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SCOPING REVIEW ON THE ROLE OF **SOCIAL PROTECTION** IN FACILITATING **CLIMATE CHANGE** ADAPTATION AND MITIGATION FOR **ECONOMIC INCLUSION** AMONG RURAL POPULATIONS



Scoping review on the role of social protection in facilitating climate change adaptation and mitigation for economic inclusion among rural populations

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Abstract

Rural populations, especially small-scale producers and women, are disproportionately impacted by climate change because their livelihoods depend largely on natural resources and weather patterns. This paper reviews the available evidence on the role of social protection programmes in facilitating climate-change adaptation and mitigation, with a specific emphasis on economic inclusion for agriculture-dependent households. A comprehensive search, using Google Scholar, incorporated peer-reviewed papers and "grey literature." Keywords underpinning the central concepts – social protection, climate change and economic inclusion – shaped the search strings. Additionally, the authors incorporated relevant papers outside of this process that they were aware of.

The available evidence for social protection programmes facilitating climate adaptation is categorized across three outputs: (1) adoption of climate-adaptive agricultural practices; (2) diversification of income sources, both on and off farm, to those that are less sensitive to climate variability; and (3) natural-resource management and ecosystem restoration. The impact of social protection programmes on take-up of climate-adaptive practices is limited and sometimes ambiguous. Evidence indicates the importance of complementary interventions, but more evidence is required to understand the binding constraints on take-up and thus be able to shape these complementary interventions and importantly to establish the link to increased income security. The literature on diversifying income sources to less climate-sensitive options is thin but is expected to increase as the agenda supporting just transition gains momentum. Encouraging evidence is available on the role of social protection in natural-resource management and ecosystem restoration, particularly around public employment programmes and environmental cash-transfer programmes.

The review also presents available evidence on the ability of social protection programmes to contribute to climate-change mitigation targets through reduction in greenhouse gas emissions and in easing the impact of climate mitigation policies on price inflation, job losses and income insecurity.

The review underscores the importance of a systems approach. It clearly demonstrates that both climate policies and social protection policies should incorporate specific elements to effectively complement each other. Better integration and coordination will enable managing trade-offs, avoiding maladaptations and reaping broader climate co-benefits. Strong local community institutions and a supportive macroenvironment remain crucial to enable access to productive resources and essential services and the availability of decent work opportunities.

Keywords: social protection; climate change; economic inclusion; adaptation; mitigation; climate action

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1. Introduction

Climate change accentuates the vulnerability of the poorest populations and drives them further into poverty. The World Bank estimates that climate change and natural disasters will push a further 32 to 132 million people into poverty by 2030 (Jafino *et al.*, 2020). According to IPCC (2022), economically and socially marginalized people residing in vulnerable regions are most affected by climate change. Some 3.3–3.6 billion people currently reside in contexts that are highly vulnerable to climate change. Hallegatte and Rozenberg (2017) estimate that the poorest 40 percent of the world will suffer income losses that are 70 percent greater than the average population. People residing in rural areas, where livelihoods depend to a large extent on natural resources and agriculture, are particularly vulnerable to climate-induced crises (FAO and Red Cross Red Crescent Climate Centre, 2019). The majority of the world’s poorest (80 percent of the extreme poor and 75 percent of the moderate poor) live in rural areas (Castaneda *et al.*, 2018). This vulnerability is greater for women and girls, who encounter structural discrimination and disadvantages that limit access to productive assets, essential social services, including social protection and climate-related information, and decent employment opportunities (FAO, 2023a). These restrictions result in limited incomes, insufficient savings, weaker social networks and heavy reliance on natural resources, which limits the capacity of women and girls to manage climate change (FAO and Red Cross Red Crescent Climate Centre, 2019). Moreover, climate-induced migration often results in women being left behind and having to shoulder added responsibilities in agriculture and household management but with reduced social and economic support and resources (Nesbitt-Ahmed, 2023).

The impacts of climate change can be divided into two categories: extreme events or climate-related shocks such as droughts and floods, and slow-onset events, described as “risks and impacts associated with e.g. increasing temperature means, desertification, decreasing precipitation, loss of biodiversity, land and forest degradation, glacial retreat and related impacts, ocean acidification, sea level rise and salinization” (IPCC, 2022, p. 9). The risks and impacts emanating from slow-onset events take the form of low yields and decreasing returns to labour and other productive assets, negatively impacting economic inclusion.

In Africa, agricultural productivity growth has declined by 34 percent since 1961 primarily because of climate change and future warming is anticipated to lead to shortened growing seasons and heightened water stress (IPCC, 2022). In Latin America, patterns of change are complex. In southeast South America, increasing mean precipitation since the mid-twentieth century has positively impacted agricultural production, but rainfed subsistence farming has been negatively impacted in the Dry Corridor in Central America and in the tropical Andes due to reduced precipitation and altered rainfall seasons (IPCC, 2022). Globally, between 330 and 396 million people could be exposed to lower agricultural yields and 314–706 million people to habitat degradation at warming beyond 1.5°C (Hoegh-Guldberg *et al.*, 2018), with associated livelihood impacts. An estimated 52 percent of people in sub-Saharan Africa and 42 percent of people in South Asia are currently employed in climate-sensitive agricultural sectors (World Bank, 2024).

Policies aimed at curbing greenhouse gas (GHG) emissions typically take the form of reduction in use of fossil fuels through promotion of renewable energy technologies; transition to low-carbon transportation; waste minimization processes; and reduction of fossil fuel and fertilizer subsidies. They also take the form of encouraging afforestation and reforestation and promotion of agricultural practices that reduce

emissions from farming, such as agroforestry, and improved livestock management. Mitigation measures such as removal of fossil fuel and fertilizer subsidies and ecosystem-restoration interventions can lead to high prices, curbs on expansion of land under cultivation and disruption of livelihoods. They require a reallocation of employment and changing methods of production across different sectors, including within rural economies. This will lead to the creation of an estimated 24 million new jobs and the loss of 6 million jobs 2030 (ILO, 2018). This represents both a challenge and an opportunity in that those affected by job losses and changed production practices will need to be supported to adjust to the green transition.

Climate-resilient development has been defined as the integration of adaptation measures and their enabling conditions with mitigation to advance sustainable development for all (IPCC, 2022). It encompasses equity, systems transitions and human, ecosystem and planetary health. Social protection is recognized as a critical policy instrument for climate-resilient development (FAO and Red Cross Red Crescent Climate Centre, 2019; Ulrichs, Slater and Costella, 2019; Tenzing, 2020; Malerba, 2021; Costella *et al.*, 2023; Aleksandrova and Costella, 2021; IPCC, 2022). While different agencies use different definitions of social protection, it is commonly agreed that “Social protection is a set of policies and programmes aimed at preventing and protecting all people against poverty, vulnerability and social exclusion, throughout their life cycle placing a particular emphasis on vulnerable groups” (SPIAC-B, 2019). In general, it includes three types of programmes:

1. Social assistance – these enable households and individuals to maintain a minimum level of income and consumption. They are non-contributory in nature. Examples include cash or in-kind transfers, which may be conditional or unconditional, and labour-intensive public-work programmes.
2. Social insurance – these are contributory mechanisms (in some cases, contributions may be subsidized) that provide a buffer against different types of contingencies across the life cycle. Examples include health insurance, pensions and maternity/paternity benefits. In this paper, agriculture-related insurance, such as weather indexed crop/livestock insurance, that is subsidized by the government to provide financial protection for small-scale producers against losses is included in this category.
3. Labour-market programmes – these are targeted at working-age populations and provide unemployment benefits, build skills and train workers with the objective of improving employability and increasing earning capacity.

This paper reviews and synthesizes the available evidence on the role of social protection programmes in facilitating climate-change adaptation and mitigation, with a specific emphasis on fostering economic inclusion of households dependent on agriculture and natural resources for their livelihoods. Section 2 describes the scope of this review, the key concepts utilized to frame the research inquiry and a conceptual framework that explains the barriers and pathways through which social protection influences climate adaptation and mitigation. Section 3 outlines the methodology used for the literature review. Sections 4 and 5 summarize available evidence on the impacts of social protection on climate adaptation and mitigation for economic inclusion. Section 6 provides conclusions from the study.

2. Framing the inquiry: Study scope, boundaries and conceptual underpinnings

2.1. Study scope and boundaries

Social protection programmes, designed to shield all populations from various risks across their life cycle, intersect significantly with climate-change adaptation and mitigation efforts given that the effects of a changing climate increase risks and vulnerability and disproportionately affect those at the margins of society.

Figure 1 provides a visual depiction of how the objectives of social protection are interlinked with climate action. The shaded boxes within the figure depict the focus of the evidence stocktaking covered in this paper. Social protection strengthens climate adaptation by increasing absorptive, anticipatory and adaptive capacity. Bahadur *et al.* (2015) define absorptive, anticipatory and adaptive capacity as follows:

- Absorptive capacity is the ability to “absorb and cope with climate variability and extremes... during and after a disturbance has occurred to reduce the immediate impact on people’s livelihoods and basic needs” (p. 30).
- Anticipatory capacity is “the ability of social systems to actively anticipate and reduce the impact of climate variability and extremes through preparedness and planning” p. 23).
- Adaptive capacity is “the ability of social systems to adapt to multiple, long-term and future climate-change risks, and also to learn and adjust after a disaster. It is the capacity to take deliberate and planned decisions to achieve a desired state even when conditions have changed or are about to change” (p. 13).

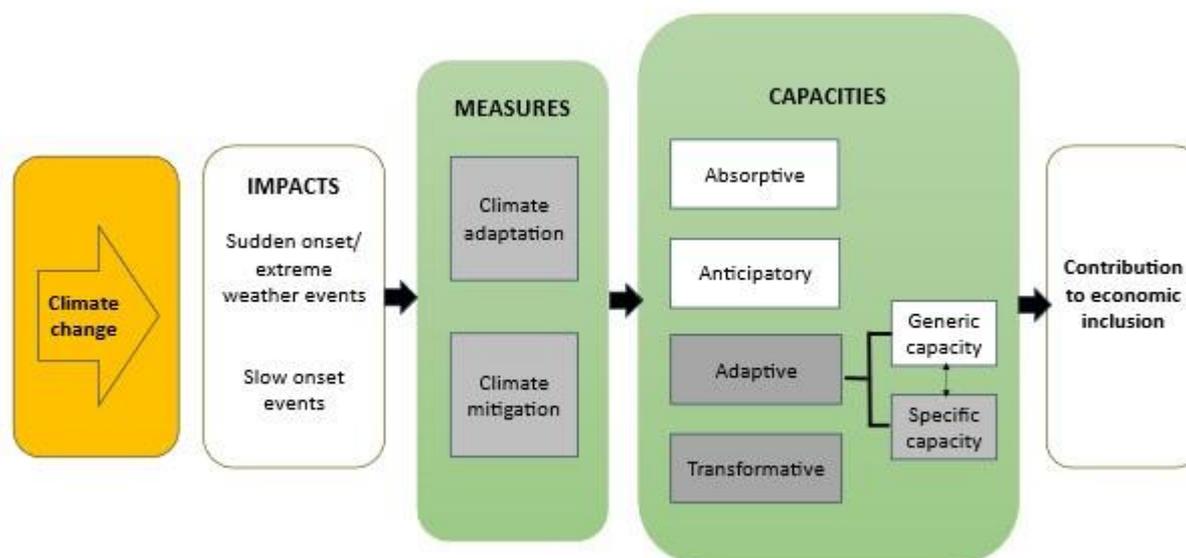
There is by now considerable evidence of social protection programmes having a positive impact on the ability of households to absorb shocks and stresses and thus protect their livelihood sources. By providing steady and predictable sources of income, they prevent recourse to negative coping mechanisms such as selling of livelihood assets in times of distress (Solorzano, 2016; Asfaw *et al.*, 2017; Winder Rossi, *et al.* 2017; Asfaw and Davis, 2018; Ulrichs, Slater and Costella, 2019) which undermine the longer-term sustainability of their livelihoods. Past literature has underlined the importance of making social protection systems “shock responsive” by integrating emergency responses with existing social protection systems (O'Brien *et al.*, 2018). Similarly, recent studies have emphasized the significance of building anticipatory capacity by taking action ahead of forecasted shocks and offer practical options for systematically integrating anticipatory action approaches within existing national social protection systems (Costella *et al.*, 2017; Bharadwaj, Mitchell and Karthikeyan, 2023; FAO, 2023b). In this paper, we focus on the role that social protection plays over and above strengthening absorptive and anticipatory capacities. A key objective is to take stock of the evidence available on social protection programmes building adaptive capacity in the mid to long term as opposed to immediate shock response.

There is now a burgeoning literature on how to measure adaptive capacity. Eakin, Lemos and Nelson (2014) and Lemos *et al.* (2016) describe two types of capacity required for addressing sustainable climate-change adaptation: generic capacity and specific capacity. Generic capacity, as used by Eakin, Lemos and Nelson (2014), refers to capacities in the human development domain such as health, education and income security, while specific capacity is used to capture tools and skills that are required to respond to specific climatic threats and adoption of climate-adaptive practices and technologies. In this paper, we focus on specific adaptive capacities and not on the role of social protection in improving human capital and food security and nutrition. While this forms an important form of adaptive strategy in that it encourages a move away from climate-sensitive livelihoods, these outcomes have already well documented (DFID, 2011; Baird *et al.*, 2014; UNICEF, 2015; Bastagli *et al.*, 2016; Hidrobo *et al.*, 2018; Olney *et al.*, 2021) and are not covered in this review.¹

In addition, social protection can also play an important role in climate mitigation by incentivizing specific actions that lead to a reduction in GHG emissions, such as discouraging deforestation and encouraging ecosystem restoration and natural-resource management. We consolidate the evidence available on the contribution of social protection programmes towards carbon sequestration and reducing GHG emissions. Moreover, social protection has a key role to play in enabling a just transition to a green economy by ensuring the transition is fair and equitable. It can help households absorb the impact of climate-mitigation policies, such as removal of fossil fuel and fertilizer subsidies, and reorientation of economies to green energy. These climate-mitigation actions can increase prices of basic goods such as food and energy and lead to job losses in carbon-intensive sectors. The impact is felt more among low-income populations, who are hit harder by these price increases, and among lower-skilled workers who do not have the resources required to retrain and develop alternate skills. This necessitates the implementation of social-assistance and insurance policies that buffer this income hit and active labour-market policies to facilitate the reallocation of workers across sectors (Malerba, 2021). By addressing issues of social justice and increasing the political feasibility of implementing mitigation actions, social protection can also enhance transformative capacity “to effect structural change that reduces entrenched social inequalities” (Tenzing, 2020, p. 5).

¹ Nevertheless, these two types of capacities are interconnected and an improvement in generic capacity will also foster an improvement in and enable greater impact of specific capacities. For example, with increased education and schooling years, individuals have an increased ability to acquire skills and knowledge specifically related to climate-adaptive practices or diversify into non-farm activities.

Figure 1. Study scope: Interlinked objectives of social protection with respect to climate action and economic inclusion



Source: Author’s elaboration. Shaded boxes depict the focus of the evidence review.

Finally, as shown Figure 1, we explicitly link social protection contributions to strengthening the different dimensions of climate resilience (absorptive, anticipatory, adaptive and transformative capacities) to economic inclusion. Social protection and economic inclusion are two overlapping concepts and both address “poverty traps”. These poverty traps tend to exist and are further exacerbated by environment degradation and climate change (Hashemi and Montesquiou, 2011). Unlocking the productive potential of people living in poverty requires the simultaneous removal of multiple constraints. Typically, economic inclusion programmes² have multiple components, such as cash, asset transfer, training and access to different kinds of services (especially financial), that address the variety of constraints that poor households face.

Cash-plus programming and graduation or big-push programmes are often used to enhance economic inclusion. Evidence has shown that the ability of these programmes to increase income and well-being for the ultra-poor can be sustainable (in terms of sustained impacts over time) and cost-effective (Tirivayi, Knowles and Davis, 2013; Banerjee *et al.*, 2015; Sedlmayer, Shah and Sulaiman, 2019; Banerjee, Duflo and Sharma, 2020; Rahman and Bandiera, 2021). In addition, there is now substantial evidence that even stand-alone social protection programmes such as cash transfers allow households to overcome liquidity and credit constraints, manage risks and plan over the medium to long term. This allow them to generate productive impacts as evinced by accumulation of productive assets, livestock, savings, increase in the use of inputs such as seeds and fertilizers, linkages with output markets, increased crop production and

² Economic inclusion strategies seek to empower poor and marginalized communities by fostering their participation in economic activities, which in turn sustainably increases their income-generating capacities. The State of Economic Inclusion Report 2021 (Andrews *et al.*, 2021, p. v) defines economic inclusion programmes as “a bundle of coordinated multidimensional interventions that support individuals, households, and communities in increasing incomes and assets”, and identifies three key components of these bundles through which governments are customizing specific economic inclusion efforts within existing anti-poverty programmes: social safety nets, livelihoods and jobs, and financial inclusion.

productivity, and diversification of income sources of poor households (Tirivayi, Knowles and Davis, 2013; Covarrubias, Davis and Winters, 2013; Asfaw *et al.*, 2014; Asfaw and Davis 2018; Handa *et al.*, 2018; Daidone *et al.*, 2019; Prifti, Daidone and Davis, 2019; Pace *et al.*, 2021; Pace *et al.*, 2022; Correa *et al.*, 2023).

However, productive impacts per se are insufficient in the face of climate change where long-term economic inclusion hinges upon enhancing the adaptive capacity of vulnerable groups. The link to climate adaptation will exist only if a concerted effort is made to provide climate-adaptive services (Ulrichs and Slater, 2017), which links to specific adaptive capacity as described above. Therefore, in this paper we focus solely on empirical evidence that demonstrates a change in production activities and income sources that are characterized by reduced sensitivity to climate variability. Previous research has highlighted the lack of evidence on this linkage (Tenzing, 2020; Costella *et al.*, 2023; Nesbitt-Ahmed, 2023). This paper aims to fill this gap by taking stock of existing evidence.

In summary, this paper consolidates the available evidence on the role of social protection programmes in enhancing specific adaptive capacity over the medium to long term in response to climate change, and its contribution to climate mitigation among rural populations.

2.2. Study scope and boundaries

The conceptual framework provided in Figure 2 provides a visual representation of the barriers and pathways through which social protection influences climate adaptation and mitigation at both the household and territorial levels.

Adopting climate-adaptation actions requires significant changes in agricultural practices and livelihood choices. For example, producers might need to adopt crops that are more drought resistant or livestock breeds that are more resilient to climate change, implement agroforestry and water-efficient irrigation methods or transition to alternative occupations. Poor rural households need to change or adapt their production systems to meet climate challenges but rarely have the resources to do so. They face several barriers to making these changes due to the significant risks and costs these actions entail, which they are ill able to afford. These include lack of access to financial and other essential services, skills and knowledge; long gestation periods with uncertain returns, which requires them to change their time horizon of decision-making; and the long-term nature of the investments, which is especially difficult for farmers who have to prioritize their immediate daily requirements. All of these factors also contribute to a high intertemporal discount rate. Each of these barriers is stronger for women than for men, since women face unequal access to and control over income-generating resources such as land, fertilizer, seed, markets, finance and labour. The underlying structural determinants for this include discriminatory gender norms, limited mobility, restricted bargaining power and inadequate representation in decision-making processes and fora (Nesbitt-Ahmad, 2023).

Moreover, for adaptation efforts to be effective and sustainable over time, they need to be tailored to the local context and use localized climate and natural-resource data and information. There also needs to be sufficient expertise at the local level to help implement these initiatives. Fragmented policies across different government departments can lead to inefficiencies and misalignment between agricultural,

water, environmental and social policy sectors. Limited institutional capacity to foster collaboration and coherence between these sectors can impede holistic adaptation measures (IPCC, 2022; Sibiya et al, 2023).

In the face of these barriers, social protection programmes ensure a minimum consumption floor to protect against extreme poverty, improve liquidity through regular cash transfers, provide knowledge and training required to shift production and livelihood choices and enable intertemporal risk management through savings and insurance mechanisms. By increasing coherence and engaging and fostering community-based organizations, social protection and climate action programmes can ensure that climate-adaptation measures are accessible and tailored to local needs and enhance community ownership and resilience.

Climate-mitigation actions such as removal of fossil fuel and fertilizer subsidies and ecosystem-restoration interventions can lead to high prices and disruption of livelihoods in their immediate aftermath. Social protection programmes that provide income and skill-development support can mitigate the negative trade-offs of these policy measures and ensure a smoother transition to greener livelihood activities, thereby safeguarding vulnerable communities from economic hardship.

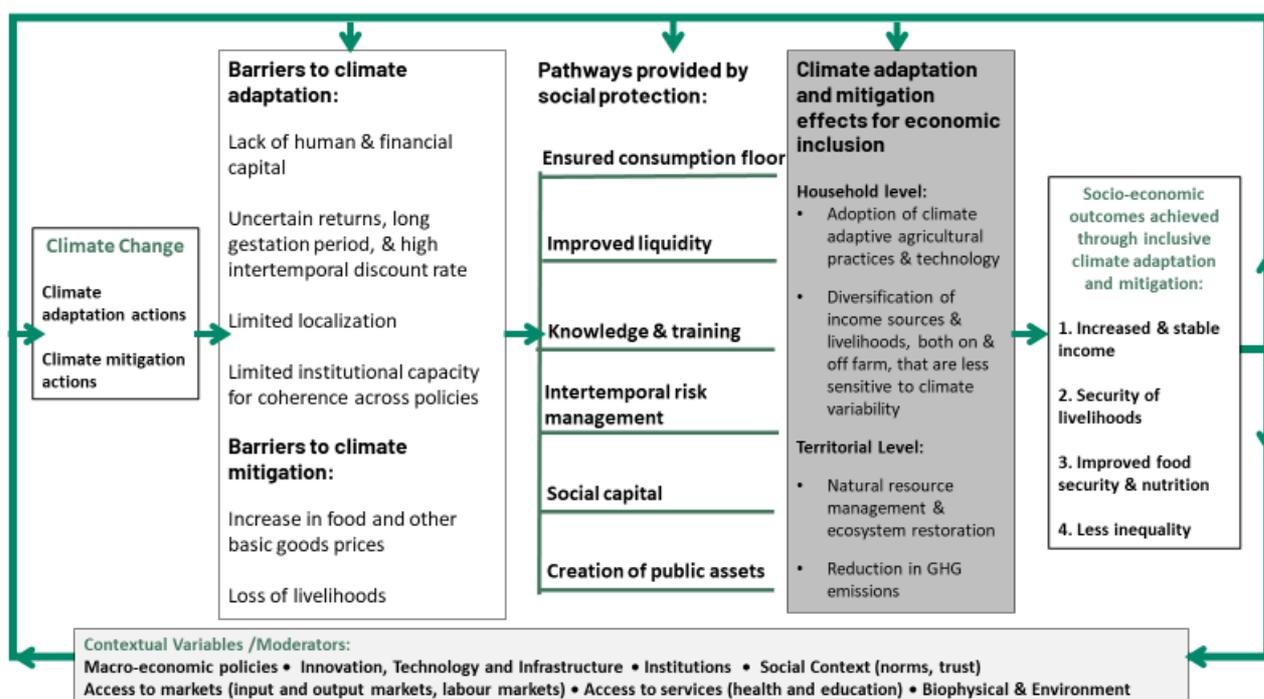
Through the depicted pathways, social protection can have climate-adaptation impacts with knock-on impacts on economic inclusion at both the household and territorial level. By drawing on the evidence reviewed and synthesized, and based on an indicator-based framework for tracking adaptation in agricultural sectors³ at national level (FAO, 2017), we identify three such outputs: (1) adoption of climate-adaptive agricultural practices and technology; (2) diversification of income sources and livelihoods, both on and off farm, to those that are less sensitive to climate variability; and (3) natural-resource management and ecosystem restoration. Additionally, social protection can contribute to the reduction of GHG emissions through the creation of public assets such as increased forest cover, climate-adaptive agricultural practices and natural-resource management. Forests act as carbon sinks, absorbing CO₂ from the atmosphere and helping offset GHG emissions. Further, increased adoption of climate-adaptive agricultural practices such as agroforestry and water-efficient farming helps sequester carbon and reduce emissions.

The framework depicts a feedback loop that shows that improved climate adaptation and mitigation contributes to increased income, more secure livelihoods, improved food security and nutrition, and less inequality. These in turn influence the underlying contextual variables that drive climate action such as macroeconomic policies (e.g. labour-market and trade policies that can create non-farm job opportunities), current state of innovation, technology and infrastructure, the underlying social context (norms and trust), access to key markets (inputs and output markets, labour markets), services (health and education) and the biophysical environment. While these contextual variables determine to some degree the success of social protection instruments in advancing climate action, these instruments themselves can generate outcomes that are able to slowly transform the context within which they are operating, creating a continuous cycle of support and resilience-building. It also underscores the importance of integrated approaches that consider the interplay between social protection, climate action and other contextual variables. While this paper does not cover the evidence regarding the feedback loop and the synergistic

³ The indicator-based framework for tracking adaptation in agricultural sectors at national level has three different dimensions of adaptation: reducing vulnerabilities, enhancing resilience and strengthening adaptive capacity. For the last of these, it provides a set of four indicators each, across four categories: (1) Natural resources and ecosystems; (2) Agricultural production systems; (3) Socioeconomics; and (4) Institutions and policymaking (FAO, 2017).

impact of an integrated approach, its primary focus lies on examining the role of social protection programmes in improving specific adaptive capacity as captured in the above-mentioned three output categories. Additionally, it investigates their contributions to climate mitigation.

Figure 2. Conceptual framework: Pathways through which social protection facilitates climate adaptation and mitigation



Source: Author's adaptation building on the conceptual framework provided in Tirivayi, N., Knowles, M. & Davis, B. 2013. *The interaction between social protection and agriculture: A review of evidence*. Rome, FAO.

3. Methodology

The literature review drew on published articles and reports, both peer-reviewed and “grey literature” from practitioners in the field. These included think tanks, government and non-governmental organizations, international organizations and donors. The search engine used was Google Scholar, as it enables searching across databases and websites and including grey literature. The literature search was conducted in July and August 2022. Relevant papers published subsequently that the authors became aware of were also included in the review.

The search strategy incorporated the three central concepts relevant to this investigation: social protection, climate change and economic inclusion. Keywords were identified within each of these concepts (Table 1). Combinations of these key words were used for the initial literature scanning. The

search query made use of the Boolean term 'AND' to identify papers that lie at the interface of these three concepts.

Table 1. Key concepts and keyword combinations

Social protection	AND	Climate change	AND	Economic inclusion
24 terms:		14 terms:		Income
Social protection		Climate change		Livelihood*
Social assistance		Climate adaptation		Job*
Social security		Climate mitigation		Employment
Social insurance		Natural-resource management		
Social safety		Afforestation		
Labour-market programme*		Conservation		
		Land management		
Cash transfer*		Pasture*		
Food transfer*		Water* management		
In-kind transfer*		Forestry		
		Aquaculture		
Cash for work		Fisheries		
Food for work		Livestock		
Public work*		Biodiversity		
Public employment programme*				
Home-grown school feeding				
Payment for ecosystem service*				
Compensation scheme				
Skill* training				
Livelihood training				
Cash Plus				
Graduation programme*				
Economic inclusion programme				
Crop insurance				
Livestock insurance				
Unemployment insurance				

* The asterisk serves as a wild-card character in search queries, enabling the retrieval of variations of a term. For instance, "programme*" will yield results containing both "programme" and "programmes," enhancing search inclusivity.

The titles and/or abstracts of the first 20 papers generated through each search query were scanned to identify a shortlist of relevant documents to be read in more detail. This generated a total of 241

documents. The abstracts of the shortlisted documents were then rapidly scanned to determine their relevance for inclusion in the literature review. Papers not pertaining to rural populations and studies not carried out in low- and middle-income countries (LMICs) were excluded. The documents were also scanned to determine whether they addressed on the confluence of social protection, economic inclusion and climate change. This process identified a total of 58 documents suitable for further review. Thirty-four relevant papers that the authors were aware of outside of this search process were added to the material to be reviewed.

Table 2 provides the number of papers shortlisted for rapid scanning, those selected for further review, and those that were identified outside the search process across six categories of different types of social protection programmes. Out of the 92 documents reviewed, 53 were selected for inclusion in this paper after a more in-depth review of the documents. It was decided to exclude papers related exclusively to payments for ecosystem services as the main objective of these programmes is conservation of natural resources and ecosystems, unlike social protection programmes that primarily aim to protect people against poverty and vulnerability. In some instances, social protection programmes are combined with environmental payments, and evidence on the impact of these programmes has been included. Papers that only described design features were excluded from the review as the objective of this paper is to review evidence on how social protection facilitates climate adaptation and mitigation.

Table 2. Search process and results

	Shortlisted for rapid scanning	Selected for further review	Other papers identified	Total reviewed	Papers included in review
Social protection/Social assistance/Social security/Social insurance/Social safety/Labour-market programme	39	11	9	20	14
Cash transfer/Food transfer/In-kind transfer	25	9	5	14	10
Cash for work/Food for work/Public work/Public employment programme	17	7	10	17	16
Miscellaneous category: Home-grown school feeding/Payment for ecosystem services/Compensation scheme/Skill training, livelihood training	73	12	8	20	7
Cash plus/Graduation programmes/Economic inclusion programme	33	8	1	9	4
Insurance: Crop insurance/Livestock insurance/Unemployment insurance"	54	11	1	12	2
Total	241	58	34	92	53

4. Evidence of social protection contributing to adaptive capacity for economic inclusion

4.1. Adoption of climate-adaptive agricultural practices

This section reviews evidence on the impacts of social protection programmes in facilitating the adoption of climate-adaptive agricultural practices. These are context specific to local geography and environment conditions, locally available resources and technology, and specific to the type of hazards faced by the local populations (e.g. floods, droughts, temperature variation).

Climate-adaptive agricultural practices include shifting planting and harvesting dates; crop diversification; adopting less-resource-intensive crops; using different crop varieties (e.g. drought-resistant and early-maturing varieties); expanding irrigation by using pond and river water; soil and water conservation practices; practices aimed at improving soil nutrient balances, soil quality and water retention; adopting mixed crop–livestock farming systems; and adaptation practices by agropastoralists (e.g. splitting herds, pasture management by creating dry- and wet-season grazing areas, movement of herds to access water and pasture in other areas, livestock diversification) (Panda, 2013; Scognamillo and Sitko, 2021).

There are many challenges associated with the adoption of these adaptive activities, including resource and liquidity constraints; risks associated with changing farm-management practices in the short term, such as yield reductions, increased weed pressure and waterlogging; and missing and incomplete rural markets that limit ability to absorb volatility (Scognamillo and Sitko, 2021; Sitko, Scognamillo and Malevolti, 2021; Correa *et al.*, 2023). As described in Section 2, social protection can play a role in meeting these challenges to some extent. The evidence reviewed in this section is summarized in tabular format in Annex 1.

Scognamillo and Sitko (2021) studied the impact of the Malawi Social Action Fund (MASAF) on beneficiaries' uptake of three climate-smart agriculture (CSA) practices: adoption of soil and water conservation (SWC) structures, such as physical bunds, tied and marker ridging systems, terracing and contour farming; legume intercropping; and organic fertilizer application. The MASAF is the largest public works programme in Malawi and covered 14 percent of the country's population in 2013. The authors found that receiving cash through MASAF increased the probability of adopting SWC structures and organic fertilizer by 0.673 and 0.371 percentage points, respectively, in the year in which the household received cash for work. The effects were sustained for two consecutive years. This is despite CSA not being a MASAF component. The authors hypothesize that this increase in adoption of CSA practices is because the programme changed the risk profile of poor households, reducing their intertemporal discount rate and enabling them to undertake risky and long-term CSA practices. Further, the authors find that adoption was higher among households that had greater agricultural endowments, indicating that resource needs for CSA might prevent adoption in some farming households. The authors believe the effect on adoption of these practices would be higher if CSA were integrated into MASAF programming.

The results were ambiguous with respect to impacts on productivity as measured by maize yields and total value of harvest. MASAF participation alone or in combination with adoption of the three CSA practices had no detectable impact on these measures under normal or dry conditions, except in two cases: sustained adoption of SWC structures in combination with MASAF participation under normal conditions and the stand-alone impact of MASAF participation during dry conditions. The former suggests a transfer of skills learned from the programme into farmer's own fields. The stand-alone impact suggests MASAF is reducing climate vulnerability through a reduction in negative coping strategies, smoothing consumption and permitting planned investments. However, the stand-alone impact during dry conditions disappears when combined with CSA practices, raising concerns about "the level of climate-smartness associated with these practices" (Scognamillo and Sitko, 2021, p. 11).

In another paper, Sitko, Scognamillo and Malevolti (2021) analysed the impact of receiving non-contributory in-kind food aid on four types of climate-adaptive activities: cereal-legume intercropping; application of organic fertilizers/mulch; construction of physical and biological SWC structures; and livestock accumulation. They utilized data on local vulnerable populations in Ethiopia and Malawi receiving food aid from a variety of different sources and found that food aid increased the probability of beneficiaries investing in SWC structures (2.1 percentage points in Ethiopia and 1.7 percentage points in Malawi). In Ethiopia, it was also associated with an increase of 31.9 percent in the number of animals owned. However, it reduced adoption of legume intercropping by 3.8 percentage points in Ethiopia and 4.0 percentage points in Malawi and the adoption of organic fertilizers in Ethiopia (2.4 percentage points). The authors posit that this might be due to a substitution effect, since food-aid baskets included legumes, which eliminates the need for the recipient household to produce legumes, and that it may be freeing up resources to procure inorganic fertilizers which provide more immediate yield impacts. The authors caution that their results indicate that while in certain circumstances food aid may act as an incentive to adopt climate-adaptive farming activities, this is not universally true or cost-effective (such as when compared with cash transfers or insurance in areas where these markets function well). Their results also show that the adoption of these adaptive activities tends to increase in proportion with the value of the transfer received. While temporary food aid may free-up household labour and help in promoting highly labour-intensive practices such as SWC structures, other more capital-intensive adaptive activities will require larger transfers to overcome resource and risk adoption barriers.

In their study of the Livelihood Empowerment Against Poverty (LEAP) programme in Ghana, Yiridomoh *et al.* (2021) found that although LEAP was not created with climate-change goals it did contribute to climate adaptation. Of the 325 individuals interviewed for the study, 91 percent of the respondents reported that they used part of the income from LEAP to manage climate-change risk. Of these, 33 percent invested LEAP transfers in buying early-maturing crop varieties to circumvent the impact of potential droughts and bushfires.

In one of the initial impact assessments of the Productive Safety Net Programme (PSNP) in Ethiopia, Gilligan, Hoddinott and Taffesse (2009) used propensity score matching and found that the programme had little impact on participants due to a low transfer value. However, when combined with other agricultural support measures through the Other Food Security Programmes (OFSP), which included various activities such as providing access to credit, agricultural extension services, technology transfer (e.g. advice on food-crop production, cash cropping, livestock production and SWC) and irrigation schemes,

participants were more likely to adopt improved agricultural techniques. This included an increase of 4.8 percentage points in the use of improved seeds and an increase of 10.7 percentage points in the use of fertilizers compared with the comparison group. The study was not able to parse out which particular components of the OFSP influenced these trends.

In a more recent impact evaluation of the PSNP, Scognamillo, Mastrorillo and Ignaciuk (2022) investigated the impact of participation in PSNP on beneficiaries' probability of self-reporting food insecurity or crop losses due to drought or other shocks. Using an instrumental variable estimation technique on a dataset of 3 639 households, the authors found that PSNP beneficiaries were less likely to experience crop losses (23 percent less) and complete crop failure (48 percent less) in the aftermath of droughts. Moreover, the paper also showed that the adaptive gains were not limited to households that were PSNP participants but also occurred at the community level due to the public works undertaken as part of the programme, such as building SWC structures. Community peers were 28 percent less likely to experience harvest losses in case of extreme dry events and this impact did not crowd out the direct effect on PSNP beneficiaries. Since they found no impact of the PSNP on households that faced other shocks, such as fire, pests, wild animals, thefts, shortage of inputs and price fluctuations, they suggest that the effect was the result of skills and knowledge of risk-management strategies related to droughts that were transferred as part of the programme.

Adimassu and Kessler (2015) conducted an impact assessment of the PSNP on farmer investments in sustainable land-management (SLM) practices in the Central Rift Valley of Ethiopia. SLM is defined as a comprehensive set of land-management practices that make "significant and lasting differences in the near future and over the long term in reducing land degradation and improving land productivity" (Adimassu and Kessler, 2015, p. 57). Using a cross-sectional dataset of 159 households and propensity score matching techniques, the authors found that farmers who did not participate in the PSNP invested more in soil erosion control measures⁴ than did PSNP participants. However, PSNP participants invested more in soil fertility management practices such as using inorganic fertilizers (mean difference estimates ranged from 9 to 17 kg), compost (mean difference estimates ranged from 295 to 430 kg) and farmyard manure (mean difference estimates ranged from 34 to 87 kg), presumably because the PSNP increased household's access to finance and encouraged fertilizer adoption. The authors concluded that the reason for the lack of investment by PSNP participants in soil erosion control mechanisms was due to the high labour and time investment required in public works competing with time and labour investment in land-management practices on their own land and suggest that PSNP should not pose a time constraint to households who need to work on their own land. The authors advocate for a greater focus on capacity building within the PSNP, using farmer-to-farmer training with a focus on land management.

Kozicka *et al.* (2023) studied the impacts of the PSNP on on-farm agrobiodiversity using the World Bank's Ethiopian Socioeconomic Survey. This is a panel dataset consisting of nearly 3 000 respondents from various regions of Ethiopia, conducted in two rounds between 2011–2012 and 2015–2016. They examined the impact of the PSNP on-farm agrobiodiversity through its impact on on-farm labour and on-farm crop

⁴ Employment of soil erosion control practices was captured by asking the farmers the length in metres of soil and stone bunds constructed per plot, which was on average 44 m for control households and 23 m for treated households without using propensity score matching (PSM) techniques. Using PSM techniques the difference came down to about 6–17 m and was not statistically significant. However, the number of observations was low, which could be driving statistical insignificance.

diversity. The provision of a stable income through the PSNP may incentivize specialization by encouraging farmers to replace income-stabilizing farming practices such as diverse crops with riskier but more profitable monocropping systems. However, it is also possible that increased household income shifts preferences towards long-term benefits of following a crop diversification strategy that increases agrobiodiversity. Thus, PSNP participation might have either a positive impact, indicated by higher on-farm labour inputs and increased agrobiodiversity, or a negative impact, characterized by lower on-farm labour inputs and decreased agrobiodiversity.

Their findings suggest that the PSNP reduced farm labour input, including labour intensity and duration, and was associated with lower levels of on-farm crop diversity. The reduction amounted to approximately 28 fewer days of farm labour per year and an 11.53 percent decline in labour intensity. Furthermore, on average, PSNP participation led to lower on-farm agrobiodiversity, as indicated by a 9.77 percent decrease in crop richness (count of different crops cultivated by the household on the farm) and a 13 percent decrease in the Simpson's Diversity Index (calculated using the proportion of specific crop areas relative to total area under cultivation; zero indicates only one crop variety is cultivated). These results imply that the PSNP may crowd out more labour-intensive farming practices, such as intercropping and cover cropping. To address these trade-offs, Kozicka *et al.* (2023) recommended incorporating training programmes that promote reinvestment in on-farm labour activities, geared towards increasing agricultural biodiversity.

Aker and Jack (2021) specifically assessed which barriers (cash versus training) acted as a binding constraint for take-up of climate-adaptive techniques in the Niger, focusing on the adoption of a rainwater harvesting technique that addresses land degradation and restores soil fertility. Small-scale farmers in 180 villages were assigned across a control group and four treatment groups, one of which received only training on the construction of demi-lunes⁵ and the other three received a variant of cash-transfer programme design (early, conditional and late)⁶ in addition to training. The theoretical premise behind offering a cash transfer was that it would help alleviate liquidity and credit constraints. The treatments were administered during the first year, and the sample was followed for three consecutive years.

Surprisingly, their findings indicate that liquidity and credit constraints had limited impacts on adoption rates as the inclusion of conditional or unconditional cash transfers did not yield any additional effect over training three years after the intervention. Providing farmers with only training increased the proportion of adopters by 90 percentage points relative to the control and farmers in this group constructed 28 more demi-lunes than those in the control group. A higher treatment effect was observed in the cash-plus (cash transfer + training) treatment groups in the first year, but this effect dissipated by the third year, with adoption levels similar across treatment groups.

The adoption of demi-lunes was found to have increased agricultural output, reduced land turnover and generated adoption spillovers. For the first year, when most of the investment costs are incurred, the authors estimated the treatment effect on agricultural revenue to be USD 40 per year and the costs around

⁵ Demi-lunes refer to a type of land contouring technique constructed on the field to collect rainfall and runoff. They are used to enhance water conservation, reduce soil degradation and lower the risk of crop failure (Aker & Jack, 2021).

⁶ The four treatment groups were: Training only; Training + "early" unconditional cash transfer (UCT) of a lump sum payment of USD 20 after the training; Training + conditional cash transfer (CCT) of USD 0.40 per demi-lune constructed about 3 months after the UCT-early treatment; Training + late UCT of USD 20.50 at the same time as the CCT payout.

USD 30. This benefit continued beyond the initial year, when private costs were nearly zero. These results highlight the cost-effectiveness of training as a means of promoting the adoption of climate-adaptive technologies and indicate that financial constraints may not be a barrier, at least for the type of households targeted by the study. The main eligibility criterion to be included in the sampling frame was access to degraded land, with households required to possess between 0.5 and 10 hectares of such land.

Agricultural insurance has been identified as an important mechanism for promoting adaptation to climate change. However, Skees, Barnett and Collier (2008) do not consider insurance to be an instrument for adaptation as it does not address the underlying risk of climate change and recommend integrating index insurance into a broader adaptation strategy. Panda (2013) cautions against maladaptive strategies that might be adopted by farmers as a result of subsidized insurance. Access to insurance can lead to indifferent behaviour by those insured and increase their exposure to climate-change hazards.

Panda (2013) investigated the impact of the National Agricultural Insurance Scheme (NAIS) in the Bolangir and Nuapada districts in Odisha, India. The NAIS covers almost all seasonal and annual crops, if historical yield data of 10 years for the crop exists, and protects farmers against crop losses suffered as a result of natural calamities. Their findings fall under two categories: barriers to take-up and the impact on adaptive actions undertaken by farmers. Take-up was found to be low. Of the 183 farmers surveyed, 132 were not insured and 38 percent of the uninsured reported “complicated procedure” as the main reason for not being enrolled in the insurance scheme. In addition, 57.3 percent of the insured farmers reported not receiving compensation from the insurance. These findings echo results from a review of weather microinsurance in Bangladesh (Akter, 2012, cited in Tenzing, 2020). Moreover, they highlighted that subsidized premiums for weather-index-based insurance might offset post-disaster relief and rehabilitation funding targeted to vulnerable communities and instead benefit better-off households. In the same vein, Lowe *et al.* (2019, cited in Nesbitt-Ahmed, 2023, p. 26) stated that such schemes are less likely to reach women farmers because of structural barriers related to lack of access to land and financial services. A study on drought insurance policy in Malawi (Reeves, 2017 cited in Nesbitt-Ahmed, 2023, p. 26) observed that insurance schemes may not cover the types of crops cultivated by women, thus exacerbating their vulnerability if not designed with a gender lens.

Panda (2013) also found that while access to crop insurance had reduced use of rainwater and encouraged a shift to cotton cultivation, it had negative impacts in terms of income diversification and reliance on cultivation. Farmers with access to crop insurance were less likely to reduce their area under cultivation and less likely to diversify their income. Furthermore, 42.6 percent of insured farmers had made the switch from paddy to cotton for its higher profitability and lower water intensity. The author cautioned against perceiving the shift from paddy to cotton cultivation as a desirable adaptive activity because it was leading to monocropping and overspecialization in cotton (increasing risk of total crop failure and food insecurity), with concomitant loss of biodiversity in the region. Instead, he recommended that the insurance scheme should include drought-resistant varieties of paddy and millet that were grown previously in the region.

In summary, insurance can be viewed as a climate adaptation tool only if it is implemented with complementary measures that take a long-term perspective on risk management. For example, Hansen *et al.* (2019, cited by Tenzing, 2020 and Rana *et al.*, 2022) found that insurance helped smallholders adopt climate-resilient agricultural practices such as use of drought-resilient plant seeds in India and Bangladesh.

4.2. Diversification of livelihoods and income sources to reduce sensitivity to climate variability

There is some overlap between the social protection programmes reviewed here and in the previous section because such programmes often combine multiple elements addressing different barriers. This section highlights evidence of social protection programmes that successfully increased diversification of income sources, both on and off farm, and reduced exposure to climate-change risks. In some cases, the studies reviewed also found evidence of adopting climate-adaptive agricultural practices, and these are documented. Annex 2 provides a summary of the evidence reviewed.

Macours, Premand and Vakis (2012) assessed the impact on livelihood diversification of the *Atención a Crisis* programme in Nicaragua, which combined a conditional cash transfer (CCT) with complementary interventions (vocational training and a productive investment grant for non-agricultural self-employment activity). This was a one-year pilot implemented between November 2005 and December 2006 in six municipalities in northwest Nicaragua that had been affected by a drought in the previous year and had high poverty rates. The 3 000 households enrolled in the programme were selected at random and assignment of communities to a treatment and control group and eligibility of households within selected communities was determined via a proxy means test. Eligible households within the treatment group were randomly allocated to one of three “treatments”: basic CCT only; CCT with vocational training; and CCT with productive investment grant. The productive investment grant (USD 200) was aimed to facilitate income diversification by providing financial support and technical assistance to start a non-agricultural self-employment activity. The training intervention aimed to increase the households’ skill set for use either in a non-agricultural wage job or self-employment by providing sewing, carpentry and other such services.

Two years after the end of the intervention, no significant effects on consumption or average income were found for the CCT only or the CCT with vocational training treatment groups. However, households that received the CCT with productive investment grant had on average 8 percent higher consumption and 4 percent higher income than households in the control group at average levels of drought. They were also 13 percentage points more likely to engage in non-agricultural self-employment activities (such as small bakeries or corner stores, manufacturing cheese products or operating as roaming sellers of cloths). These households had higher average yearly profits from non-agricultural self-employment activities (603 Cordobas or about USD 30 higher) and higher values from sale or self-consumption of livestock products (222 Cordobas or about USD 10). However, there was no significant impact on participation in non-agricultural wage employment for any treatment groups except in the case of the group receiving CCT and vocational training when affected by weather shocks. The authors posit that, while the productive grant allows relaxation of capital constraints, the vocational training relaxes skills constraints, which increases wage work (probably through migration) at the time of shocks.

Kaur *et al.* (2019) documented evidence on both absorptive capacity (which is not the focus of this paper per se) and adaptive capacity of households participating in National Rural Employment Guarantee Scheme (NREGS) in India. They used mixed methods, combining qualitative data with a survey of 651 participating households across four states in India (Andhra Pradesh, Jharkhand, Odisha and Sikkim). Of the 651 households surveyed, 64 percent displayed resilience to the impacts of climate change by absorbing (34

percent) or adapting to climate stresses (26 percent) or in a few cases, transforming their livelihoods (4 percent). The paper emphasized the importance of context in the impact of NREGS across states and districts. For example, households in Mayurbhanj District in Odisha developed transformative resilience, which was credited to wages and access to drip irrigation from bore wells and farm ponds for rubber, mango and grass plantations constructed as part of the NREGS programme. Further, through support from the Odisha Livelihoods Mission, beneficiaries formed producer groups that were linked to the market through rubber, dairy and handicrafts companies, leading to an annual average income generation estimated at USD 420.

The *Haku Wiñay/Noa Jayatai* programme in Peru, which targets extremely poor rural communities and families, was formulated to help beneficiaries of the country's *Juntos* CCT programme to "graduate" out of poverty by providing capacity building in, for example, financial literacy and development of business plans, transfer of technology such as irrigation systems and application of good agricultural practices. In an evidence review of the programme, Rivera (2023) noted that households participating in both programmes increased use of organic fertilizer and overhead irrigation by 32 percent and 20 percent, respectively. Total income increased by almost 8 percent compared with the total income of families that received only *Juntos*, primarily driven by self-employment income from agricultural (crop and livestock) and non-agricultural activities (services, crafts, marketing) and a reduction in income from agricultural wages. The paper recommends adopting a territorial development approach that incorporates cultural, economic and environmental peculiarities of regions and accounts for any unintended effects such as soil contamination or degradation, overexploitation of aquifers, deforestation and biodiversity loss.

Weldegebriel and Prowse (2013) used propensity score matching to assess the impact of the PSNP on on-farm income, off-farm income (defined as temporary wage labour and income derived from natural resources such as firewood, charcoal and wild fruit) and non-farm income. Their findings indicated that receiving transfers from the PSNP did not, on average, lead to an increase in either on-farm or non-farm income. However, there was a significant rise in off-farm income, mainly through natural-resource extraction. The positive impact on off-farm income was in the range of 21.6 percent to 39.0 percent, with an increase of 33.6 percent to 43.7 percent in income derived from the sale of natural resources. This suggests that the PSNP may not be supporting diversification of income sources in a beneficial way for climate adaptation. Some caution is required in interpreting the results as the propensity score matching analysis did not account for critical assets such as landholding size and draft power (e.g. oxen), which play a crucial role in farm production.

Solorzano (2016) found that income from the CCT programme *Oportunidades* in two rural communities in Yucatan, Mexico, was used for household consumption because the transfer was too small to facilitate other investments, while grants from other programmes such as the *Fomento Agropecuario* were used to invest in new enterprises. Nevertheless, in some instances, *Oportunidades* helped move households from climate-sensitive work to non-climate-sensitive activities. For example, rural households diversified their incomes by migrating to nearby cities and working in the construction industry during erratic rainfall seasons, whereas those in coastal areas diversified their incomes by taking up off-farm activities such as working in tourism or as a plumber or other trades. However, the author questions the value of this diversification, and highlights the importance of macroeconomic policies that address high unemployment rates, informality and bad labour conditions. The paper identifies a trade-off between coping and

(mal)adaptive policies: while programmes like *Oportunidades* encourage the rural youth to seek off-farm formal and skilled work through its discourse and conditionalities of attending school, the local macroeconomic context and power dynamics are such that there are still few opportunities for employment either in and outside these rural communities. Meanwhile, the transition has eroded knowledge of traditional livelihoods and practices.

Some of the largest social protection programmes in the world are public food procurement programmes, which have the ability to generate income-earning opportunities by generating structured demand for specific food crops. For example, the Public Distribution System (PDS) in India provides subsidized food grains to over 800 million individuals (TCI, 2022) and school feeding programmes across the world reach about 418 million school children (WFP, 2022), making them the world's most extensive social safety nets. Through structured demand and a procurement process geared towards local smallholders, these programmes can incentivize production and generate or shift income sources towards certain food crops. Depending on the composition of the food baskets and procurement process adopted, the true cost and benefits of these programmes goes beyond procurement, distribution and consumption.

Within school feeding programmes, home-grown school feeding programmes utilize the strategy of public food procurement for procuring food from local smallholder farmers. This opens up the possibility of providing an alternate source of income for smallholders through a more favourable market channel which offers increased certainty regarding market access and the terms of exchange (FAO, 2018). There have been encouraging pilots of home-grown school feeding programmes that adopt climate-sensitive elements. For example, Borish, King and Dewey (2017) conducted a study of the Bwaliro Primary School Feeding and agroforestry programme in Busia County, Kenya. They found that the programme enabled participants to learn new farming techniques such as livestock rearing, planting vegetables and fruit trees. This, along with knowledge of new crops such as termite-resistant banana trees, had the added benefit of increasing supply of timber, firewood and fruit and promoting afforestation. Nearly half of the 64 participant households surveyed indicated that their income had increased and that they had personally benefited from agroforestry techniques learned through the school. Similarly, Bhalla (2023) documents how the Biodiversity for Food and Nutrition project, also implemented in Busia County, had promoted agroecological approaches to farming by encouraging the production of local food crops such as African leafy vegetables through the home-grown school feeding programme.

However, public food procurement programmes can sometimes generate hidden environmental costs. For example, TCI (2022) documents that in India the PDS basket primarily consists of rice and wheat and half of it is procured from two states, Punjab and Haryana. In 2019–2020, the PDS cost about USD 13.8 billion, but the hidden costs of producing rice and wheat for the PDS resulted in environmental costs amounting to USD 5.1 billion, primarily due to greenhouse gas emissions, increased water use and pollution stemming from burning crop residues and the two states bore the brunt of these environmental and health-related expenses. These costs can be substantially reduced if the composition of the food basket changes to include more nutritious items like pulses and millets and if a change is made to a more locally-sourced basket prioritizing local procurement. This shift in procurement would enhance livelihood opportunities in poor states while concurrently mitigating the detrimental effects associated with the intensive cultivation of rice and wheat in Punjab and Haryana.

4.3. Contribution to natural-resource management and ecosystem restoration

Natural-resource management and ecosystem-restoration practices serve a dual role: they enhance resilience against climate impacts while also sequestering carbon and reducing greenhouse gas emissions, thus serving both adaptation and mitigation goals simultaneously. This section focuses on the impact of social protection instruments in bolstering climate-adaptation capacity through natural-resource management and ecosystem restoration. Evidence is concentrated around public employment programmes and predominantly clustered around two programmes – the Mahatma Gandhi NREGS in India and the PSNP in Ethiopia.

Public employment programmes have been typified as “double dividend” programmes since they serve to both provide a guaranteed wage to address poverty and promote construction of green community infrastructure and integrated catchment management approaches for resource management (Gyori, Diekmann and Kühne, 2021). The evidence reviewed in this section is also presented in a tabular format in Annex 3 for ease of reference.

Fischer (2019) utilized primary data from 1 400 households, 798 projects and qualitative fieldwork to analyse the impact of NREGS on climate risk reduction in Kangra district in Himachal Pradesh, India. The theoretical premise is that small-scale natural-resource focused projects such as micro-irrigation, check dams, water recharge pits, retention walls, drainage canals and wells, which are included in the list of permissible works under the programme, help to address climate risks and make livelihoods more secure and resilient. The study area included two blocks within which 40 villages per block were selected purposefully to include a diversity of demographic characteristics, such as village size, caste and ethnicity. Forty households were randomly selected within each village. Ninety percent of the households surveyed self-reported having benefited from at least one asset that was constructed as part of the programme and two-thirds reported that they had benefited from two or more assets. These assets spanned both rural connectivity (small roads, concrete village paths, small bridges) and water management. Between 2007 and 2012, 251 out of the 798 projects included focused directly on water management, including work on building or restoring canals and building rainwater storage tanks and check dams. Evidence drawn from focus-group discussions revealed that 79 percent of the water projects improved water availability for irrigation, drinking, livestock or domestic use. However, as reported through focus-group discussions, 3.6 percent of the water-related projects either reduced water availability or increased flooding, possibly due to poor design or implementation.

Importantly, from an inclusivity perspective, benefits tended to flow more towards historically marginalized and poorer sections of society, i.e. groups that are more likely to face increased climate risks. This was partly a result of programme design, since only households with no market labour option are likely to register for NREGS given that the NREGS wage rate is lower than the market wage rate. The author conjectures this may be because small-scale communal assets are less relevant to wealthier households but also notes that access to benefits from these projects is not automatic as access to assets created by the programme is channelled through civic institutions, i.e. households belonging to a larger number of civic institutions such as women’s groups, benefited more from the programme. The incorporation of community-based planning or formalization of local-level decision-making in the design of NREGS has been

identified as a strength of the programme (Adam, 2015; Fischer, 2019; Norton *et al.*, 2020) because it enhances citizen engagement in addressing local challenges and utilizes local knowledge and experiences to create more-effective and context-appropriate climate interventions. Theoretically, this would make the programme inherently inclusive and strengthen local institutions provided there is no elite capture of these community-based organizations.

Adam (2015) critically evaluated NREGS as a mainstreamed adaptation⁷ strategy and identified the strengths of the programme as including institutional capacity building by handing decision-making powers to local actors and institutions; blended ecosystem services with livelihood generation, as indicated by water conservation projects that include flood protection and drought proofing (48 percent of total), provision of irrigation facilities to targeted vulnerable groups (18 percent), rural connectivity (18 percent) and land development works (14 percent); linkages to financial connectivity through wage payments and opening of bank accounts; and inclusivity as evinced by 40 percent of the participants belonging to Scheduled Castes and Tribes and 40 percent of participants being women in 2010–2011. However, the benefits are not adequate, and questions remain around the sustainability and utility of the assets created. The most important critique of the programme that potentially prevents it from achieving its basic goal of social protection is that of delays in wage payments.

In a comprehensive analysis of NREGS in four districts (using a sample of ten villages in each district) in four states of India, Esteves *et al.* (2013) found that approximately 80 percent of the works were associated with natural resources such as water, land, cropland and wasteland. The assessment of works was conducted using two methods: a survey of selected NREGS beneficiaries, where they were asked to compare the current scenario (during 2011–2012) with the average scenario before the implementation of NREGS (around 2006–2007), and biophysical measurements of various indicators such as soil organic carbon, soil erosion, groundwater level and biomass where NREGS had been implemented. These measurements were compared with the conditions before NREGS implementation or with control plots that did not undergo any works. Significant impacts on water resources, land resources, crop production systems and forests were observed. These can be summarized as follows:

- Impact on water resources: Works such as check dams, percolation tanks and desilting of tanks can have a positive impact on groundwater levels and area under irrigation. Despite continued extraction, groundwater levels either increased or remained stable. Based on recall, the survey of beneficiaries indicated that area irrigated using groundwater sources had increased in 30 out of the 40 study villages and the average increase in irrigated area at the village level was in the range of 0.2 to 57 hectares.
- Impact on drinking water availability: Survey respondents reported that water-harvesting structures, including the construction of dedicated cattle ponds or troughs, had increased drinking water availability for both humans and livestock.

⁷ Mainstreamed adaptation is defined as “the integration of climate concerns and adaptation responses into policies, plans, programmes, and projects at the subnational and local scales” (Adam, 2015, p. 143).

- Impacts on land resources: Land development works improved soil fertility, as indicated by an increase in soil organic carbon content in 72 percent of the beneficiary sample plots. Soil erosion was reduced on 82 percent of the beneficiary sample plots through the construction of check dams and bunding.
- Impacts on crop production systems: There was an increase in total area under cultivation in all four districts due to the land development and waterworks. In three districts, previously uncultivable land was brought under cultivation, and in one district the water conservation and harvesting works made it possible to cultivate in the rabi season. On average, beneficiaries in 32 out of the 40 study villages reported an increase in crop yields. Crop yields were reported to have increased across all crops, with notable yield increases in rainfed crops such as cereals, minor millets and pulses.
- Impacts on forests, plantations and fruit orchards: Afforestation, reforestation and horticulture-development activities under NREGS led to the planting of forest and fruit-yielding tree species in 31 out of 40 study villages. These tree plantations have the potential to provide fodder, fuelwood, non-timber forest products, fruits, flowers and nuts, diversifying livelihoods and reducing vulnerability to climate risks.
- Potential impacts on carbon sequestration: NREGS works contributed to increased soil organic carbon content in 72 percent of the beneficiary sample plots, indicating potential carbon sequestration in the soil.

Norton *et al.* (2020) reviewed programme documentation and evidence in their opinion piece on NREGS, PSNP and the Temporary Employment Programme (PET) in Mexico, and concluded that utilizing public employment programmes for both poverty reduction and ecological stewardship is possible through careful selection and technical support to nature-based public-work projects such as watershed management, soil conservation and land rehabilitation, and the construction of community assets such as grain silos and local roads, which strengthen the income-earning capacity of the rural poor. However, they highlighted two main challenges that need to be addressed: the need for maintenance of the assets created under these programmes and balancing multiple objectives simultaneously. From the perspective of climate change and economic inclusion, another challenge noted is that public works tend to focus on small-scale infrastructure such as roads, sheds and clinics rather than environmental assets. One reason for this is the lack of technical inputs and capital such as skilled labour and equipment relative to the abundance of unskilled labour. This is attributable to the lack of complementarity and coherence between social-welfare ministries and ministries responsible for agriculture and allied sectors.

“At the institutional level, social welfare ministries often charged with running social-assistance programmes are generally not equipped with the technical expertise necessary to identify appropriate projects with environmental goals. ... There may also be significant trade-offs between social and environmental goals. If, for example, the poverty reduction goal is to provide work and income in the dry season in an agricultural area with a unimodal rainfall pattern (when there is a surplus of unused labour), that may not allow support to be provided to certain kinds of activities essential to the stewardship of the local ecosystem that might be best carried out either in, or shortly after, the rainy season” (Norton *et al.*, 2020, p. 8).

In Uganda, between 2016 and 2021 the Third Northern Uganda Social Action Fund (NUSAF3) supported 2.9 million people and its labour-intensive public-works component built 3 459 community assets, which included embankments, roads, irrigation canals and nurse beds and afforestation (Makerere University Business School, 2021). The livelihood support component was designed to provide skills development training, livelihood grants and mentoring support. The programme fostered community institutions through the creation of village revolving funds accessible to self-help groups and by employing a community-driven development approach for the selection of public works. The evaluation found that tree planting, water management and soil erosion control activities in Budaka and Manafwa districts had increased green cover and reduced soil erosion and environmental pollution.

Another category of social protection programmes that have impacts on natural resources and ecosystems is environmental cash transfers where the transfer of cash is conditional on adopting environmentally sustainable practices or made in exchange for compliance with regulations that prevent access to ecosystem resources for certain time periods to allow their replenishment. In the fisheries sector, for example, closed fishing seasons can achieve multiple objectives of providing social protection, facilitating economic inclusion and supporting adaptive capacities when well designed and implemented. Implementing a closed season can be a component of a climate-adaptive strategy as it helps contribute to maintaining healthy and resilient fish stocks in the face of changing climate conditions. A closed season in fisheries is a specific period when fishing for certain species is restricted or banned in a designated area to protect fish populations during critical life phases, such as breeding or spawning, allowing them to replenish to ensure sustainability. To make closed seasons viable, they are accompanied by payments in cash or kind to poor fisherfolk who have no alternative sources of livelihood.

Altenburg *et al.* (2017) studied two environmental cash for work (ECfW) programmes in the Philippines. One compensated fishers for lost income during the closed season in Balayan Bay while the other restored mangrove forests in the Southwestern Tagalog Region.

The review of the closed-season ECfW used focus-group discussions and interviews with fishery experts, commercial vessel crews and owners/captains and municipal fisherfolk, covering 83 respondents. The study found that, during the 2014 closed season, the ECfW provided economic relief to fisherfolk who had no alternative livelihood while allowing the fishing stock to grow during the use-restricted period. For the assessment of the mangrove-reforestation ECfW, the authors conducted 42 semi-structured individual interviews and four focus-group discussions across four barangays (city districts/villages) in which at least 62 percent of the population were living below the poverty threshold. Different targeting and payment methods were used in each barangay. The study found that ECfW payments were usually necessary because poor families were not in a position to undertake voluntary planting activities without compensation. However, since participants were primarily motivated by monetary compensation this may lead to adverse incentives such as prioritizing quantity over the survival rate of planted mangroves. To reign in these adverse incentives, the study recommended combining a community forest management approach with ECfW to support mangrove restoration and create alternative livelihoods, for example by investing in aquasilviculture.

Bangladesh, in particular, has a long history of using environmental cash transfers to incentivize sustainable fisheries management, starting with the Payment for Hilsa conservation project in the early 2000s.

Significant declines in catches of hilsa fish (*Tenualosa ilisha*) had led to the declaration of five sites as hilsa sanctuaries, where fishing was restricted during the breeding season. As documented by Mohammed and Wahab (2013), in 2010–11 about 187 000 households were provided compensation for loss of earnings in the form of 30 kilograms of rice per household per month and provision of support services (cash and training) for generating alternative income-generating activities for fishermen and women. Individual households were paid about BDT 6 000 (USD 77) to BDT 10 000 (USD 128), depending on the number of household members and their degree of vulnerability. Although the study presented no micro-level data, the analysis of macrodata suggested that the intervention helped increase hilsa production and catch while at the same time halting and reversing the decline of the hilsa population and increasing incomes of fishers' household. For example, eight times as many eggs and *jatka* (juvenile hilsa less than 23 cm in length) were recorded in 2011 as in 2007–2008 (Rahman *et al.* 2012, as cited in Mohammed and Wahab, 2013, p. 24), resulting in an increase in hilsa catch of about 42 000 tonnes in 2010-2011 (FRSS, 2012, as cited in Mohammed and Wahab, 2013, p. 25), worth about USD 27.3 million per year. The attribution of ecological impacts to the closed season is not based on counterfactual evidence and therefore the authors advise caution on their interpretation. Moreover, they recommend focusing on the financial sustainability of such schemes, particularly in terms of implications of what happens when funding ends. To address this, they recommend establishing a conservation trust fund, financed by earmarking export taxes or instituting payments by those who use the ecosystem. However, the latter can only be instituted once the fisher community has “graduated” and has the ability to make these payments. It also must be done in a participatory process wherein the fisher community is empowered to make these decisions for themselves and ensure compliance and their preferences for both compensation and payment packages are taken into account.

Béné and Haque (2021) conducted an impact evaluation of the Enhanced Coastal Fisheries or ECOFISH project in Bangladesh which was implemented for five years between 2014 and 2019. This project also implemented bans on hilsa fishing as well as compensating fishers for the loss of income and food caused by the ban. It also aimed to enable households to engage in alternative livelihood options by providing productive assets, skills training specific to those assets, business literacy training, access to microfinance for women and access to soft loans to prevent non-formal predatory lending. While the authors found that ECOFISH interventions did not decrease the likelihood of households resorting to negative coping strategies, especially when faced with serious illness or loss of assets, it did increase likelihood of engaging in adaptive activities such as preparedness plans (store water and food in advance, strengthen housing roofing structure), alternative livelihood activities (non-fishing activities, investment in small livestock, home gardening) and collective work to reinforce the embankment prior to the flood season.

5. Climate mitigation

5.1. Contribution to reduction in green house gas emissions

Social protection programmes have been shown to contribute to climate mitigation. This section presents evidence on the contribution of social protection programmes to GHG reduction, including some of the same programmes that have been covered in the previous sections. Annex 4 provides a summary of these studies.

Hirvonen *et al.* (2022) found that the PSNP's public works component increased tree cover by 3.8 percent between 2005 and 2019. The increase was higher in less-densely-populated areas and on steep-sloped terrain. The study covered an area of 34.5 million hectares across multiple agroecological zones located in four highland regions (Amhara; Oromia; Southern Nations, Nationalities and Peoples' Region [South Ethiopia Regional State since 2023]; and Tigray).

Given that land degradation and deforestation are major environmental problems, this suggests an important role for public works programmes in carbon sequestration and climate mitigation. In addition, there is potentially an adaptation gain since, as the authors note, trees reduce soil erosion, enhance water supply stability, improve soil fertility and stimulate precipitation. The authors estimate that the annual reduction in CO₂ emissions from the increased tree cover are equivalent to 4.16 million Mg of CO₂ equivalents per year, which contributes about 1.5 percent of the annual emissions reduction pledged by 2030 by Ethiopia in its Nationally Determined Contribution (NDC) for the Paris Agreement.

This is in the same range and magnitude found by Woolf, Solomon and Lehmann (2018), who estimated that the PSNP contributed to capturing on average 5.7 Mg of CO₂ per hectare per year at its project sites using different methods. This aggregated to a total reduction in net GHG emissions from PSNP's land management at the national scale at an estimated 3.4 million Mg of CO₂ equivalents per year. Further, Hirvonen *et al.* (2022) estimated that this contribution in itself could offset up to 49 percent of the administrative costs of the programme in the long run if the increase in tree cover is preserved. The authors recommended that these benefits be incorporated in the cost-benefit analysis when deciding which programmes to invest in.

In India, the potential of carbon sequestration achieved by the Mahatma Gandhi NREGS has been studied by Ravindranath and Murthy (2021). The NDC target for India is to create an additional carbon sink of 2.5 to 3.0 billion tonnes of CO₂ through additional forest and tree cover by 2030. Of all the activities covered under NREGS that promote carbon sequestration, only drought proofing, which entails tree planting, can contribute to the carbon sink targets outlined in the NDC. However, NREGS carbon sequestration co-benefits go beyond tree planting. Including all natural-resource-based activities under this programme that provide adaptation benefits, such as land development, water conservation and harvesting and micro-irrigation, gave an estimate of 102 MtCO₂ total mean carbon sequestered at the national level in 2017–2018, and this is projected to increase to about 249 MtCO₂ by 2030. This is despite accounting for negative carbon sequestration rates as carbon is released from the soils as a result of some activities.

There is evidence too of both conditional and unconditional cash-transfer programmes on environmental aspects, including reduction in deforestation. The *Bolsa Verde* programme in Brazil, for example, provides top-up cash payments to beneficiaries of the national social cash-transfer programme *Bolsa Familia* who reside in an eligible priority rural area in exchange for complying with environmental conservation requirement of maintaining forest cover of 80 percent. If the forested area falls below that threshold, households residing within it have their benefit suspended. Wong *et al.* (2023) estimated that deforestation is 22 percent lower inside areas benefiting from *Bolsa Verde* compared with similar areas that are not participating in the programme. They estimate that the programme pays for itself in that the value of benefits from CO₂ reductions were estimated at USD 415 million between 2011 and 2015, which was approximately four times the cost of the programme. However, this estimate took into account only the quarterly cash payment to beneficiaries and not total administrative costs, so the return on investment is lower than this but still positive.

The *Bolsa Floresta*⁸ programme in Brazil combines conditional payments and livelihood-focused investments to conserve forests in 15 protected areas of the Brazilian state of Amazonas. Cisneros *et al.* (2022) found that the programme decreased yearly forest losses by about 10 percent on average within the protected areas between 2008 and 2015. In absolute terms, the effects translate to 856 hectares of avoided deforestation. The effects gradually increased in post-treatment years (2008–2015) and were higher in locations close to the treated communities and where there is relatively more pressure on forests. The authors note that higher impacts and higher cost-effectiveness could have been observed if the programme had been targeted to areas with higher deforestation pressure and if compliance had been more effectively monitored. Moreover, a programme such as the *Bolsa Floresta* has other impacts apart from decreasing deforestation, such as stronger community institutions and improved social and welfare outcomes due to emphasis on health, education, transportation and livelihoods.

Ferraro and Simorangkir (2020) estimated that the national cash-transfer programme in Indonesia, *Keluarga Harapan*, reduced tree cover loss by an average of 30 percent (hectares/year/village) in rural villages exposed to the programme between 2008 and 2012. Gyori, Diekmann and Kühne (2021) noted that providing monetary incentives can have a detrimental impact on the intrinsic motivation of people to behave in a sustainable manner. While the current review did not reveal evidence of this, there is empirical evidence that cash transfers may inadvertently contribute to deforestation or overfishing due to increased economic activity (Gilliland, Sanchirico and Taylor, 2019) and an increase in consumption (Malerba, 2020). This therefore implies that, without specifically reinforcing environmental objectives within programme design, cash transfers can have dual impacts: they may lead to increased deforestation or decline in fish stocks but may also contribute to global mitigation goals by discouraging deforestation or overfishing

⁸ Both *Bolsa Verde* and *Bolsa Floresta* are targeted to *Bolsa Familia* beneficiaries and to those residing in conservation areas. *Bolsa Verde*, however, also includes residents of agrarian reform settlements. *Bolsa Verde* provides for quarterly payments for two years (BRL 1 200 or about USD 717 per year), renewable for another two. *Bolsa Floresta* payments on the other hand last indefinitely. *Bolsa Floresta* establishes an annual payment totalling BRL 1 360 or about USD 777 per family per year, divided into four components. The first (*Bolsa Floresta Familiar*) includes direct monthly payments to the woman representing each family. The second (*Bolsa Floresta Renda/BFP Income*), provides transfers aimed at generating alternative sustainable income (production of Brazil nuts, *pirarucu*, *açaí*, tourism, etc.). The third (*Bolsa Floresta Social*; also about 25 percent of total) is focused on social investments, such as support for community infrastructure, education and health. The fourth component (*Bolsa Floresta Association*) is for investments in strengthening community-based organizations, such as offices and local mobility of leaders (Cisneros *et al.*, 2022; Foundation for Amazon Sustainability, 2021).

through the provision of alternative income sources, wherein market-purchased goods substitute for those derived from deforestation or overfishing (Ferraro and Simorangkir, 2020).

In an evaluation of the *Familias en Acción* programme in Colombia, Malerba (2020) found evidence of an increase in consumption of land- and energy-intensive goods (specifically beef and refrigerators) at the household level and that the increase in beef consumption may have increased deforestation by 8 percent. However, this impact is not detected at the municipality level as municipalities enrolled in the programme have experienced less deforestation than those not registered by approximately 0.5 percent. This may be because the impact of increased beef consumption is having an ecological footprint in a different geographical area.

5.2. Promoting climate mitigation: managing transitions and facilitating a just transition

Social protection instruments have an essential role to play in managing the transition to a green economy and in ensuring that this transition is fair and equitable (Gyori, Diekmann and Kühne, 2021; Malerba, 2021; Costella *et al.*, 2021; Mukherjee *et al.*, 2023).

Removing or reducing fossil fuel subsidies to reduce GHG emissions has been discussed as a key climate-mitigation strategy. In general, consumption subsidies are regressive as their benefits are disproportionately captured by the relative better-off since their consumption levels are relatively higher. However, a reduction in these subsidies is manifested in an increase in the cost of food and other basic goods, which has a disproportionate impact on low-income households as these commodities form a greater share of their household expenditure. Cash transfers can play an important role in mitigating the impact of these price increases.

Mukherjee *et al.* (2023) conducted a global stocktaking on cash transfers and energy subsidy reform and identified 24 reform episodes that incorporated social protection measures alongside energy subsidy reforms. These spanned 18 countries⁹ from the mid-1990s to 2016. More than half of these episodes consisted of new cash-transfer programmes, while others either expanded or scaled up existing programmes. Most reform episodes were instigated by macrofiscal crises as these subsidies exert significant burden on the public exchequer. Therefore, fiscal savings is the main objective, and the idea is that targeted cash transfers can lead to net fiscal savings. Policymakers must strike a balance: greater coverage and a more generous cash transfer will deliver lower fiscal savings but acceptance of the reform from a political economy point of view will be greater.

Some of the key lessons learned from the review included the importance of establishing social protection mechanisms before the reforms are initiated, a clear and targeted communication campaign and streamlined and fully operational registration and delivery systems and processes, building trust among all stakeholders by increasing transparency and complementing the cash transfer with other measures to build resilience to shocks. Eligibility criteria were the biggest challenge in most countries, together with the

⁹ Armenia (1), Brazil (1), Dominican Republic (1), Ghana (2), India (1), Indonesia (3), Islamic Republic of Iran (1), Jordan (2), Kenya (1), Malaysia (1), Mauritania (2), Morocco (1), Nigeria (1), the Philippines (1), Syrian Arab Republic (1), Tunisia (1), Ukraine (2) and Yemen (1).

danger of exclusion errors. While the report determined that most of the reform episodes led to net fiscal savings, it did not address the welfare impact on people. The authors highlighted the Dominican Republic as a successful case example: over the course of nearly two decades, subsidies for liquid petroleum gas and electricity were redirected to targeted cash transfers covering 40 percent of all households in the country. The government used the existing *Solidaridad* CCT programme to target energy transfers to vulnerable households and used it as a platform to gradually integrate two energy-sector-specific programmes – *Bonogas* and *Bonoluz*.

Mitigation policies such as phasing out of coal or banning activities in protected areas such as fisheries or forests also lead to job losses and create income insecurity. In the case of the latter, CCT programmes can compensate for income losses, as discussed section 4.3. Bagolle, Costella and Goyenoche (2023) provide additional examples where, in addition to cash transfers, other social protection mechanisms were used to offset job losses. In Romania, where a coal mine was closed, cash transfers were combined with job incentives, job training and microcredit programmes to create over 13 000 jobs and almost half of those in affected in the community affected were able to find alternative employment (Rigolini, 2021, as cited in Bagolle, Costella and Goyenoche, 2023, p. 22). In China, approximately one million public forestry workers and 120 million rural households were affected by a forest conservation programme. To mitigate these impacts, public employees received assistance, such as job placement services, unemployment benefits and pension plans. As a result, two-thirds of the affected employees were either transferred to alternative jobs or retired and 124 million households benefited from a CCT and consumption subsidy (AFD and ILO, 2019, as cited in Bagolle, Costella and Goyenoche, 2023, p. 22).

While the green transition entails job losses in certain sectors, the magnitude of job losses can be dwarfed by the number of new jobs that can be created in the green economy. A report by the International Labour Organization, the UN Environment Programme and the International Union for Conservation of Nature (2022) estimates that an additional 20 million jobs could be generated worldwide if investment in nature-based solutions¹⁰ were tripled by 2030, most of them in rural areas. The report emphasizes the importance of managing the transition through job placement services, retraining, early retirement, access to unemployment benefits and the use of public employment programmes or public works and payment for ecosystem services.

¹⁰ Nature-based solutions are defined as “actions to protect, conserve, restore, sustainably use and manage natural or modified terrestrial, freshwater, coastal and marine ecosystems, which address social, economic and environmental challenges effectively and adaptively, while simultaneously providing human well-being, ecosystem services and resilience and biodiversity benefits” (ILO, UNEP and IUCN, 2023, p. 17).

6. Conclusion

This paper reviewed the available evidence on the role of social protection programmes in facilitating climate-change adaptation and mitigation, with a specific emphasis on fostering economic inclusion of small-scale producers dependent on agriculture and natural resources for their livelihoods. Drawing on existing literature, the paper drew a distinction between generic and specific adaptive capacity, wherein generic adaptive capacity refers to improvement in education, health, food security and nutrition, and income security, while specific adaptive capacity refers to specific tools and skills that are required to respond to climatic threats. While investing in both types of capacity simultaneously is essential, and the role of social protection in building generic adaptive capacity is instrumental (as has already been documented in existing literature reviews), this paper focuses on the evidence for social protection programmes increasing specific adaptive capacity that enables mid- to long-term economic inclusion. It also analyses evidence on the contribution of different social protection instruments to climate mitigation through a reduction in GHG emissions and by absorbing the impact of climate-mitigation policies such as removal of fossil fuel and fertilizer subsidies and reorientation of economies to green energy.

Table 3 summarizes the results of the evidence review with respect to the outcome categories.

There is evidence across multiple types of social protection programmes of facilitation of adoption of climate-adaptive agricultural practices and technology, but there is a need to generate more evidence as the results are sometimes ambiguous (with certain types of adaptive practices increasing among participants and others among non-participants). Importantly, evidence on the link to a sustainable increase in income by virtue of adoption of these practices is still absent. Moreover, the review found that social protection programmes need to explicitly incorporate specific elements that address climate change to help ensure that they reach climate-related objectives, otherwise the climate impacts will be minimal. These elements may take various forms, such as providing access to critical assets, services and training necessary for transitioning to more adaptive livelihoods. Related to this, further investigation is required for finding the binding constraint for take-up of climate-adaptive practices, which significantly influences the design and implementation of social protection programming. The binding constraints may vary according to context, geography and climate hazards, necessitating tailored strategies for adaptive practices.

The evidence is very sparse on diversification of income sources and livelihood to those that are less climate sensitive. One reason for lack of evidence is the lack of programmes that operate at scale in this technical space in rural areas in developing countries. This is expected to change as the agenda on just transition gains momentum and there is increased programming on the creation and scaling of programmes that seek to create sustainable (not ad hoc and casual) non-farm and off-farm employment opportunities. Historically, participation of women in such opportunities is low and therefore it will be important to adopt gender-sensitive and gender-transformative measures to ensure that gender inequalities do not increase. Equally important is incorporating the care economy within the just transition because climate-change events have increased the burden of care work largely undertaken by women and girls and worsened their time poverty (for example, in having to travel longer distances for water collection), which in turn has

hindered their educational and employment opportunities and adversely impacted their health and nutrition (Nesbitt-Ahmed, 2023).

Encouraging evidence is available on the role of social protection in natural-resource management and ecosystem restoration, such as in the case of NREGS in India, PSNP in Ethiopia and specific environmental cash-transfer programmes in the Philippines and Bangladesh. However, the studies reviewed also shed light on some of the drawbacks holding these programmes back, such as the need for appropriate selection of public works, ensuring the sustainability and utility of the public assets constructed and the need for complementary interventions to mitigate any unintended effects such as lower on-farm labour input and decreased agrobiodiversity at farm level or inadvertently encouraging monocropping or overexploitation of natural resources.

An important insight of the review is the role that community institutions play as part of a climate-adaptive strategy. Strong community institutions can facilitate build-up of local capacity required for implementing adaptation measures; empower local actors to have access and entitlement to assets that help them to improve their adaptive capacity; and facilitate collaborative decision-making and information sharing, which can bring to bear a variety of traditional and Indigenous perspectives and solutions. An important consideration that has not been covered by the evidence captured in this review is the critical role Indigenous Peoples have played in safeguarding ecosystems. It is imperative that the principle of self-determined development, requiring full collaboration with Indigenous communities, is adhered to in the design and implementation of social protection programmes (FAO, 2021).

Table 3. Evidence on the link between social protection and climate adaptation and mitigation

		Amount of Evidence		
		Limited	Medium	High
L e v e l o f A g r e e m e n t	High	Diversification to less climate sensitive income sources: <ul style="list-style-type: none"> • More evidence required for all types of programmes including cash transfers, public food procurement, and active labour market programmes • No impact on formal wage employment 		Natural resource management and ecosystem restoration: <ul style="list-style-type: none"> • Positive evidence on water & land management & conservation with potentially positive impacts on livelihoods • Evidence centered on only two programmes - NREGS and PSNP Climate mitigation: <ul style="list-style-type: none"> • Increased forest cover (NREGS, PNSP, Bolsa Verde, Bolsa Floresta)
	Medium	Climate mitigation: <ul style="list-style-type: none"> • Cash transfers help cushion the impact of removal of fuel and fertilizer subsidies 	Climate mitigation: <ul style="list-style-type: none"> • Cash transfers can lead to increased deforestation through increased land & energy consumption 	
	Low		Climate-adaptive agricultural practices (Public Works, Cash, Cash+, Food aid): <ul style="list-style-type: none"> • Marginal increases in some (not all) adaptive practices and link to productivity/income unclear • Evidence of non-participants increasing some kinds of adaptive practices compared to participants • Complementary measures required 	

Source: Author's elaboration.

Incorporating comprehensive cost-benefit analysis into the design and evaluation of social protection programmes is essential. Such analysis should factor in broader impacts, including climate-mitigation benefits and potential unintended consequences. The review highlights that mitigation benefits of social protection programmes can be significant, and harnessing these co-benefits not only bolsters the case for social protection but also advances broader climate goals. For example, annual reduction in CO₂ emissions from the increased tree cover due to the PSNP is estimated to be equivalent to 1.5 percent of the annual emissions reduction pledged by 2030 by Ethiopia in its NDC for the Paris Agreement. Carbon sequestration benefits due to additional forest and tree coverage are also found for NREGS in India, the *Bolsa Floresta* and *Bolsa Verde* programmes in Brazil, and the national cash-transfer programme in Indonesia, *Keluarga Harapan*.

At the same time, the cost-benefit analysis should also incorporate unintended consequences and maladaptations. For instance, shift from paddy to cotton cultivation in India, driven by access to crop insurance, raises concerns about monocropping and biodiversity loss. Maladaptation or unintended effects can also take the form of increased reliance on unsustainable practices and livelihoods or increased exploitation of natural resources. This highlights the importance of carefully crafting programme components to avoid inadvertently exacerbating vulnerabilities and incorporating co-benefits generated through the programme to help identify the true value of these programmes and guide policymakers in making informed decisions.

These findings underline the importance of adopting a systems approach. The livelihoods of marginalized communities are inherently climate sensitive. While social protection programmes can foster economic inclusion by bolstering their capacity to adopt climate-resilient livelihoods, they do not automatically translate into enhanced adaptive capacity (Agrawal *et al.*, 2020). To achieve this, it is important to link social protection programmes, climate action programmes and livelihood programmes. Macroeconomic labour and trade policies are essential in creating non-farm opportunities, without which diversification of livelihoods is hindered. In addition, it is crucial to address power imbalances and structural inequalities, including access to productive resources such as land, water and technology, access to essential services such as roads and markets and the availability of decent work opportunities. Solorzano (2016, p. 35) cautions that, without an inclusive systems approach, “diversification can lead to the atomization of livelihoods into small activities with very low productivity.”

In their study on how to make cash-plus interventions work, Roelen *et al.* (2017) focus primarily on linking cash-transfer programmes with nutrition and productivity-enhancing services. Many of the lessons captured in their study also apply to linking these programmes with climate adaptation and mitigation. The authors highlight key success factors, which include better coordination between the different implementing agencies and high-level political commitment. Better coordination takes the form of formal agreements, delineating roles and responsibilities of each of the implementing institutions, case management to ensure establishment of linkages across sectors, and adequate resources to match the greater ambition of achieving multiple objectives. In addition to a systems approach, the strengthening of social protection systems themselves, at the national and subnational levels, plays an important role in the coordination of various programmes and policies to ensure seamless delivery of multiple services. An example of this is the integration of social and farmer registries, which streamline targeting and efficient allocation of benefits.

Lastly, social protection also has an important role to play in increasing the political and ethical feasibility of implementing a just transition by mitigating the adverse impacts of carbon mitigation policies such as removal of fossil fuel subsidies and restructuring of economies towards greener sectors and practices.

Despite the insights gained from this evidence review, the study has certain limitations. First, we acknowledge the weakness of using only Google Scholar as the search engine as it does not use transparent algorithms for how it identifies and sorts results and has been shown to provide results that are not precise, transparent, or reproducible (Gusenbauer and Haddaway, 2020). However, we used multiple search strings within Google Scholar and complemented it by using the snowball approach, wherein subsequent relevant papers were identified through the reference lists of the initial studies found and by including relevant papers the authors were made aware of subsequent to the Google search.

Second, the papers reviewed did not uncover gender-specific dimensions to take into consideration when understanding how social protection programmes are able to facilitate climate action. A more in-depth analysis of gender-differentiated vulnerabilities is warranted to provide a more comprehensive understanding of how social protection can address gender-specific needs and how gender dynamics influence climate resilience. For example, we know that women often face exclusion in public employment programmes because of the physical nature of the work required or because of competing claims on their time due to their caregiving role. This necessitates gender-responsive measures that encourage women's participation, such as crèche services for child care and quotas implemented with explicit consideration of their time constraints. Further research is essential to explore the intersectionality of social protection, climate change and gender, emphasizing the design and implementation features of programmes (Nesbitt-Ahmed, 2023).

Finally, there is a need for more detailed exploration of the specific features of social protection programmes and systems (for e.g. interoperable registries, access to climate information services, linkages with other relevant sectors such as agriculture, labour, forestry, fisheries) that make some more effective than others, and to understand what conditions and which climate hazards influence their effectiveness. Specialized knowledge and evidence must be generated within sectors such as fisheries, forestry and pastoralism, and tailored to specific population groups such as migrants and Indigenous communities, to identify effective design features in employing social protection for building climate-change resilience. These limitations highlight areas for further exploration and research in this multidisciplinary field.

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7. Appendices

Appendix 1. Summary of findings: Facilitating the adoption of climate adaptive agricultural practices

Name of programme	Name of study and countries covered	Methodology	Positive	Negative
Malawi Social Action Fund (MASAF)	Scognamillo and Sitko (2021) – Malawi	Quantitative analysis – Multivariate probit and two-way fixed-effects model	MASAF increases the probability of adopting soil and water conservation structures and organic fertilizer application by 0.673 and 0.371 percentage points, respectively, the year in which the household receives cash for work. The effects are sustained for two consecutive years.	Climate-smart agricultural practices had heterogeneous results on productivity.
Non-contributory in-kind food aid	Sitko, Scognamillo and Malevolti (2021) – Ethiopia and Malawi	Quantitative – bivariate and mixed recursive models	Food aid increased the probability of beneficiaries investing in soil and water conservation (2.1 percentage points in Ethiopia and 1.7 percentage points in Malawi).	Reduces the adoption of legume intercropping by 3.8 and 4.0 percentage points in Ethiopia and Malawi, and the adoption of organic fertilizers in Ethiopia (2.4 percentage points).
Livelihood Empowerment Against Poverty (LEAP)	Yiridomoh <i>et al.</i> (2021) – Ghana	Quantitative survey	91% of respondents reported that they used LEAP transfer to manage climate-change risk. Of these, 29% used cash for farm intensification activities such as to purchasing fertilizer to increase crop yield and 33% invested LEAP grants in buying early-maturing crop varieties.	
Productive Safety Nets Programme (PSNP) + Other Food Security Programmes (OFSP)	Gilligan, Hoddinott and Taffesse (2009) – Ethiopia (Tigray, Amhara, Oromiya and SNNPR)	Impact evaluation – propensity score matching	Impact estimate of 4.8-percentage-points increase in the use of improved seeds and 10.7-percentage-points increase in the use of fertilizers.	PSNP alone did not have impacts due to low transfer value.
PSNP	Scognamillo, Mastrotillo and Ignaciuk (2022)	Impact evaluation – Instrumental variables technique	PSNP beneficiaries are less likely to experience crop losses (23% less) and complete crop failure (48% less) in the aftermath of droughts. Community peers are also 28 percent less likely to experience harvest losses in case of extreme dry events. Authors attribute this to skills and knowledge of risk-management strategies related to droughts that was transferred as part of the programme.	

Name of programme	Name of study and countries covered	Methodology	Positive	Negative
PSNP	Adimassu and Kessler (2015)	Impact evaluation – propensity score matching	PSNP participants invested more in soil fertility management practices such as inorganic fertilizers (mean difference estimates ranged from 9 to 17 kg), compost (mean difference estimates ranged from 295 to 430 kg) and farmyard manure (mean difference estimate ranged from 34 to 87 kg).	However, non-PSNP households invested more in soil erosion control measures compared with PSNP participants – mean difference estimates ranged from 6.5 m to 17 m for soil and stone bunds.
PSNP	Kozicka <i>et al.</i> (2023)	Impact evaluation – panel dataset		Negative effect on-farm labour input, including labour intensity: 28 fewer days of farm labour per year, and 11.53% decline in labour intensity. Lower on-farm crop diversity: 9.77% decrease in crop richness, a 13.00% decrease in the Simpson Index, and a 13.30% decrease in the Shannon Index.
Cash + (adoption of rainwater harvesting techniques)	Aker and Jack (2021) – Niger	Quantitative – randomized control trial – 5 study arms	Providing farmers with training increased only the proportion of adopters by 90 percentage points. Treatment effect on agricultural revenue estimated to be USD 40 per year while costs around USD 30.	Cash-plus treatment arms observe a higher treatment effect in the first year but this effect dissipated by the third year.
National Agricultural Insurance Scheme (NAIS)	Panda (2013) – two districts in Odisha, India	Quantitative regression analysis	Access to crop insurance had positive impacts on two adaptation actions— reduced use of rainwater and shifting to cotton cultivation (odds ratio of greater than two). 42.6% of the insured farmers had made the switch from paddy to cotton for its higher profitability and less water intensity.	Authors caution against monocropping and overspecializing in cotton (leading to more risk of total crop failure and risk of food insecurity) and loss of biodiversity in the region. Also, farmers with crop insurance were less likely to reduce their area under cultivation because of climate risks.

Appendix 2. Summary of findings: Facilitating diversification of livelihoods to those less exposed to climate vagaries

Name of programme	Name of study and countries covered	Methodology	Positive	Negative
<i>Atencion a Crisis</i> Programme	Macours, Premand and Vakis (2012) – Nicaragua	Impact evaluation – four study arms	Households who received the productive investment grant were 13 percentage points more likely to engage in non-agricultural self-employment (such as small bakeries, cheese products, corner stores or as roaming sellers of cloths) and have higher profits.	Households who received the productive investment had no significant impact on participation in non-agricultural wage employment. The vocational training package did not lead to a significant impact on consumption or income, but it did lead to increase in wage work at the time of shocks.
Mahatma Gandhi National Rural Employment Guarantee Scheme	Kaur <i>et al.</i> (2019) – India (Andhra Pradesh, Jharkhand, Odisha and Sikkim)	Mixed methods – qualitative data with a survey of 651 participating households	Of the 651 households surveyed, 64% displayed resilience to the impacts of climate change by absorbing (34%) or adapting to (26%) climate stresses or, in a few cases, transforming their livelihoods (4%). Beneficiaries in Mayurbhanj District in Odisha, through support from the Odisha Livelihoods Mission, formed producer groups that were linked to the market through rubber, dairy and handicrafts companies, leading to an annual average income generation estimated at USD 420.	
Productive Safety Nets Programme	Weldegebriel and Prowse (2013) - Ethiopia	Impact evaluation – propensity score matching		No increase in farm or non-farm income. Increase in off-farm income from 21.6% to 39%, and specifically an increase from 33.6% to 43.7% in income derived from the sale of natural resources.
<i>Oportunidades</i>	Solorzano, (2016) – Yucatan, Mexico	Qualitative (key informant interviews and focus-group discussions using participatory tools, retrospective life-history interviews); baseline household survey; participant observation	Transfer was too small to facilitate investments other than increase in household consumption. In some instances, helped move households from climate-sensitive work to non-climate-sensitive activities such as in the construction industry and off-farm activities (e.g. tourism, plumber).	Macroeconomic context such that there are limited employment opportunities. Erosion of knowledge of traditional livelihoods and practices.

Name of programme	Name of study and countries covered	Methodology	Positive	Negative
Public Distribution System in India	TCI (2022) – India	True-cost accounting approach	<p>If the composition of the food basket changes to include more nutritious items like pulses and millets, it would mitigate negative environmental impacts and lead to positive impacts on diet diversity.</p> <p>If a change is made to a more “locally-sourced” basket, it would enhance livelihood opportunities in economically disadvantaged states.</p>	The hidden costs for the production of rice and wheat resulted in environmental costs amounting to USD 5.1 billion, primarily due to greenhouse gas emissions, water use and pollution stemming from crop residue burning.
Kenya Home Grown School Feeding programme	Borish, King and Dewey (2017) and Bhalla (2023) – Busia county, Kenya	Small n (64) end-line survey and qualitative	<p>Enabled participants to learn new agroforestry techniques and knowledge of new crops such as termite-resistant banana trees. This had the added benefit of increased supply of timber, firewood, fruit, income and afforestation.</p> <p>Promoted agroecological approaches by encouraging the cultivation of local food crops such as African Leafy vegetables.</p>	

Appendix 3. Summary of findings: Facilitating natural-resource management and ecosystem restoration

Name of programme	Name of study and countries covered	Methodology	Positive	Negative
Mahatma Gandhi National Rural Employment Guarantee Scheme (NREGS)	Fischer (2019) – Kangra district in Himachal Pradesh, India	Dataset of 1 400 households and 798 projects (postintervention treatment only) + qualitative fieldwork	<p>General: 90% of the households surveyed reported having benefited from the outcome of at least one NREGS project and two-thirds had benefited from two or more.</p> <p>Water management: Between 2007 and 2012, 251 projects out of 798 focused directly on water management including work on building or restoring canals, building rainwater storage tanks and check dams. Focus-group discussions revealed that 79% of the water projects improved water availability for irrigation, drinking, livestock or domestic use.</p>	9 of the water-related projects either reduced water access or increased flooding, likely as a result of poor design or implementation.
NREGS	Adam (2015) – India	Non-quantitative critical evaluation	<p>Highlighted type of public works undertaken, which included:</p> <p>Blended ecosystem services with livelihood generation – water conservation projects that included flood protection and drought proofing (48% of total), provision of irrigation facilities to targeted vulnerable groups (18%), rural connectivity (18%), land development works (14%); linkages to financial connectivity and inclusion through wage payments and opening of bank account</p> <p>Inclusivity – 40% of the participants belong to Scheduled Castes and Tribes category and 40% were women in 2010–2011.</p>	<p>Questions remain around the sustainability and utility of the assets created.</p> <p>Inadequate benefits and delays in payments.</p>
NREGS	Esteves <i>et al.</i> (2013) – India (Andhra Pradesh [Medak], Karnataka [Chitradurga], Madhya Pradesh [Dhar] and Rajasthan [Bhilwara])	Quantitative survey of NREGS beneficiaries, and biophysical measurements – control vs treatment plots	<p>Water resources: groundwater levels either increased or remained stable; area irrigated using groundwater sources increased from 0.2 to 57 hectares and area irrigated using surface water sources increased from 0.5 to 58 hectares at the village level.</p> <p>Land: increase in soil organic carbon content in 72% of the beneficiary sample plots. Reduction in soil erosion in 82% of the beneficiary sample plots</p> <p>Crop production systems: gross area cultivated increased by 43.5% to 102.5%; average yield increases ranging from 46% to 100%.</p> <p>Forests, plantations, and fruit orchards: planting of forest and fruit-yielding tree species in 31 out of 40 study villages.</p>	

Name of programme	Name of study and countries covered	Methodology	Positive	Negative
NREGS, Productive Safety Nets Programme (Ethiopia), Temporary Employment Programme (Mexico)	Norton <i>et al.</i> (2020) – India, Ethiopia, Mexico	Programme documentation and evidence review for an opinion piece	Ecological stewardship through nature-based public-work projects such as watershed management, soil conservation, land rehabilitation; and income-earning capacity of the rural poor through community assets such as grain silos and local roads.	Inadequate wages compared with basic needs; poor maintenance of the assets created; selection of works tended to be small-scale infrastructure such as roads, sheds and clinics rather than environmental assets because of lack of technical inputs and capital; and difficulties in balancing multiple objectives simultaneously.
Northern Uganda Social Action Fund (NUSAF3)	Makerere University Business School (2021)	Survey + qualitative assessment of impact on natural-resource management and ecosystem restoration	NUSAF3's labour-intensive component built 3 459 community assets, which included embankments, roads, irrigation canals and nurse beds and afforestation. Examples are provided in two districts where tree planting, water management and soil erosion control activities led to improved green cover, less soil erosion and reduced environmental pollution.	
Environmental Cash for Work (ECfW)	Altenburg <i>et al.</i> (2017) – Philippines	Qualitative case study	ECfW provided economic relief to the commercial fishers, who have no alternative livelihood, while allowing the fishing stock to grow during the use-restricted period, and prevented the destruction of mangroves.	
Payment for Hilsa conservation project	Mohammed and Wahab (2013) – Bangladesh	Evidence review of macrolevel impacts	Helped increase hilsa production and catch while at the same helped halt the decline of hilsa population and reverse it. Macrodata used to infer increase in incomes of fisher households.	No household-level data; only about 50 percent of the hilsa fishers were included in the programme.
Enhanced Coastal Fisheries or ECOFISH project	Béné and Haque (2021) – Bangladesh	Impact evaluation – difference in differences	Households were more likely (54% more likely as captured by constructed resilience index) to engage to adaptive activities – preparedness plans, alternative livelihood activities and collective work.	Did not reduce the propensity of households to engage in negative coping strategies especially when faced with serious illness or loss of assets.

Appendix 4. Summary of findings: Climate mitigation

Name of programme	Name of study and countries covered	Methodology	Evidence
Productive Safety Nets Programme (PSNP)	Hirvonen <i>et al.</i> (2022) – Ethiopia	Spatial matching techniques using satellite data to identify control areas through matching based on agroecological and socioeconomic characteristics	<p>Increased tree cover by 3.8% between 2005 and 2019.</p> <p>Annual negative CO₂ emissions from the increased tree cover estimated to be equivalent to 1.5% of the annual emissions reduction pledged by 2030 by Ethiopia in its Nationally Determined Contribution (NDC) for the Paris Agreement.</p> <p>This contribution could offset up to 49% of the administrative costs of the programme in the long run if tree cover is preserved.</p>
PSNP	Woolf, Solomon and Lehmann (2018) – Ethiopia	Tier 1 and 2 greenhouse-gas accounting methodology for the agriculture, forestry and other land-use sector within PSNP sites (results measure impact of including sustainable land-management [SLM] public works within PSNP sites, compared with PSNP which do not use SLM)	<p>PSNP contributed to capturing on average 5.7 Mg of CO₂ per hectare per year (MgCO₂eha⁻¹y⁻¹).</p> <p>Total reduction in net GHG emissions from PSNP’s land management at the national scale is estimated at 3.4 million MgCO₂ey⁻¹ which is 1.5% of the emissions reductions from the agriculture, forestry and other land use sector pledged in the NDC for Ethiopia.</p>
Mahatma Gandhi National Rural Employment Guarantee Scheme (NREGS)	Ravindranath and Murthy (2021) – India	Agroecological region stratification to identify “MGNREGS impacted plots” and “control plots”	<p>The projected cumulative carbon sink created through drought proofing activities under NREGS is projected to be 56 Mt CO₂ in 2020, 281 Mt CO₂ in 2025 and 561 Mt CO₂ in 2030.</p> <p>The total mean carbon sequestered at the national level was estimated to be 102 Mt CO₂ in 2017–2018, and was projected to increase to about 132 Mt CO₂ by 2020 and 249 Mt CO₂ by 2030.</p>
<i>Bolsa Verde</i>	Wong <i>et al.</i> (2023) – Brazil	Difference in differences	<p>Kept deforestation 22% lower inside treated areas compared to similar untreated areas.</p> <p>The programme paid for itself in that the benefits from carbon dioxide reductions were valued at USD 415 million between 2011 and 2015, which was four times the cost of the programme.</p>
<i>Bolsa Floresta</i>	Cisneros <i>et al.</i> (2022) – Brazil	Spatial matching techniques to identify counterfactual sites wherein their unit of analysis is a 5-by-5-km grid-cell across 53 reserves, 265 000 km ²	<p>Decreased yearly forest losses by about 10% on average within the protected areas between 2008 and 2015. In absolute terms, the effects translated to 856 hectares of deforestation avoided.</p>

Name of programme	Name of study and countries covered	Methodology	Evidence
<i>Keluarga Harapan</i>	Ferraro and Simorangkir (2020) – Indonesia	Generalized synthetic control model	Reduced tree cover loss by 30% on average (hectares/year/village) in rural villages exposed to the programme between 2008 and 2012
<i>Familias en Acción</i>	Malerba (2020) – Colombia	Difference in differences with inverse probability treatment weighting	Increase in consumption of land and energy-intensive goods (specifically beef and refrigerators) and the impact of beef consumption was estimated to have potentially increased deforestation by 8%. However, this impact was not detected at the municipality level as municipalities enrolled in the programme experienced less deforestation than those not registered by approximately 0.5%. This may be because the impact of increased beef consumption is having an ecological footprint in a different geographical area.

Scoping review on the role of social protection in facilitating climate change adaptation and mitigation for economic inclusion among rural populations

Rural populations, especially small-scale producers, are disproportionately impacted by climate change because their livelihoods depend largely on natural resources and weather patterns.

This paper reviews the available evidence on the role of social protection programmes in facilitating climate-change adaptation and mitigation, with a specific emphasis on economic inclusion. Evidence on adaptation is categorized across three outputs: adoption of climate-adaptive agricultural practices; diversification of income sources; and natural-resource management and ecosystem restoration.

The review also presents available evidence on social protection programmes contributing to climate-change mitigation targets through reduction in greenhouse gas emissions and in easing the impact of mitigation policies.

The review underscores the importance of a systems approach, strong local community institutions and a supportive macroenvironment.

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