Food and Agriculture Organization of the United Nations

Summary

The unjust climate

Measuring the impact of climate change on rural poor, women and youth

ETHIOPIA – A young mother holding her son in the Somali region during a drought. Climate change is increasing the frequency and severity of drought events in many parts of the world.

Summary

Numerical highlights

- In an average year, poor households lose 5 percent of their total income due to heat stress relative to better-off households, and 4.4 percent due to floods.
- Floods widen the income gap between poor and non-poor households in rural areas by approximately USD 21 billion a year, and heat stress by more than USD 20 billion a year.
- Long-term temperature rises lead to an increase in poor households' dependency on climate-sensitive agriculture relative to that of non-poor households. A 1° C increase in average long-term temperatures leads to a 53 percent increase in the farm incomes of poor households and a 33 percent decrease in their off-farm incomes, relative to non-poor households.
- Every year, female-headed households experience income losses of 8 percent due to heat stress, and 3 percent due to floods, relative to male-headed households.
- Heat stress widens the income gap between female-headed and male-headed households by USD 37 billion a year, and floods by USD 16 billion a year.
- A 1° C increase in long-term average temperatures is associated with a 34 percent reduction in the total incomes of female-headed households, relative to those of male-headed households.
- In an average year, households headed by young people see their total incomes increase by 3 percent due to floods, and by 6 percent because of heat stress, relative to older households.
- Heat stresses cause young rural households in low- and middle-income countries to increase their annual off-farm income by USD 47 billion relative to that of other households.
- Extreme temperatures push children to increase their weekly working time by 49 minutes relative to prime-aged adults, mostly in the off-farm sector, closely mirroring the increase in the work burden of women.
- Rural people and their climate vulnerabilities are barely visible in national climate policies. In the nationally determined contributions (NDCs) and national adaptation plans (NAPs) of the 24 countries analysed in this report, only 6 percent of the 4 164 climate actions proposed mention women, 2 percent explicitly mention youth, less than 1 percent mention poor people and about 6 percent refer to farmers in rural communities.
- Of the total tracked climate finance in 2017/18, only 7.5 percent goes towards climate change adaptation; less than 3 percent to agriculture, forestry and other land uses, or other agriculture-related investments; only 1.7 percent, amounting to roughly USD 10 billion, reached small-scale producers.

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Policy highlights

Rural people's multidimensional climate vulnerabilities demand multifaceted policies and programmes that address both the farm and off-farm sources of rural people's vulnerabilities, and reduce farmers' reliance on maladaptive coping strategies.

These policies and programmes must also address the specific constraints faced by vulnerable populations, including limited access to productive resources, low risk tolerance, constrained access to information and extension services, and limited capacities to exercise agency in economic and social domains.

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EFFECTIVE CLIMATE ACTIONS must tackle the diverse drivers of **people's climate vulnerability**

Linking social protection programmes to advisory services can encourage adaptation and compensate farmers for losses. Access to cash-based social assistance programmes increases the productive asset holdings of rural people, encourages them to use improved inputs and farm practices, and enables a shift away from casual wage labour arrangements. These positive impacts can be enhanced by bundling this assistance with climate advisory services and extension support.

The ability to act on climate-related agricultural advice depends on people's economic agency and decision-making power. Gender-transformative methodologies, which use social behaviour change methodologies to directly challenge discriminatory gender norms, can tackle entrenched discrimination that often prevents women from exercising full agency over economic decisions that impact their lives.

Participatory extension methodologies can boost the participation of vulnerable people and result in a greater uptake of improved practices. These methods enable groups of farmers to experiment with different approaches to address shared challenges in their farm systems, while limiting the individual risks associated with trying new practices. These approaches also increase people's sense of agency and self-efficacy in the face of climate risks.

To maximize the positive impact of off-farm opportunities, complementary services are essential. In addition to providing technical and vocational education, it is important to strengthen people's non-cognitive skills. This can be done through programmes that challenge gender stereotypes in the workforce, as well as mentorship programmes focused on building socioemotional skills.

Investing in the collection of disaggregated data is essential to assess the impacts of different climate actions on vulnerable populations. The rapid increase in climate projects and programmes provides a unique opportunity to collect evidence that can guide current and future climate actions.

Overview

Global efforts to tackle the climate crisis must address its impacts on people, particularly the most vulnerable. Because of their reliance on weather-dependent agriculture and agrifood systems, climate change has a profound impact on the incomes and livelihoods of rural people living in low- and middle-income countries. However, policy attention and funding for vulnerable rural people falls woefully short of actual needs. In 2017/18, only 1.7 percent of global tracked financing reached small-scale producers, while only 3 percent supported climate adaptation in agriculture, forestry and other land uses.

Rural people's vulnerabilities to climate change are strongly influenced by a person's wealth, gender and age. These factors also affect their abilities to manage the impacts of climate stressors on their livelihoods and determine the type of adaptive actions they take. Meanwhile, different climate stressors — heat stress, floods, droughts or long-term temperature increases — affect different groups of rural people in very dissimilar ways.

The design and implementation of effective people-centred climate actions requires an understanding of the diverse drivers of climate vulnerability in rural areas. These drivers include barriers to the access to the resources, services and employment opportunities that rural people can leverage to adapt to and cope with climate change. For example, discriminatory norms and policies place a disproportionate burden on women for care and domestic responsibilities, limit their rights to land, prevent them from making decisions over their own labour and hamper their access to information, finance and other essential services. Overcoming these challenges requires specific interventions to enable diverse rural populations to take climate-adaptive actions and avoid maladaptive coping strategies.

Evidence is critical to guide policies and programmes that address diverse climate vulnerabilities in rural areas. While climate policies often acknowledge that women, youth and people living in poverty are more vulnerable to climate impacts, there is very little evidence to understand the magnitude and nature of the vulnerabilities these groups face. Moreover, there is virtually no evidence from diverse low- and middle-income countries on how various climate stressors affect rural women, youth and people living in poverty.

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VULNERABILITIES
to climate change are strongly influenced by
wealth, gender and age

This report assembles an impressive set of data from 24 low- and middle-income countries in five world regions to measure the effects of climate change on rural women, youth and people living in poverty. It analyses socioeconomic data collected from 109 341 rural households (representing over 950 million rural people) in these 24 countries. These data are combined in both space and time with 70 years of georeferenced data on daily precipitation and temperatures. The data enable us to disentangle how different types of climate stressors affect people's on-farm, off-farm and total incomes, labour allocations and adaptive actions, depending on their wealth, gender and age characteristics.

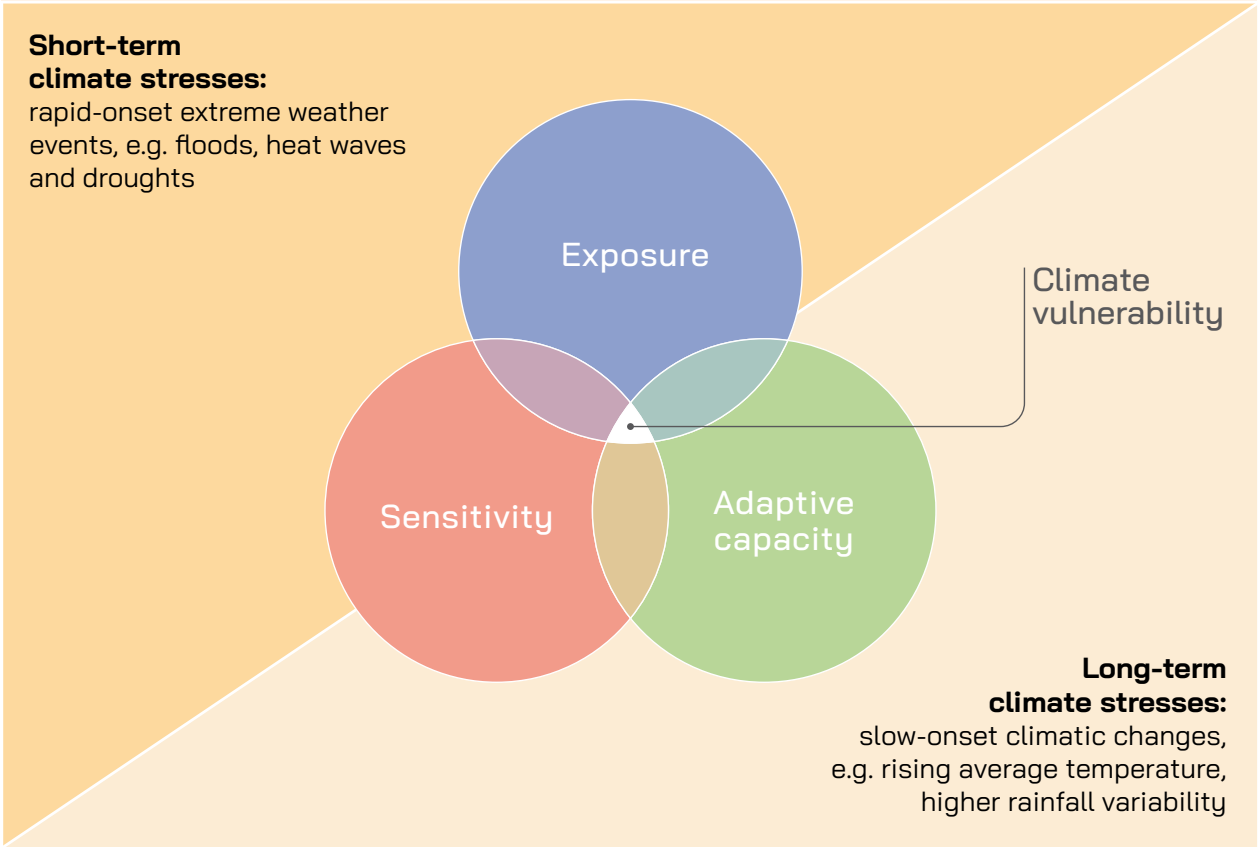
Conceptual framing

Climate change has both direct and indirect effects on the livelihoods and well-being of rural people. Rising temperatures and extreme weather events directly undermine the productivity of the agricultural systems rural people rely on, with global warming estimated to have reduced the yields of major cereal crops by an estimated 2 to 3 percent between 1981 and 2002. Indirectly, reductions in agricultural productivity ripple through the rural economies and agrifood systems that rural people depend on, limiting non-agricultural income opportunities, increasing food prices and disrupting agricultural markets. Assessments of the climate vulnerability of rural people must therefore pay attention to both the farm and non-farm dimensions of people's livelihoods.

A person's vulnerability to climate change is strongly influenced by their agency, socioeconomic endowments and degree of access to support services. This report conceptualizes climate vulnerability as consisting of three elements (see **Figure 1**). Exposure is the type, frequency and intensity of the climate variations, or climate stressors, that affect a person. Sensitivity is the degree to which a person is susceptible to harm due to exposure to climate stressors. Adaptive capacity refers to the ability of a person to adjust to climate change, taking advantage of potential opportunities and responding to its consequences. A person's wealth, gender and age influence their exposure to climate stressors, the sensitivity of this exposure and the capacity to adapt.

FIGURE 1

Climate Vulnerability



Wealth-related disparities in climate vulnerability

Extreme weather events disproportionately affect poor rural households, leading to significant reductions in their incomes and widening income inequality. With every day of extreme heat, poor rural households lose 2.4 percent of their on-farm incomes, 1.1 percent of the value of the crops they produce, and 1.5 percent of their off-farm income relative to non-poor households. Similarly, every day of extreme precipitation causes poor households to lose 0.8 percent of their incomes relative to non-poor households, mostly driven by losses in off-farm incomes. In an average year, poor households lose 5 percent of their total incomes due to heat stress, and 4.4 percent due to floods, relative to non-poor households.

Floods and heat stress widen the income gap between rural poor and non-poor households by approximately USD 21 billion and USD 20 billion a year, respectively. These estimates highlight the massive challenge that extreme weather events pose for global efforts to reduce poverty and inequality. This challenge will only become more acute as the frequency and intensity of these events increase because of climate change.

Extreme weather events push poor rural households to adopt maladaptive coping strategies, including reducing income sources, liquidating livestock and redirecting expenditures away from their farms. Indeed, poor households tend to reduce the diversity of their income sources when exposed to heat stresses, relative to better-off households. Meanwhile, floods and heat stress cause poor households to lose livestock holdings relative to non-poor households, either through distress sales of animals or higher levels of livestock mortality. And poor households reduce their investments in agriculture relative to non-poor households when faced with floods and droughts, as they redirect their scare resources away from agricultural production towards immediate consumption needs. These maladaptive coping strategies are likely to make them more vulnerable to future climate stressors than non-poor rural households.

In addition, long-term increases in temperatures push poor rural households to rely more on weather-dependent agriculture for their livelihoods, thereby increasing their climate vulnerability. Agricultural production is highly sensitive to climate change. But as temperatures rise, poor households tend to become more reliant on agriculture for their incomes and less able to access off-farm income relative to non-poor households. A 1° C increase in average temperatures is associated with a 53 percent increase in the farm incomes of poor households and a 33 percent decrease in their off-farm incomes, relative to non-poor households. Thus, while better-off households adapt to rising temperatures by diversifying into off-farm sectors, poor households do not. This likely increases their overall vulnerability to the impacts of climate change.

Heat stresses widen the income gap
between rural poor and non-poor households by
USD 20 BILLION
A YEAR

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Gender disparities in climate vulnerability

Female-headed households lose significantly more of their incomes than male-headed households when extreme weather events occur. A day of extreme temperature or extreme precipitation is associated with a 1.3 percent and 0.5 percent reduction, respectively, in the total incomes of female-headed households, relative to that of male-headed households. This translates into an annual income gap of 8 percent due to heat stress, and of 3 percent due to floods, compared with male-headed households. Across low- and middle-income countries, heat stresses widen the income gap between rural female-headed households and male-headed households by USD 37 billion a year, and floods by USD 16 billion a year.

Different types of extreme weather events affect female-headed households in different ways. Floods cause female-headed households to lose off-farm income relative to male-headed households, but do not cause a significant loss in farm income. Conversely, droughts and heat stress lead to a significant relative reduction in the farm incomes of female-headed households. An additional day of drought or extreme temperatures reduces the farm incomes of female-headed households by 0.4 and 1.1 percent, respectively, relative to male-headed households. In case of drought, female-headed households can compensate their losses in farm income with off-farm income.

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Female-headed households respond to extreme weather events in diverse ways, but these strategies do not reduce their vulnerability. In case of floods, female-headed households intensify their agricultural activities by acquiring more livestock and spending more on their agricultural systems, relative to male-headed households. This is likely due to the fact that they lose more off-farm income opportunities relative to male-headed households. Conversely, droughts and heat stress cause a significant reductions in the livestock holdings and agricultural expenditures of female-headed households relative to male-headed households. Given that these events are associated with a significant relative reduction in the overall incomes of female-headed households, these strategies do not appear to be effective at enhancing their resilience.

Women take on an additional work burden compared to men when extreme weather events occur, but also lose more income opportunities. Floods and droughts cause rural women to take on more work relative to men. They also significantly increase the hours that they work per week relative to men. With floods and droughts, women tend to work significantly more on their own farms compared to men, while the opposite is true for heat stress, which causes women to dedicate relatively more of their time to work away from their farms. The increase in women's work highlights their critical role in sustaining family livelihoods during extreme weather events. However, without significant changes in gendered norms concerning women's role in care and domestic activities, this additional work likely adds to the already disproportionate work burden that rural women shoulder.

Women plot managers are as capable as men to adopt climate-adaptive agricultural practices, but often lose more income and off-farm

Each day of **extreme high temperature** reduces the total **VALUE OF CROPS** produced by **WOMEN** farmers by **3%** relative to men

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opportunities when exposed to extreme weather events. Each day of extreme high temperature reduces the total value of crops produced by women farmers by 3 percent relative to men. At the same time, there are few statistically significant differences between plots managed by women and those managed by men in terms of the adoption of climate-adaptive agricultural practices in response to extreme weather events. Therefore, a critical programmatic and policy concern is how to support women farmers to translate their adaptive actions into meaningful improvements in their agricultural systems. Gender-responsive agricultural extension services are likely to be an important element in such efforts.

Plots managed by women withstand the adverse effects of floods relatively better than plots managed by men. A day of flooding increases the total value of crops produced on women's plots by 1.6 percent compared to men's plots. The adoption of simple irrigation systems in flood zones may explain this result.

Long-term increases in temperature widen the income gap between female- and male-headed households. An increase of 1° C in long-term average temperatures is associated with a 34 percent reduction in the total incomes of female-headed households relative to male-headed households. This result is mainly driven by a relative reduction in the farm incomes of female-headed households, which decrease by 23.6 percent compared to those of male-headed households. Female-headed households also spend relatively more on agricultural investments than men. Thus, global warming causes women to invest relatively more in agriculture, but also to lose relatively more than men. This points to an urgent need to support female-headed households to better adapt their agricultural systems to climate change.

Age-based differences in climate vulnerability

Households headed by young people are better able to access off-farm employment opportunities in the face of extreme weather events than older households, which makes their incomes less vulnerable to such events.A day of extreme precipitation or extreme heat is associated with a 0.6 or 1 percent increase, respectively, in the total incomes of young households relative to older households. In an average year, young households increase their total income by 3 percent due to floods, and 6 percent due to heat stresses, compared to older households. Indeed, while these events reduce the farm income of young households relative to that of older households, the former compensate these losses with additional income from off-farm sources. For example, a day of extreme heat is associated with a 2.9 percent increase in the off-farm incomes of young households, relative to older households.

Young rural households

are more likely to access off-farm income sources to **MANAGE THE IMPACTS OF EXTREME WEATHER**

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Therefore, while global discussions tend to focus on young people's vulnerability to climate change, this analysis shows that older rural households are substantially more vulnerable to extreme weather events.

Contrary to poor or female-headed households, which often reduce their livestock holdings to cope with extreme events, households headed by young people take advantage of extreme weather events to acquire livestock. In rural areas, livestock typically serves multiple functions, including providing food and income and serving as a store of value. By increasing their livestock holdings during extreme weather events, young households expand their asset base and increase their abilities to generate income in the future, enabling them to better cope with future stressors.

Households headed by young people contribute significantly to rural off-farm economies when extreme weather events occur. Young rural households in low- and middle-income countries increase their off-farm income by approximately USD 47 billion a year relative to other households when exposed to heat stress. Leveraging the contributions of young people to rural off-farm economies should thus be a priority in global climate actions.

Extreme temperatures lead to a relative increase in children's work. For each day of extreme temperature, the number of hours worked by children per week increases by seven minutes compared to prime-aged adults. Given that children experience about seven days of heat stress per year on average, this effect translates into a relative increase in children's weekly labour time of 49 minutes. This increase is driven by a rise in children's off-farm work. These results closely mirror those for rural women, suggesting that women's and children's work are often closely connected in a context of extreme weather events.

Long-term increases in temperature result in a relative increase in the diversification of young people's incomes. This is likely due to an increased reliance on off-farm income sources, with agricultural options becoming more limited as places become hotter. This finding reinforces the overall finding that young rural households are generally better able to adapt to climate stressors than older households, and that they do this by exploiting off-farm income sources.

Policy priorities for inclusive climate action

The evidence in this report confirms that rural people are adversely affected by climate stressors through a variety of channels, including reductions in both on-farm and off-farm incomes and the adoption of maladaptive - and counterproductive - coping strategies. Therefore, policies and programmes must be developed to address rural people's climate vulnerabilities. Given the multidimensional nature of these vulnerabilities, it is crucial to develop and implement multifaceted policies and interventions.

Poor households and those headed by women and young people tend to experience farm income losses as a result of climate stressors relative to other rural groups. This reflects their generally lower climate-adaptive capacity and points to the need for interventions that enable them to adopt adaptive farming practices and technologies.

A wide range of farming practices and technologies can be tailored to different agroecological contexts. However, promoting their adoption by vulnerable and resource-constrained farm households requires programmatic interventions to address key adoption barriers and constraints.

First, there are constraints to accessing and mobilizing the resources required for adoption. These may include the financial resources needed to acquire new technologies, such as improved seed varieties, irrigation equipment and technologies, as well as other factors of production, such as land and labour.

Second, farmers may have limited access to extension, technical assistance and weather advisory services that would enable them to anticipate climate stressors and identify potentially effective solutions. Because of the low farmer-to-extension worker ratios in many countries, extension services often target larger land holders, neglecting poorer and land-constrained producers.

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A third barrier are the risks associated with the adoption of adaptive practices. Many of these practices, particularly those focused on strengthening natural processes to build more resilient agricultural systems, take time to generate describable benefits and may even lead to a short-term drop in productivity. The uncertainty and long-time horizons of these practices constitute a serious impediment to adoption.

Addressing the multiple and diverse constraints to farm-level climate adaptation by vulnerable people requires multidimensional and integrated approaches. While the evidence on the most effective approaches for enabling and sustaining the adoption of farm-level adaptation practices remains quite limited, the literature points to several areas for prioritization.

Multiple sources of vulnerability require **MULTIFACETED INTERVENTIONS**

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Leveraging social protection

The evidence of the productive benefits of social protection programmes for rural people suggests that such programmes can be successfully integrated into broader climate adaptation and agricultural development strategies, to boost the uptake of climate-adaptive practices and minimize reliance on maladaptive practices.

Social protection measures are particularly well-suited for supporting vulnerable groups because they are often unable to access traditional risk management mechanisms, such as credit or insurance services. In addition, social protection mechanisms can be tailored to address the specific vulnerabilities of women, children, older people and poorer people living in rural areas.

To unlock the potential of social protection measures for inclusive climate actions, several issues must be taken into consideration. First, the development of climate policies is typically led by ministries for the environment, which tend to pay little attention to the important role that social policies can play towards climate objectives. Indeed, based on our analysis of the nationally determined contributions (NDCs) and national adaptation plans (NAPs) of the 24 countries in this report, social protection is mentioned in only 1.74 percent of all actions, and these are concentrated in only two countries. A second element is the lack of public funding for social protection programmes. This challenge may be addressed by using climate financing to fund climate-focused social protection programmes, thus helping to boost the degree of social protection of vulnerable rural people.

Tailoring extension services to the needs of vulnerable people

To promote the widespread implementation of climate-adaptive actions by rural people, access to adequate advisory services is critical. How such services are delivered, and the types of support that are associated with them, determines the degree to which they reach vulnerable groups.

Participatory extension methodologies, such as farmer field schools, increase the participation of vulnerable people and promote the uptake of improved practices. These methodologies enable farmers to experiment with different approaches to address shared challenges in farm systems, while limiting the individual risks associated with trying new practices. While the evidence remains thin, participatory methods for addressing climate impacts have proven effective in increasing the awareness of climate risks and promoting the adoption of climate-adaptive practices among poor and vulnerable producers in Bangladesh and Malawi.

The inclusiveness of climate actions is also determined by who delivers the extension services. Increasing the number of female extension agents, for example, was found to boost the adoption rate of sustainable land management practices by women farmers in Mozambique. Meanwhile, peer-to-peer mentorship programmes have been shown to help young farmers develop social networks

to share information on best practices and strategies to improve farm incomes.

Of course, people's ability to act on information depends on their economic agency and decision-making power. Women often face discriminatory norms that limit their ability to exercise agency over economic decisions that are relevant to their lives. Incorporating gender-transformative methodologies, which employ social behavioural change approaches to directly challenge discriminatory gender norms, is crucial to tackle entrenched discrimination that prevents women from exercising full agency over their economic lives. Such methodologies typically involve both women and men, and use participatory methods for social change that can be integrated into agricultural advisory systems and value chain interventions.

Enabling off-farm opportunities

Sustaining and increasing off-farm income opportunities for vulnerable groups requires interventions that tackle both the macro- and micro-level factors that limit people's access to decent off-farm income opportunities.

At the macro-level, issues related to education, disparate time burdens and mobility all influence the types and quality of off-farm income opportunities that people can access. Social and economic factors that limit children's access to education, particularly for those living in economically marginalized rural households, must be identified and addressed. Low education levels limit people's options for off-farm employment and restrict their capacity to build and grow enterprises, thereby pushing many marginalized people into work that is precarious, informal and badly paid.

The impacts of climate change may exacerbate educational inequalities, as exposure to extreme weather events can push economically marginalized households to withdraw their children from school. This effect is particularly worrisome for girls. Public policies must therefore strive to prevent the gender gap in educational attainment from growing as a result of climate change. In Malawi, school feeding programmes have been shown to reduce the probability that girls are withdrawn from school when droughts occur.

The green economy is often promoted as a solution to create decent employment opportunities, while simultaneously tackling local and global environmental challenges. However, many green jobs favour men over women, given that they tend to focus on science, technology, engineering and mathematics (STEM), fields in which women are generally underrepresented. Thus, measures to improve access to education must go hand in hand with efforts to tailor curricula to emerging employment needs. This includes focusing on improving the participation of girls in STEM curricula.

Addressing gender disparities in the burdens of domestic work and care responsibilities is critical to improve the access to and participation in remunerative off-farm work opportunities in rural areas. The provision of childcare, for example, has been shown to have a considerable positive impact on women's - employment.

Supporting the development of markets for climate-adaptation services can create important opportunities in the off-farm sector, while at the same time addressing farm-level constraints to adaptation.

The creation of employment and the formation of enterprises in agrifood systems are particularly important, particularly for women and young people. Agrifood enterprises enable rural youth and other people to diversify their income sources and reduce their dependency on climate-sensitive primary agricultural production.

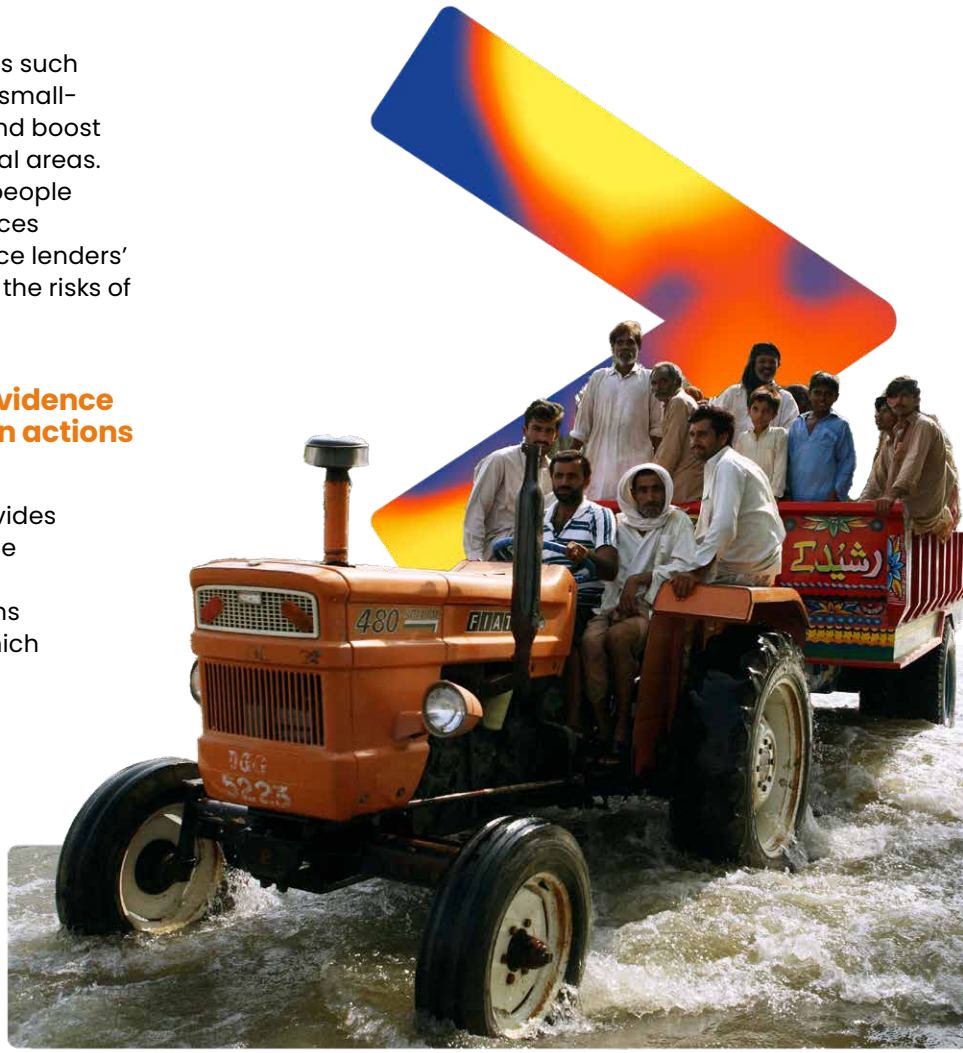
The provision of complementary services is essential to maximize the positive impact of off-farm opportunities. In addition to providing technical and vocational education, efforts should be made to strengthen people's non-cognitive skills. For example, personal initiative training, which focuses on building participants' socioemotional skills, has a greater impact on both male and female entrepreneurs' profits than traditional business training.

Expanding access to financial services such as loans for agrifood enterprises and small-scale producers is crucial to create and boost non-farm income opportunities in rural areas. Enabling young people, women and people living in poverty to access these services requires innovative strategies to reduce lenders' requirements for collateral and offset the risks of loan repayment failure.

Compiling data and building evidence on inclusive climate adaptation actions

The rapid increase in climate projects and programmes in recent years provides a unique opportunity to build evidence to guide future and current climate actions. The analysis of climate actions enables a better understanding of which interventions are most effective at supporting climate adaptation in rural areas, particularly among vulnerable populations who are at risk of being left behind. Without actionable evidence, the scarce resources available for climate actions may be wasted on ineffective approaches.

While data granularity has progressed over the past decade, the lack of data that can be disaggregated at the level of individuals hampers efforts to identify critical social vulnerabilities and target these with effective actions. For the analysis in this report, for example, gender- and age-disaggregated data on individual-level labour outcomes, and plot-level productivity and adaptation outcomes were only available for six and seven countries, respectively, out of a total of 24 countries. Other vulnerable groups, such as indigenous communities or individuals with disabilities, could not be analysed due to the lack of relevant data. Furthermore, individuals often belong to multiple vulnerable groups simultaneously, resulting in an intricacy of different types and intensities of vulnerabilities. Intersectionality is therefore a crucial aspect that deserves further research to gain a more holistic understanding of the complex dynamics of climate-related vulnerabilities.



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