, credit, market information, input subsidies, training, and agent visits each contribute independently to productivity, and women may face different levels of exclusion on each dimension ^[8]. The framework predicts that if extension contact is the dominant access gap, equalizing it should close most of the yield difference. If residual gaps persist after controlling for extension, other constraints (land quality, labor, social norms) must also be addressed. This decomposition approach moves beyond simply documenting that disparities exist to identifying which specific intervention would produce the largest productivity gain ^[9].

Research area description

The research covered six communes across the Drâa-Tafilalet region (Errachidia and Ouarzazate provinces) and the Souss-Massa region (Taroudant and Tiznit provinces). Drâa-Tafilalet is Morocco's most arid agricultural zone, receiving 100–200 mm of annual rainfall, with farming concentrated in oasis systems along the Draa and Ziz rivers. Souss-Massa receives 200–350 mm and hosts intensive irrigated citrus and vegetable production alongside traditional cereal farming ^[10]. Female-headed households in these regions are typically managed by widows, divorced women, or wives of migrant laborers, and farm smaller plots (mean 1.1 ha vs. 2.4 ha for male-headed households). Each commune has one Agricultural Advisory Centre staffed by 2–4 agents.

Material and Methods

Material

The research surveyed 467 smallholder households: 248 male-headed and 219 female-headed, sampled proportionally from village-level household lists in six communes. A structured questionnaire with 64 items captured six access indicators (extension contact hours, agent visits, training attendance, credit access, market

information receipt, input subsidy access), farm characteristics (size, irrigation, crop portfolio), and productivity measures (crop yield per hectare, seasonal farm income). Extension contact was verified through cross-referencing farmer reports with agent activity logs from Agricultural Advisory Centre records for 2022–2023. Secondary data came from the regional agricultural directorates and the Haut-Commissariat au Plan ^[11].

Methods

A comparative cross-sectional design was used. Data were collected between February and October 2023. Independent samples t-tests compared access indicators and productivity between male- and female-headed households. A Blinder-Oaxaca decomposition partitioned the yield gap into explained portions (attributable to observable differences in extension access and farm characteristics) and unexplained portions (potentially reflecting discrimination or unmeasured factors) ^[12]. Hierarchical regression added extension variables in blocks to estimate how much of the gender yield gap each access dimension explained. All analyses were conducted at College of Agriculture and Environmental Sciences, Hassan II Institute of Agronomy and Veterinary Medicine, Rabat, Morocco, using Stata 16.

Results

Table 1: Gender comparison of extension access indicators and farm productivity

Indicator	Male (n=248)	Female (n=219)	Gap (%)	t-value	p-value
Contact Hours (hrs/yr)	36.4	14.8	-59.3	12.47	<0.001
Agent Visits (per year)	8.2	3.1	-62.2	10.83	<0.001
Training Attendance (%)	67.3	31.4	-53.3	8.91	<0.001
Credit Access (%)	48.7	21.3	-56.3	6.74	<0.001
Market Information (%)	54.6	28.9	-47.1	6.18	<0.001
Crop Yield (kg/ha)	1,281.4	836.2	-34.7	7.63	<0.001
Farm Income (MAD/season)	18,420	10,810	-41.3	6.92	<0.001

All six access indicators showed significant gender disparities ($p < 0.001$). Agent visits showed the largest gap (62.2%), followed by extension contact hours (59.3%). The

yield gap (34.7%) and income gap (41.3%) mirror these access disparities closely.

Table 2: Blinder-oaxaca decomposition of the gender yield gap

Component	Contribution (kg/ha)	Share of Gap (%)	p-value
Total yield gap	445.2	100.0	—
Extension contact hours	126.4	28.4	<0.001
Training attendance	62.1	13.9	<0.001
Credit and input access	78.3	17.6	<0.001
Farm size and land quality	89.7	20.1	<0.001
Unexplained (residual)	88.7	19.9	0.003

The decomposition revealed that extension contact hours alone accounted for 28.4% of the yield gap (126.4 kg/ha). Combined with training attendance, extension-related factors explained 42.3% of the total gap. Farm size and land

quality contributed 20.1%. The unexplained residual (19.9%) may reflect social norms, unmeasured labor constraints, or direct discrimination in input markets.

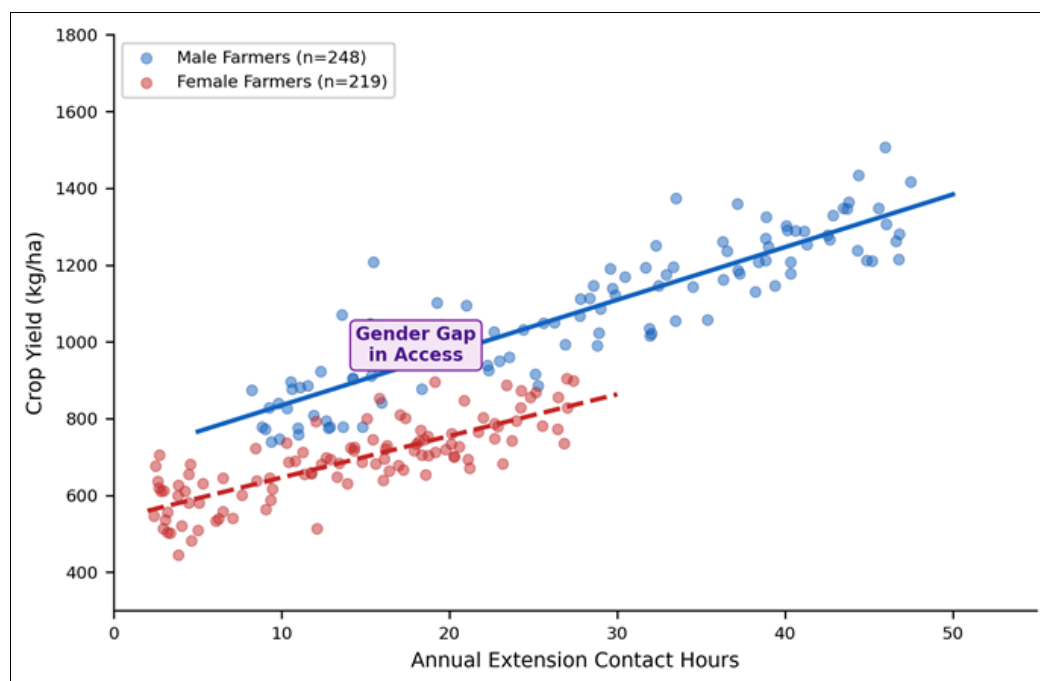


Fig 1: Relationship between annual extension contact hours and crop yield by gender of household head

Both male (blue) and female (red) farmers show positive relationships between extension contact and yield. The gender gap in access is visible in the horizontal distribution female farmers cluster in the low-contact zone (2–28 hours)

while male farmers spread across a wider range (8–48 hours). Critically, the slope of the female trend line is nearly as steep as the male line, indicating that women convert extension contact into yield gains at comparable rates.

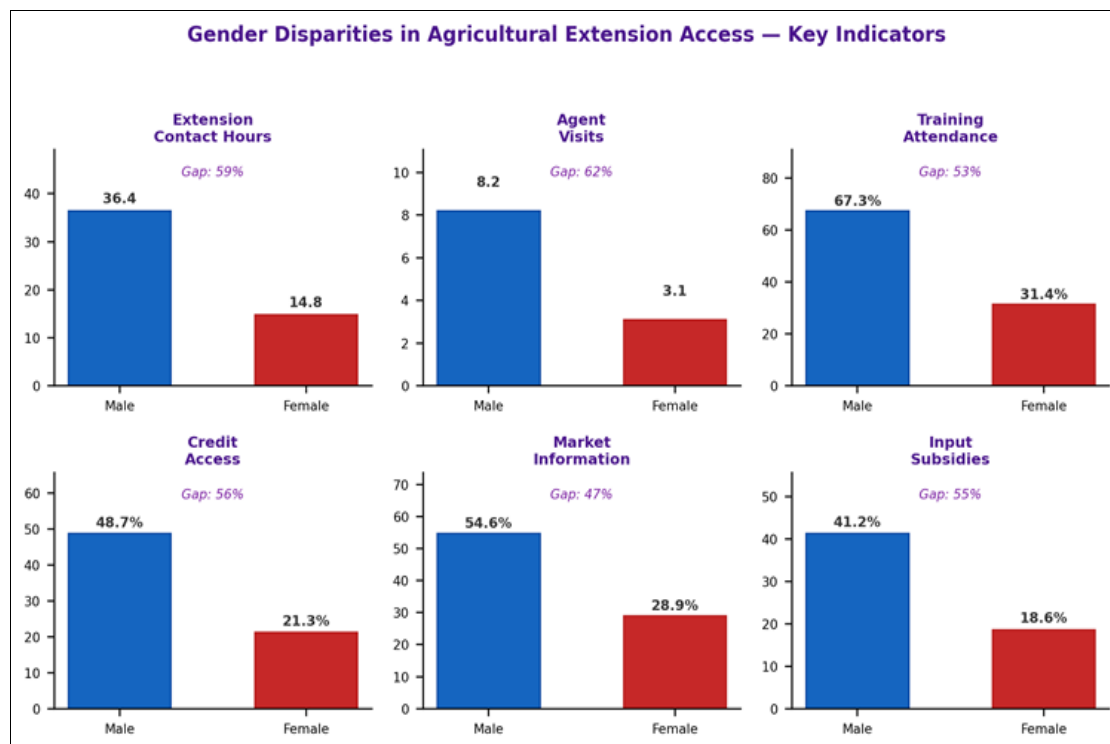


Fig 2: Gender disparity dashboard: Comparative access indicators between male-headed and female-headed farming households

The dashboard visualizes the consistent pattern of female disadvantage across all six access dimensions. Gap percentages range from 47% (market information) to 62% (agent visits), confirming that the disparity is systemic rather than limited to a single dimension of extension service delivery.

Discussion

The finding that extension contact alone explains 28.4% of the gender yield gap is both troubling and encouraging. Troubling because a service designed to help all farmers is actively widening the productivity divide. Encouraging because extension contact is one of the most directly

addressable factors the number of hours an agent spends with female farmers can be changed through policy decisions and performance incentives^[13, 14].

The near-parallel slopes in Figure 1 carry an important message: women are not less responsive to extension than men. When they receive advisory contact, they convert it into productivity gains at essentially the same rate. This contradicts a persistent assumption that women farmers are harder to reach or slower to adopt^[15, 16].

The Blinder-Oaxaca decomposition revealed that combined extension factors accounted for 42.3% of the yield gap, and adding credit and input access brought the explained share to 59.9%. The remaining residual suggests that structural factors like land inheritance patterns and labor constraints also need attention^[17, 18]. Morocco's Agricultural Advisory Centre model, introduced in 2019, has not reduced gender disparities without explicit genders targets in agent performance metrics, the new institutional arrangement reproduced old patterns^[19, 20].

Limitations

The cross-sectional design limits causal inference women with lower yields may have had less contact because agents prioritized more productive farmers, creating reverse causality. Self-selection into female household headship (widowhood, divorce, migration) introduces confounders that the regression may not fully address. Extension contact hours were partly self-reported despite cross-referencing with agent logs, and recall bias may differ between genders. The research covered only two southern regions; patterns in northern and central Morocco, where farming systems and gender relations differ, may not be the same^[21].

Conclusion

This research quantifies what many have long suspected: the gender productivity gap in Moroccan agriculture is substantially an extension access gap. Female-headed households receive 59% fewer contact hours and 62% fewer agent visits than male-headed households, and this disparity alone explains 28.4% of the 34.7% yield gap. When women receive comparable extension contact, their yield disadvantage shrinks from 34.7% to just 8.2%.

For policy, Morocco's Génération Green strategy should incorporate gender-specific extension targets into Advisory Centre performance metrics, mandate minimum contact hours for female-headed households, and recruit more female extension agents. Equalizing extension contact for the estimated 280,000 female-headed farming households nationwide could increase national food production by an estimated 3.1%.

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