WFP EVALUATION

Mali, Resilience Learning in the Sahel

Impact evaluation report

OEV/2022/030
July 2025

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Acknowledgements

The work described in this report is the result of a collaboration between the World Food Programme (WFP) and the World Bank's Development Impact Evaluation (DIME) department. The study has been pre-registered in the American Economic Association Randomized Control Trials (AEA RCT) registry at: https://www.socialscienceregistry.org/trials/6851.

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We are grateful to all individuals who contributed to data collection, and in particular the respondents for their time. We express our sincere appreciation to the German Federal Ministry for Economic Cooperation and Development (BMZ) for their generous funding support, which has made this programme and impact evaluation possible.

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The Mali impact evaluation results are among the first from the WFP Climate and Resilience Window, and the operational teams should be commended for their support to its implementation.

Disclaimer

Suggested citation: Premand, P., Christian, P, Fernandez, C., Heirman, J., Jospe, E., Waidler, J., Bajpai, P., Eltoukhi, O., Faisal, F. (2025). Mali, Resilience Learning in the Sahel: Impact evaluation endline report. WFP Evaluation. World Food Programme Office of Evaluation and World Bank Development Impact Evaluation (DIME).

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Executive summary

1. In Mali, the compounding impacts of recurring droughts and heightened insecurity have led to a gradual decline in livelihoods. More than 715,000 people are acutely food insecure, with the November 2023 Cadre Harmonisé analysis projecting this number to exceed 1.4 million during the 2024 lean season. Critical malnutrition levels persist among children, especially in Gao and Ménaka, while conflict-related incidents continue to hinder aid efforts.
2. The concept of resilience has gained attention because it recognizes the importance of addressing shorter-term humanitarian needs, while simultaneously supporting communities in their efforts to cope with future crises induced by climate change, conflict, and other factors. Many institutions, including the World Food Programme (WFP), have increasingly adopted a resilience-based approach in their programming. Notably, in 2018, WFP and the governments of Burkina Faso, Chad, Niger, Mauritania, and Mali launched the Sahel Integrated Resilience Programme, an integrated approach to boost resilience and adaptation of communities to ecosystem degradation, climate change and other vulnerabilities (WFP, 2021).
3. The Mali Impact Evaluation investigates the household-level impacts of integrated resilience programming, including food assistance for assets (FFA), lean season support (LSS), and accompanying activities (nutrition support, school feeding and smallholder agriculture market support activities) delivered on top of a COVID-19 Safety Net programme. Taking resilience as a household's ability to adapt to their environment, absorb shocks and stressors, and transform their capacities, this IE combines detailed baseline and follow-up data, covering broad household capacities, with high-frequency data, measuring food security and well-being dynamics.
4. The Mali IE is part of a broader research initiative focusing on resilience in the Sahel region known as the Impact Evaluation for Resilience Learning in the Sahel. This initiative is funded by Germany's Federal Ministry for Economic Cooperation and Development (BMZ) and shares a similar IE framework and resilience measurement strategy with Niger. Both the Niger and Mali IEs also fit under the Climate and Resilience Impact Evaluation Window, established by the WFP Office of Evaluation (OEV) in collaboration with the World Bank's Development Impact Evaluation (DIME) department. The primary objective of the Climate and Resilience Window is to conduct a series of impact evaluations across various countries using comparable designs to enhance the generalizability of findings.
5. The Climate and Resilience Window includes a portfolio of impact evaluations across a series of countries using the same (or very similar) designs to increase generalizability of results. The first round of impact evaluations aims to understand how WFP FFA, or integrated programming layered onto FFA activities (depending on the country) contribute to resilience in Mali, Niger, Rwanda and South Sudan.
6. Across the four countries in the Climate and Resilience Window, impact evaluations find that resilience programming layered on FFA increases food security, highlighting positive short- to medium-term impacts two years after the start of the programmes. Impacts are also observed in other dimensions of economic and psychosocial well-being. Yet the timing of impacts on food security varies considerably over the study period. For instance, in Niger and South Sudan, the impacts of the WFP resilience programme are mostly observed in the post-harvest period and do not extend to the lean agricultural season or throughout the year. The primary mechanism for the increase in food security observed after harvest is an increase in agricultural production, which was not sufficient to translate into improvements in coping strategies or resilience to shocks within the study period.
7. In Mali, the impact evaluation used a randomized controlled trial (RCT) design to compare households in villages where the integrated resilience programming was implemented to similar villages where this programming was not delivered. The impact evaluation finds a small impact on the quantity of food consumed from gifts and exchanges, suggesting that the programme induced some sharing of

resources between community members. It also finds a small increase in the value of sales among those who cultivate land at the programme's endline.

8. However, after one-and-a-half to two years, the Mali impact evaluation does not find statistically significant improvements in food security, dimensions of psychosocial well-being, or other economic outcomes such as consumption and livelihoods up to two years of programme implementation. The high-frequency data point to larger impacts on food security between September and December 2021. This was around the time a drought shock occurred and when resilience programme activities were active in the largest number of communities, which suggests that the programme may have mitigated the effect of that shock. However, these impacts were not statistically significant and were not apparent the following year. Relatedly, the impact evaluation does not find an improvement in subjective resilience or in coping strategies up to two years after the start of the programme.
9. In the broader context of the results from the Sahel Integrated Resilience Programme in Niger, and wider results from the window, the size of the estimated impact on food security tends to be more muted in Mali. However, there is also much more variation (in technical terms, a broader confidence interval) around the estimated impacts. This pattern of results is consistent with a substantial variation in programme implementation documented in Mali, a context where programme implementation was particularly challenging.
10. Furthermore, in Mali the integrated resilience programme was layered on a COVID-19 Safety Net delivered to the poorest households across resilience programme and comparison communities. The impact evaluation does not find significant impacts of the resilience programme on food security for either those eligible or those ineligible for the COVID-19 Safety Net. However, impacts on food security tend to be higher among the (less-poor) households that were ineligible for the COVID-19 Safety Net. This suggests that any additional impacts of the resilience programme could be difficult to identify on top of gains already achieved by the COVID-19 Safety Net in both the programme and comparison groups.
11. The design and methods of the impact evaluation have limitations. They require interventions to follow a predetermined plan and reach a sufficient number of targeted households with enough support to produce a statistically significant difference. During the course of the evaluation, there were programme implementation challenges that could make it more difficult to detect impacts, including: adjustments in the process to target beneficiaries for the FFA component; a lower-than-expected number of households receiving FFA; and proximity between some treatment and control villages. These challenges are described in more detail in Section 3.5. In addition, to reflect real world impacts, the evaluation uses an intent-to-treat estimation based on community level targeting and data from all households (participants and non-participants) located in the same villages, which can under-estimate the impacts of the programme on the subset of households that chose to participate.
12. The impact evaluation in Mali shows impacts in different areas from those observed in other countries in the Climate and Resilience Window. Results show that the programme reduces the share of households that seek loans. There was also a slight decrease in the households that have an internal migrant (a household member living elsewhere in the country), and consequently those that receive remittances in programme villages. These mechanisms are distinct from the main impact pathways through agricultural livelihoods and productivity observed in Niger and South Sudan. This may partly reflect the highly fragile setting in which the resilience programme is implemented in Mali.

1. Introduction

1. This impact evaluation is part of the Climate and Resilience Impact Evaluation Window, which has been created by the World Food Programme (WFP) Office of Evaluation (OEV), Livelihoods, Asset Creation, and Resilience Unit, in partnership with the World Bank's Development Impact Evaluation (DIME) department.

2. The WFP Impact Evaluation Strategy (2019-2026)[1] focuses on establishing impact evaluation windows, which are portfolios of impact evaluations across a series of countries using the same (or very similar) designs to increase generalizability of results. The first round of impact evaluations in the Climate and Resilience Window aims to understand how WFP food assistance for assets (FFAs), or integrated programming layered on FFA activities (depending on the country) contributes to resilience. WFP country offices were invited to propose their programmes to be included in the window in 2019. Mali and Niger were selected following a workshop in Dakar, Senegal, and further in-country feasibility assessments.

3. The concept of "resilience" has gained attention because it recognizes the importance of addressing shorter-term humanitarian needs while simultaneously supporting communities in their efforts to cope with future crises induced by climate change, conflict, and other factors. Many institutions, including WFP, have increasingly used this concept of resilience as a basis for their programming. Building on existing United Nations definitions, WFP defines "resilience" as the capacity of individuals, households, communities, institutions, and systems to prepare for, anticipate, absorb, recover, adapt, and transform in the face of shocks and stressors in a timely, efficient and sustainable manner.[2]

4. In 2018, WFP and partners launched the Sahel Integrated Resilience Programme. The main objective of the WFP resilience programme is to strengthen the socioeconomic resilience of smallholder farmers and vulnerable populations. The programme is intended to build the resilience of food systems and livelihoods of targeted communities, while also strengthening community structures to support social cohesion, and contribute to conflict prevention and prospects for peace.

5. Against this backdrop, World Bank DIME and WFP, with support from Germany's Federal Ministry for Economic Cooperation and Development (BMZ), set up an impact evaluation to identify the impact of WFP's Integrated Resilience Programme on resilience capacities.

6. This report begins by describing the country context and the programme evaluated. This is followed by a discussion on the evaluation methodology and design, limitations, and ethical considerations.

7. The report then describes the stakeholders, different data sources and tools used. This is followed by a discussion of project implementation. The report then presents the results, combining findings from high-frequency surveys (over 20 months of programme implementation) and endline data (two years after the programme started) using regression analysis on key pre-specified outcomes variables. To conclude, the report discusses the main findings and suggests considerations for future programmes. The annexes contain the surveys and detailed baseline and endline results.

1.1 Country context

8. Mali is a land-locked country in the heart of the Sahel region with a population of 23.3 million (in 2023).[3] Mali exhibits some of the world's lowest social indicators, standing at 188 out of 192 on the United Nations Development Programme's Human Development Index 2023/2024[4] and 98th out of 125 countries on the Global Hunger Index 2023.[5] After a military coup in March 2012, large portions of

[1] World Food Programme. 2019. *WFP Impact Evaluation Strategy (2019-2026)*.
[2] This definition aligns to key external definitions – including Food Security Information Network (2014), UNISDR (2016), FAO (2016), UN common guidance (2021), BMZ transitional development assistance (2021), USAID (2021).
[3] United Nations Population Fund. 2023. World Population Dashboard.
[4] United Nations Development Programme. 2024. *Human Development Report 2023/2024*.
[5] Global Hunger Index. 2023. Global Hunger Index scores by 2023 GHI rank.

northern and central Mali fell under the control of non-state armed groups, prompting the deployment of a United Nations peacekeeping mission in July 2013. From mid-2016 onwards, there has been a rise in local conflicts and insecurity, impeding humanitarian access, and resulting in a significant increase in displacement and vulnerability among conflict-affected communities.[6] Economic sanctions imposed on the Government of Mali by the Economic Community of West African States (ECOWAS), coupled with the repercussions of the Ukraine crisis and global recession, led to inflation reaching a peak of nearly 15 percent in mid-2022, exacerbating extreme poverty and food insecurity.[7]

9. Mali is facing a severe food insecurity crisis, with more than 715,000 people currently experiencing acute food insecurity.[8] In 2023, for the first time, 2,500 people in Ménaka were classified at Integrated Food Security Phase Classification Phase 5 (IPC 5) (catastrophe/famine) level.[9] The 2023 government-led SMART[10] survey found critical levels of acute malnutrition in children aged under 5 years old in Gao (15 percent) and Ménaka (19 percent), precarious levels in Mopti and Sikasso (9 percent and 8 percent) and worrying levels (10-14 percent) in other regions. Despite a 7 percent decrease in recorded security incidents in 2023, attacks by armed groups and military actions rose by 25 percent, reducing humanitarian access in multiple regions. The November 2023 Cadre Harmonisé[11] analysis projects more than 1.4 million people to be acutely food insecure at IPC 3 (crisis) and above during the 2024 lean season. The crisis is spreading geographically, with the number of areas classified as IPC 3 (crisis phase) expected to increase from five in 2023 to 13 in 2024. Mali was listed as a global hunger hotspot in May and October 2023, with food insecurity elevated to the highest alert level.[12]
10. Malnutrition in its various forms imposes a substantial burden on human well-being and the economy. Over the last five years, undernutrition has contributed to 34 percent of all infant deaths in Mali. The malnutrition situation is dire in regions where conflicts persist, such as Gao, Timbuktu, and Ménaka. Chronic malnutrition, marked by a 24 percent prevalence of stunting in children aged under 5 years, poses a significant public health issue, especially in the Southern region.[13]
11. Agriculture, primarily in the form of subsistence production, constitutes over 80 percent of employment. Yet, smallholder farmers face elevated poverty rates due to factors such as land degradation, insufficient access to fertilizers, post-harvest losses stemming from inadequate storage and processing capabilities, and restricted access to markets.[14]
12. Food insecurity exhibits seasonal variations, with anticipated peaks occurring before the primary cereal harvest for farmers (from June to September) and driven by the availability of pasture and water for pastoralists (from March to June). Every few years, extensive droughts occur, advancing the lean season by several months. In these periods, the physical demands related to agriculture and livestock become particularly pronounced, exacerbating the disparity between energy requirements and access to food. Negative coping mechanisms have been prevalent since 2014, with a notable peak in 2015. This increase can be linked to the adverse effects of drought on agriculture and livestock production, compounded by the consequences of conflict and the substantial displacement of communities.

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[6] World Food Programme. 2022. *Mali Country Brief*. November 2022.
[7] International Monetary Fund. 2023. *IMF Country Report No. 23/209*. Mali: 2023 Article IV Consultation-Press Release; Staff Report; Staff Supplement; and Statement by the Executive Director for Mali.
[8] World Food Programme. 2024. *Mali Country Brief*. January 2024.
[9] Integrated Food Security Phase Classification, it is a five-phase scale that classifies levels of acute food insecurity, with 1 being the least acute, and 5 being the most acute.
[10] Standardized Monitoring and Assessment of Relief and Transitions (SMART), a methodology used in emergencies which balances simplicity and technical soundness.
[11] Unified tool used by the international community for food and nutrition insecurity analysis throughout several Sahel and West African countries.
[12] World Food Programme. 2019. *Mali Country Strategic Plan (2020-2024*). November 2019.
[13] Ibid.
[14] Ibid.

13. Given the dynamic food security situation, the WFP's Mali Country Strategic Plan 2020–2024 (CSP) has adopted a two-pronged approach to address the short-term and long-term needs of beneficiaries in its programming.[15] The CSP stresses the importance of maintaining the WFP's capacity to respond to emergency needs while also increasing its focus on longer-term outcomes (such as diversified livelihoods, agricultural productivity, peace, and social cohesion), to improve households' and communities' capacities to respond to shocks and stressors, and to therefore enhance resilience.

14. Safety net programmes can alleviate poverty, reduce food insecurity, and enhance resilience among impoverished populations, including in the Sahel. Evidence from Mali's social safety net programme – *Jigisémèjiri* – suggests that cash transfers combined with nutrition communication activities can lead to improvements in food security, increases in assets and households' savings (Hidrobo et al., 2020). Complementing regular safety nets with livelihood support interventions can further enhance impacts on resilience through livelihood diversification, asset accumulation, savings, and strengthened social support (Bossuroy et al., 2022).

[15] Ibid.

2. Programme description

15. WFP's resilience programme in Mali is aligned with the Country Strategic Plan (CSP) objectives and includes interventions that aim to promote the capacities of households and communities to absorb shocks, adapt to risks, and transform livelihoods. These interventions include: (i) food assistance for assets (FFA); (ii) lean season support (LSS); (iii) nutrition/health; (iv) value chain and smallholder agriculture market support (SAMS); and (v) school feeding. The planning and prioritization of these interventions is supported and guided by a community-based participatory planning (CBPP) process.

16. By introducing a combination of layered and sequenced activities targeting the most vulnerable, the programme aims to promote the resilience capacities of individuals, households, and communities:

    - at the community level – activities aiming to promote resilience focus on environmental rehabilitation and food systems development. These include the FFA and SAMS components; and
    - at the individual and household levels – activities promoting resilience, including investments in human capital by providing an integrated package of school feeding and nutrition services, and LSS for vulnerable households. These activities complement government efforts and the WFP COVID-19 Safety Net.[16]

17. Below we describe the integrated resilience package components as they were designed in 2019.

    - **The FFA component** aims to meet the immediate food needs of households while also: restoring degraded landscapes; improving water harvesting; reducing the risk of environmental disasters; creating productive assets to secure ecosystem services; increasing productivity and yield; supporting economic development; and strengthening social ties between community members and villages. Assets are selected via a community-wide participatory process and asset-creation activities are tied to cash or in-kind support. The selection of villages for FFA activities is guided by the identification of watersheds that host the interventions.[17] Beneficiaries are paid USD 35 per month (CFA 19,500) for three months to work on the assets (usually between March and June before the rainy season, but the period can be extended as needed).[18] Typical examples of related assets include road rehabilitation, building dams, half-moons, market gardens, dune fixing, fishponds, water towers, and stone cords (bunds). The timing and duration of payments are determined by the progress of asset creation work, which is planned around specific seasons.
    - **The nutrition/health component** aims to prevent malnutrition through a combination of nutrition-specific, sensitive interventions (with a lifecycle approach) that seek to improve the availability, access, and use of nutrient-dense food and the adoption of key nutrition and healthy family practices. The WFP provides food supplements to households with children aged under 2 years old, and also to pregnant or lactating women. This is complemented with intensive capacity-building activities at the community level on how to develop local initiatives that can improve community feeding practices. The WFP also provides incentives to pregnant or lactating women to boost attendance at nutrition sensitization sessions, and to antenatal and postnatal care in health facilities. This is combined with the prevention and treatment of wasting through health facilities and the general food assistance platform. The nutrition component comprises income-generating activities sensitive to nutrition, consisting of a one-time payment of USD 150 (CFA 100,000) to support starting or maintaining any nutrition-sensitive income-generating activity such as trading,

[16] The programme also proposes a number of homestead development activities such as implanting the "jardin de case", planting fruit trees, introducing "foyer ameliorés", and so on. These activities support nutrition activities as well as environmental adaptation techniques.

[17] Intervention sites are identified through village clusters that share common water resources.

[18] The implementation of asset creation follows the seasonal calendar specific to each area and depends on the type of asset being developed. As a result, the progress of asset realization may vary across different regions.

agro-nutrition or livestock. All these activities are backed by large sensitization campaigns (or social and behaviour change communication) to promote good practices related to feeding, nutrition, health, and hygiene for infants and young children.

- **The SAMS component** aims to complement FFA activities by supporting smallholders in managing assets and increasing their incomes through related activities, such as improving storage (reducing post-harvest losses), agro-food processing, capacity-building, and market access facilitation.
- **The school feeding component** aims to increase access to education and school retention rates by providing nutritious school meals and support to adolescent girls. Complementary activities – such as nutrition education, the creation of school gardens, or training on canteen management – leverage schools as a platform to contribute to food diversification and deliver messages on hygiene, family practices, and environmental stewardship.
- **The LSS** provides unconditional cash/food assistance to extremely poor households to offset the peak hunger and malnutrition period. It amounts to USD 52 (CFA 30,400) for two or three months between June and August.

18. Around the time when the resilience programme started, WFP Mali also introduced a **COVID-19 Safety Net programme** to support vulnerable communities impacted by the COVID-19 shock. This safety net intervention was implemented in the same geographic areas as the integrated resilience programme.

19. The key activities of the COVID-19 Safety Net programme included:
    - Unconditional cash transfers (UCT)
        - Eligible households within targeted villages received a direct cash transfer of CFA 15,000 (USD 30) monthly for at least six months a year.
        - All villages (in programme and comparison groups) in the resilience impact evaluation sample were included.
        - Eligibility within targeted households was based on the Food Consumption Score (FCS) as measured by the Registre Social Unifié (Unified Social Registry).
    - Nutrition support
        - This included a one-time top-up payment that complemented the UCT and assisted households with children younger than 2 years of age (USD 70 top-up), or with pregnant or lactating women (USD 90 top-up).
20. Since the COVID-19 Safety Net intervention was implemented consistently in resilience programme villages and comparison villages, it does not introduce a bias when estimating the impact of the resilience programme. However, this means that the impact evaluation includes any impacts of the resilience programme that can be measured above and beyond the effects of the safety net intervention, as discussed further in Section 3.
21. As of 2021, the integrated resilience programme covered 21 communes across five regions in Mali: Gao, Koulikoro, Ménaka, Mopti, and Tombouctou.[19] To enable baseline data collection and randomization, the impact evaluation focuses on new villages (Figure 1) added to the resilience programme in 2021 by WFP Mali Country Office – 91 villages across 14 communes in the regions of Gao (communes of Asongo, Gabero, Gao, and Gounzoureye), Koulikoro (commune of Nossombougou), Mopti (communes of Dàndóli, Dourou, Kendié, Soroly, and Wadouba), and Tombouctou (communes of Alafia, Séréré, Soboundou, and Soumpi).[20]

[19] World Food Programme. 2021. *Mali Annual Country Report*.
[20] Ménaka is not included in the impact evaluation because no new village enrolled in the resilience programme that year.

Figure 2: Map of the regions included in the impact evaluation

3. Evaluation design and methodology

22. The impact evaluation aims to examine how WFP's Integrated Resilience Programme in Mali contributes to household well-being, livelihoods, and ultimately resilience. This impact evaluation is also part of a broader research agenda for resilience in the Sahel, the Impact Evaluation for Resilience Learning in the Sahel initiative funded by Germany's Federal Ministry for Economic Cooperation and Development (BMZ), which includes a similar impact evaluation design and resilience measurement strategy in Niger.

3.1 Evaluation theory

23. When WFP established the Climate and Resilience Impact Evaluation Window[21] in 2019, the theory of change underlining WFP's resilience programmes assumed that supporting communities through multiple activities will: (i) support people to ensure their short-term well-being; and (ii) enhance people's capacity to maintain and improve their well-being when facing shocks and stressors. Figure 2 presents a simplified version of the full programme theory of change.

24. In line with the Climate and Resilience Window,[22] this impact evaluation of WFP's resilience programme in Mali aims to test the following hypotheses:

    Hypothesis 1: In the short term, the WFP's resilience programme will support people in maintaining their food security by meeting a household's immediate food needs that may arise during a shock or stressor. The effect of activities focused on meeting immediate food needs would be reflected mainly in:

    - household-level food consumption; and
    - coping strategies of households.

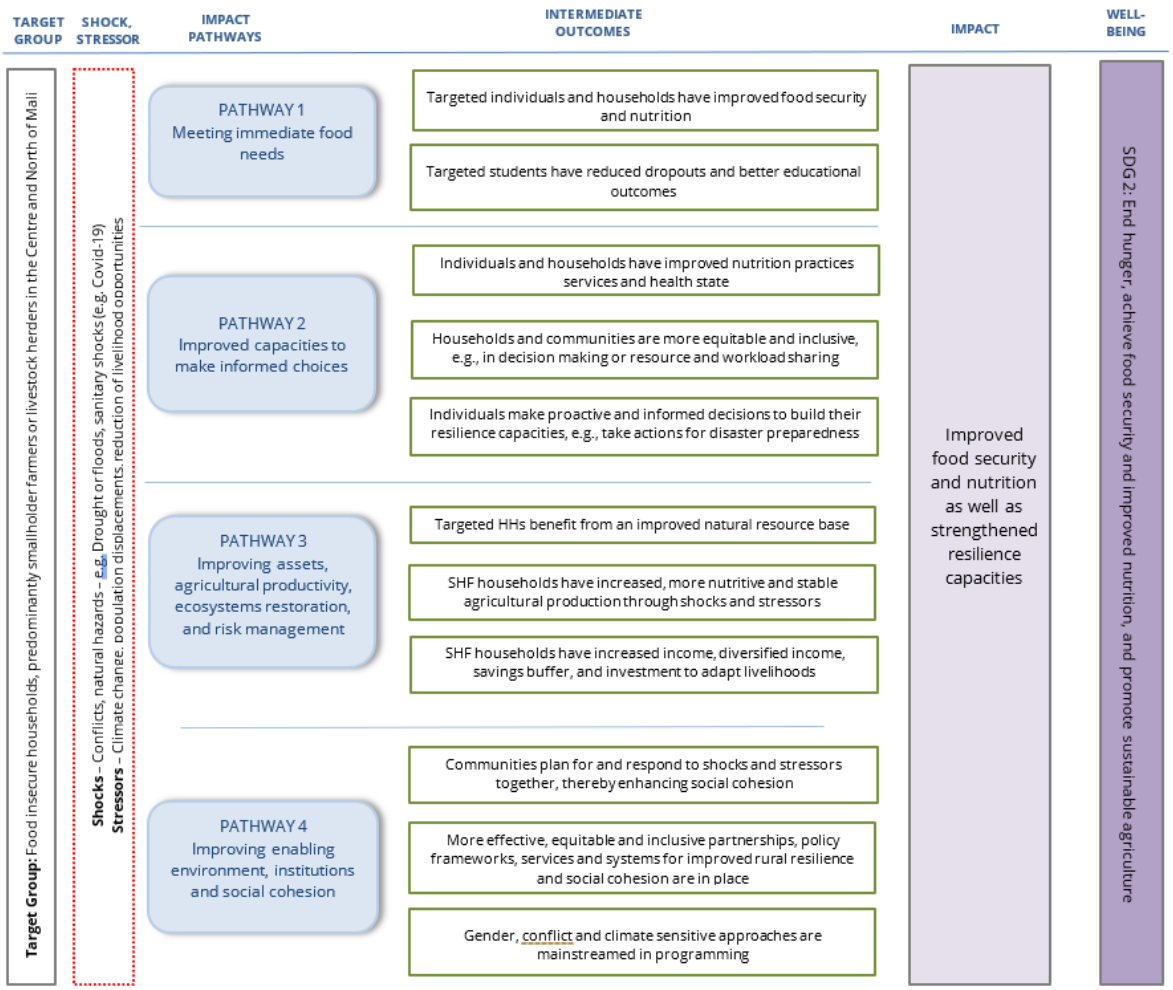
    Hypothesis 2: In the medium term, the WFP resilience programme will support households by improving capacities associated with maintaining or improving food security while experiencing multiple or recurring shocks and stressors. These capacities include:

    - livelihood activities;
    - household assets;
    - financial outcomes (e.g. income, savings, and expenses); and
    - variations in food consumption over time.

25. This report documents impacts up to two years after the start of programme implementation, covering both short-term impacts and initial medium-term impacts. The impact evaluation helps to shed some light on the empirical question of whether and when WFP's Integrated Resilience Programme may start to have medium-term impacts on resilience capacities. Discussions about the timing of impacts over the longer-term are further elaborated on in Section 10.

[21] World Food Programme. 2019. *Resilience in a changing climate: Impact Evaluation Window*.
[22] World Food Programme. 2022. *Do integrated WFP interventions contribute to household resilience capacities? Impact Evaluation Brief*.

Figure 3: The theory of change of the resilience programme in Mali developed by the country office.



3.2 Evaluation question

26. The main evaluation question is:[23]

    - What is the impact of the integrated WFP resilience package (FFA, LSS, SAMS, nutrition/health, education) on the resilience of recipient households and communities, beyond the impact of the COVID-19 Safety Net?

27. The priority is to document the ability of households to maintain and improve food security and well-being in the face of shocks.

3.3 Randomized controlled trial (RCT) design

28. The impact evaluation is designed as a cluster RCT. In Mali, it was established at the design stage that villages are the entry point for programme targeting and implementation. Many activities critical to the programme are implemented at the village level. Therefore, to identify the causal impact of the resilience programme on different comparison groups, the impact evaluation uses village-level randomization. The resilience programme in Mali covered 59 villages before the programme planned an expansion to 45 additional nearby villages. A set of 174 villages (clusters) eligible for the programme expansion across four regions were randomly assigned to the following groups:

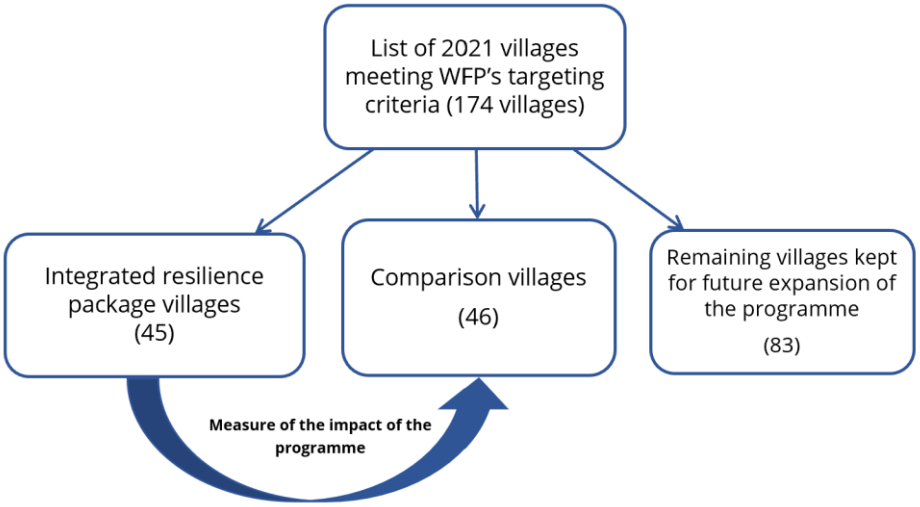
    - **Group A: Programme group** – villages that are assigned to receive the integrated resilience package **(45 villages).**
    - **Group B: Comparison group** – villages that are not assigned to receive the integrated resilience package during the impact evaluation period **(46 villages).**
    - **Group C**: **Waitlist group** – villages that are outside of the impact evaluation sample and were not surveyed for the impact evaluation **(83 villages).**

29. The randomized assignment of the programme group (i.e. the integrated resilience package) to the 45 villages leverages resources constraints of the programme for learning. After randomly assigning the 45 villages, the remaining villages were split into the comparison group and the waitlist group, anticipating that future financial availability may allow more villages to receive the programme. This approach is depicted in Figure 3.

30. The evaluation did not impose artificial constraints on the number of potential beneficiaries receiving programme benefits. The randomized assignment of villages is an objective and unbiased mechanism to decide which of the eligible villages, all meeting the same eligibility criteria for support, can receive the programme first. Respecting a sufficient sample size, the randomization eliminates any systematic differences between the programme and comparison groups and creates a valid counterfactual.

[23] The evaluation question was identified in collaboration with Regional Bureau of West Africa and Mali Country Office after consultations and an inception workshop with all stakeholders.

Figure 4: Resilience package experimental design



3.4 Study sample and data

31. Prior to the baseline survey, and at the request of the country office, a household listing process was carried out in all villages in the programme and comparison groups, as part of the broader Unified Social Registry initiative with the Government of Mali. The impact evaluation team supported this process in the 91 villages that are included in the impact evaluation.[24]

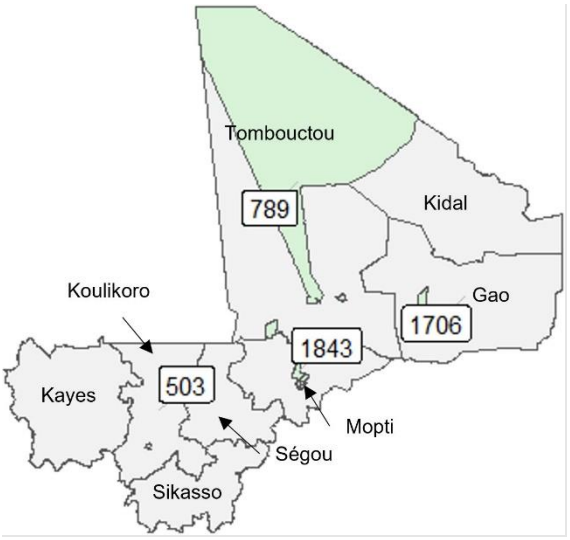
32. For the baseline survey, the impact evaluation team randomly sampled 60 households per village (plus five replacements) using data from the Unified Social Registry, resulting in a total of 5,093 households.[25] The baseline multi-module household survey allows us to measure capacities such as assets, and capabilities that are expected to predict food security dynamics. The baseline survey was also implemented with the larger resilience measurement framework in mind, which requires regular follow-up surveys with the baseline households.

Table 1: Number of baseline surveys by region in the Mali sample

Region	Households	Share
Koulikoro	503	10.39
Mopti	1,843	38.07
Tombouctou	789	16.30
Gao	1,706	35.24
Total	4,841	100.00

[24] For more details about the Unified Social Registry data collection and baseline, please refer to the Mali Baseline Report.
[25] Some villages had fewer than 60 households; in those cases, the research team sampled all households. Details of the sampling strategy and power calculations are provided in Section 4 of the Mali Inception Report.

Figure 5: Number of baseline surveys by region in Mali



Note: The map displays the administrative regions of Mali and highlights (in green) the 14 communes where the impact evaluation was conducted.

33. At baseline, the evaluation observes an adequate balance on outcomes of interest between programme and comparison groups. The programme and comparison groups vary only on a few variables, as expected following a successful randomization. When imbalances are observed, they are often weakly statistically significant or of small magnitude. Specifically, compared with the comparison group, the programme group had significantly higher revenue from crop sales, they reported higher stress levels (Cohen's Perceived Stress Scale), experienced a higher number of shocks, and used a lower number of negative coping strategies (Table E1/Annex E).[26] Overall, considering the level and magnitude of significance, the comparison and programme groups are confirmed to be similar at baseline, and we can estimate programme impacts through the difference in outcomes between programme and comparison groups at follow-up.

3.5 Limitations and notes

34. The impact evaluation focuses on household or individual-level outcomes. Therefore, it does not measure impacts on ecosystems, nor system-level impacts on soil restoration or food value chains, as per agreement with the Mali Country Office and the Regional Bureau of West Africa (RBC) at the onset of the impact evaluation.[27]

35. A noteworthy limitation is that programme implementation data was only available from the programme monitoring system at the village level. This prevents documenting which components each household received and assessing the degree of integration of programme components during implementation.

36. Based on conversations between the impact evaluation team and the country office at design stage, food assistance for assets (FFA) was understood to be open for participation to everyone in the village. However, in April 2022, staff from the Office of Evaluation undertook a mission to Mali and learned that some additional targeting had been carried out to select FFA participants within communities. Unfortunately, the unexpected introduction of additional targeting within communities

[26] For more details on baseline results, please refer to the Mali Baseline Report.

[27] For more information and evidence on the impacts of a similar programme (in particular, the half-moons that were promoted through FFA) on vegetation, see Mishra et al. (2023).

makes it impossible to know the exact comparable population (that would have been targeted) in the comparison group. To overcome this challenge in Niger, a community-level targeting simulation was used to identify would-be FFA beneficiaries in comparison communities. However, this was not possible in Mali as the additional targeting was not expected before the baseline. This also means that there is a relatively lower percentage of FFA participants in the impact evaluation survey sample than initially expected.

37. Over the course of the evaluation, the impact evaluation team also learned of some cases where the comparison villages received resilience programme activities, including four villages from Mopti (detailed in baseline report). Based on the qualitative data and the information obtained during a mission to Mali, there is also anecdotal evidence that in Gao, FFA activities extended to some neighbouring (comparison) villages. Such deviations in programme implementation and the impact evaluation design can make differences between groups smaller and more difficult to identify.
38. Some of the treatment and control villages are close to each other (with an average distance of 3.1 km, smaller than the average distance in Niger of 8.4 km). For that reason, sensitivity checks are performed to document the robustness of the results by considering only control villages that are further away, and as such less likely to be affected by potential spill-overs.

3.6 Ethical considerations

39. The study strictly adheres to ethical guidelines, including the 2020 United Nations Evaluation Group standards. Oversight and enforcement of ethical considerations are diligently managed by the WFP Office of Evaluation and the World Bank Development Impact Evaluation (DIME) team at all phases of the evaluation.
40. Key ethical principles and practices were rigorously implemented:
    a. **Institutional Review Board approval:** The evaluation team obtained international approval (on 12 November 2020) from an Institutional Review Board for the Climate and Resilience Impact Evaluation Window design as well as the specific design and measurement elements in Mali. The evaluation team also obtained approvals from the National Institute of Statistics in Mali. This ensured that the evaluation complied with local regulations and did not violate any local laws.
    b. **Informed consent:** Households participating in the study initially consented to WFP programme involvement, followed by separate consent for participation in the baseline survey, each round of the high-frequency and endline surveys. Refusing to take part in the survey had no bearing on eligibility for WFP support.
    c. **Privacy during interviews:** To ensure respondent privacy and comfort, interviews occurred at respondents' homes, away from others' hearing range.
    d. **Time compensation:** To compensate households for their time to participate in the surveys, the evaluation team did a lottery each round where one respondent per village was randomly selected to receive a cash transfer of USD 30 (equivalent to the monthly FFA transfer).
    e. **Training and protocols:** Enumerators underwent extensive training and piloting, ensuring uniform and contextually appropriate questioning. Third-party experts trained enumerators on handling sensitive questions related to intimate partner violence.
    f. **Ethical oversight:** Ongoing monitoring and management of ethical issues occurred during the study, with additional concerns addressed in line with established guidelines.
41. In summary, the impact evaluation prioritizes ethical conduct, covering informed consent, privacy, cultural sensitivity, and vulnerable participant protection. Ethical integrity was consistently upheld and monitored to safeguard participants throughout the research process.

4. Stakeholder analysis

42. The stakeholder analysis for this evaluation identifies those who may influence, or be influenced by, the evaluation's outcomes. Stakeholders include internal and external parties, and programme beneficiaries. The primary user is the WFP Country Office in Mali, but the evaluation aims for broader use of its findings.

43. Stakeholder categories include:

    a) internal Mali-based stakeholders: key personnel within the country office;

    b) internal stakeholders outside of Mali: involving the WFP Office of Evaluation, the WFP Regional Bureau of West Africa (RBD), and headquarters divisions;

    c) populations in need;

    d) external international stakeholders: comprising international non-governmental organizations (NGOs), donors, United Nations agencies, the World Bank, and local forums; and

    e) external national stakeholders: including government entities at national and subnational levels, as well as local NGOs.

44. Stakeholder engagement methods differ by category but may involve reviewing and providing input on evaluation documents, actively monitoring the evaluation's design during programme implementation, participating in workshops, and offering feedback on evaluation reports.

45. The engagement aims to ensure that diverse perspectives are considered and that the evaluation's results are effectively used by stakeholders. A richer stakeholder analysis is presented in the inception report.

5. Data collection

5.1 Quantitative surveys

46. Quantitative data for this impact evaluation was collected in several rounds (more details are presented in Annex A). The baseline data collection was completed between January and February 2021 (Baseline Report). Then, high-frequency data was collected between April 2021 and December 2022. Finally, the endline data was collected in March 2023 from all locations, using a household survey covering outcomes of interest for the Climate and Resilience Window and other project-specific indicators.

Table 2: Timeline of data collection

Round	Dates	Households surveyed		Round	Dates	Households surveyed
Baseline	Jan-Feb 2021	4,841		HF6	Mar-April 2022	1,527
HF1	Apr-May 2021	1,532		HF7	May-June 2022	1,517
HF2	June-July 2021	1,536		HF8	July-Aug 2022	1,517
HF3	Aug-Sept 2021	1,538		HF9	Sept-Oct 2022	1,512
HF4	Oct-Nov 2021	1,527		HF10	Nov-Dec 2022	1,544
HF5	Dec 2021-Jan 2022	1,515		Endline	March 2023	4,498

47. Of the targeted sample of 4,843 households, 4,841 households were successfully surveyed at baseline (99.9 percent), while 4,498 were surveyed at endline (93 percent of the baseline sample). High-frequency surveys targeted a sub-sample of 1,563 households from baseline, and all rounds achieved a completion rate of 97 percent or greater. Similar high response rates were achieved in programme and comparison group thanks to high-quality field procedures.

5.2 Qualitative surveys

48. Before quantitative data collection at endline, qualitative data collection was carried out in December 2022 and January 2023. The main objective of qualitative data collection was to inform the development of the endline survey. Ten focus group discussions (FGDs) were organized to gather insights that could complement and/or explain the main results observed from the quantitative analysis from the high-frequency data (see Annex B for more details).

6. Outcomes of interest and resilience measurement

49. A growing body of the literature on resilience has relied on measuring programme impacts at a single point in time, and documenting positive gains in well-being, sometimes by comparing households in communities exposed or not to shocks (Gunnsteinsson et al., 2019; Marcours et al., 2022; Barrett and Constas 2014, Premand and Stoeffler, 2022). This impact evaluation considers the fact that the capacities needed to improve and sustain well-being are likely to evolve over time, depending on the type and severity of shocks encountered. Evaluating the effect of programmes on resilience requires measuring well-being over time, including across seasons, before and after shocks, as well as absorptive, adaptive, and transformative capacities. Building on proposals from Barrett and Constas (2014) and Cissé and Barrett (2018) to conceptualize resilience as avoidance of poverty in the face of shocks and stressors, each impact evaluation in the Climate and Resilience Window directly measures welfare dynamics to understand resilience outcomes. These measures are calculated from a minimum set of indicators collected at higher frequencies in each country.

50. The indicators were selected in collaboration with the WFP Country Office, and the following three issues were considered: (i) operational relevance and importance to the programme components; (ii) a review of relevant literature; and (iii) evidence generation across the portfolio of Climate and Resilience Window evaluations. The primary set of outcomes are food security indicators, such as Food Consumption Score (FCS), Food Insecurity Experience Scale (FIES), and household food consumption. Intermediary outcomes related to livelihoods (such as agricultural production, asset ownership, off-farm income-generating activities) help us understand which mechanisms cause impacts in terms of resilience capacities. We also measure psychological and social well-being, which highlight other benefits beyond the food security and economic impacts of the intervention package. Annex A summarizes and briefly defines the key outcomes of interest for the impact evaluation in Mali.

51. Outcomes are measured at baseline and endline through a multi-module household survey covering the domains shown below, which are aligned with the study objectives, impact evaluation inception report, and window pre-analysis plan. The high-frequency survey (two-monthly surveys following the baseline) collected data on a subset of indicators, including food security outcomes, coping strategies, and shocks. It also recorded self-reported programme participation over time. A key feature of the resilience measurement approach adopted for this evaluation is the incorporation of high-frequency data to explore the dynamics of well-being throughout the evaluation period. This approach to resilience measurement differs from previous resilience indices, which are static, and measure resilience at one point in time, or before and after an intervention.

1. **Main outcomes of interest:**
    - food security: FCS and FIES;
    - consumption (food and non-food);
    - income-generating activities (livelihoods): agriculture, livestock, wage employment, off-farm business;
    - coping strategies; and
    - financial outcomes.
2. **Additional outcomes:**
    - social capital;
    - psychosocial well-being; and
    - migration.

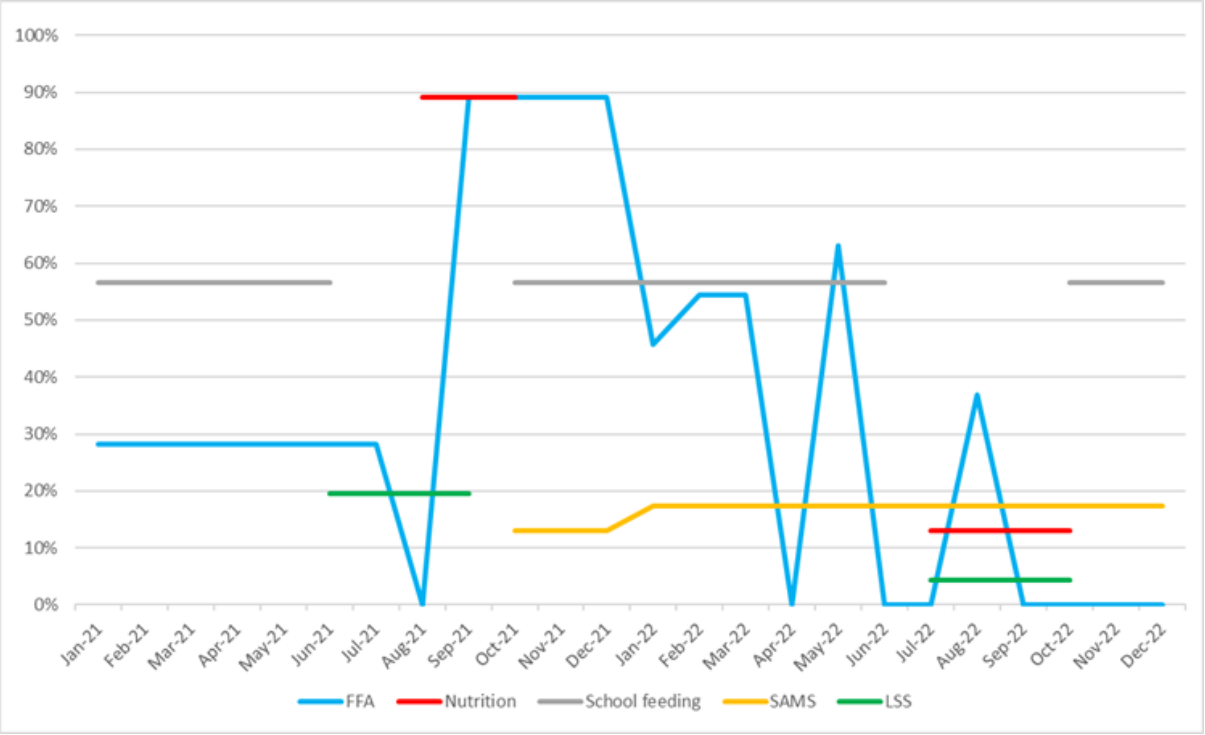
7. Programme implementation

52. Throughout implementation, the programme faced a very challenging operational environment, with recurrent episodes of violence, in addition to the COVID-19 pandemic and other shocks. These factors influenced the capacity of WFP and cooperating partners to reach all the villages targeted at the same time. Other operational challenges are described below.

7.1 Programme implementation insights from implementation data

53. Figure 5 and Table 3 illustrate the implementation variation of the resilience programme across the 45 programme villages throughout the impact evaluation period. These data are drawn from implementation information collected from WFP sub-offices in northern Mali, as well as from the WFP Country Office. Monthly implementation rates are presented as the percentage of programme villages receiving each component of the integrated resilience programme. Overall, there is notable variation in the programme's implementation across villages and over time. Some programme components are not consistently implemented everywhere, and certain components are active only for a few months annually.

Figure 6: Share of programme villages receiving resilience programme activities over time in 2021 and 2022



FFA = food assistance for assets; SAMS = smallholder agriculture market support; LSS = lean season support.

54. Starting with food assistance for assets (FFA), initially, only 28 percent of programme villages participated in asset-building activities during the first half of 2021. This can partly be explained by delays with the contracting of cooperating partners to support programme implementation. Implementation of FFA activities increased to almost 90 percent during the second half of 2021, starting at the end of the lean season in September 2021. However, participation again varies significantly throughout 2022, with no FFA activities occurring in or after September 2022. It is also worth noting that the implementation of FFA follows the seasonal calendar specific to each area and depends on the type of asset being developed. As a result, the progress of asset realization may vary

across different regions. These variations stem from the programme being adapted locally during implementation.

55. Nutrition activities took place between August and October 2021, reaching 90 percent of programme villages. This activity took place from July to October 2022, but only reached 12 percent of programme villages.

56. Looking at the education (school feeding) intervention, an impact evaluation village could benefit from school feeding if it was located within a 5 km radius of a school feeding site. Throughout the impact evaluation period, school meals were provided to children from 57 percent of programme villages. Other children also received school meals: they were living in communities that did not benefit from the resilience programme, but were close enough to schools supported by WFP.

57. Smallholder agriculture market support (SAMS), targeting farmers' organizations to complement FFA activities, reached only 13 percent of programme villages starting in late 202,1 and 17 percent in 2022.

58. Lean season support (LSS) was distributed in 20 percent of programme villages from June to September 2021, and in only 4 percent of villages from July to October 2022.

59. To better understand programme integration, we used the village-level data to document the number of components being implemented in a given village. Table 3 shows that, while two components were implemented in a high percentage of villages in a given year, only very few villages benefited from three components or more. This illustrates that there was substantial variation in the way the programme was implemented across villages and over time.

Table 3: Degree of resilience programme integration over time

	2021	**2022**
Any 1 component	100.0%	100.0%
Any 2 components	84.8%	60.9%
Any 3 components	28.3%	8.7%
Any 4 components	0.0%	2.2%
Any 5 components	0.0%	0.0%

60. Self-reported data on implementation collected during the high-frequency surveys in programme villages shows consistent information with a relatively low rate of participation in the programme, along with variation in participation over time (Table 4). When we consider households that report benefiting from any WFP programme component at least once, we find that 75 percent of households participated at any point in time, but only 45 percent reported participating twice or more. Similar numbers are obtained when asking households whether they received cash transfers, including from FFA, LSS, or COVID-19 safety nets.

61. These patterns suggest that households mostly associate participation in the programme with receiving cash transfers. The self-reported participation rates are therefore in line with the implementation rates documented using WFP Mali's village-level monitoring data. This also makes it hard to disentangle household participation in FFA, LSS and/or the COVID-19 safety nets using the self-reported participation data, as all these activities included cash transfers.

Table 4: Self-reported programme participation in programme villages from high-frequency data

Reported participating in any WFP component		**Reported receiving cash transfers from FFA, LSS or safety nets**	
At least once	**Twice or more**	**At least once**	**Twice or more**
75.59%	45.14%	70.69%	42.48%

62. Implementation challenges are reflected in an internal WFP audit that was conducted between January and April 2021. Concerns included: inadequate beneficiary registration due to absence of identity documents; a need to enhance access-related processes and coordination to overcome access constraints and improve targeting, programme design, implementation, and monitoring; staff shortages and high turnover; and non-compliance of vendors (such as cooperating partners and financial providers).[28]

63. These observations were followed by agreed actions, most implemented by March 2022. These actions included: strengthening staff capacity; implementing mitigating actions to ensure a fair recruitment and oversight of vendors; improving beneficiary management through a digitalization plan and clear protocols for targeting and identification; a shift in transfers modalities (from vouchers to digital cash); and a clear strategy to overcome access constraints.[29] All progress and improvements realized by the Mali Country Office occurred while the impact evaluation was ongoing, so the evaluation is unlikely to record the positive gains resulting from these changes.

7.2 Programme implementation insights from qualitative data

64. Between December 2022 and January 2023, the evaluation team conducted ten focus group discussions (FGDs). The FGDs took place in the regions of Gao and Koulikoro, and helped to inform the preparation of the endline survey and add insights to complement or explain the main findings from the impact evaluation.

65. The FGDs covered comparison and programme communities. Among the ten planned FGDs, two were conducted in comparison villages and eight in programme villages, categorized based on the types of assets built. Each FGD featured a group size of six to eight participants, with the condition that all participants in programme communities came from households registered for FFA.

66. This section provides some insights from the FGD. These are not meant to be representative or generalizable to the whole programme area, but rather to provide some texture to the quantitative information on implementation, analysis, and interpretation of impact results.

FFA participation

67. In programme villages, the asset work was mainly carried out by individuals from the same village. In a few villages, the work on some assets was extended to neighbouring villages, located up to 5 km away. Participants from neighbouring villages were not involved unless additional workers were required. In one comparison village in Koulikoro, participants reported working on neighbouring village land, and they were paid for their work.

68. In Koulikouro, FGD participants reported that they worked on assets included dams, warehouses, water towers, road rehabilitation, or half-moons, and received some agricultural assets such as ploughs.

69. In Gao, participants in the FGD reported that they worked on assets such as dams, dune fixing, market gardens, water channels, and a cereal bank.

70. Participants mentioned numerous benefits of the completed assets, such as improved water access through the dam and wells, which supports local gardening and food security. An onion storage facility helped reduce crop spoilage and lessen the community's reliance on charcoal. The half-moons improved soil moisture retention, enabling successful crop growth in areas that previously struggled.

    The FGD participants' experiences in asset work varied greatly between locations, which supports monitoring data and survey findings that show inconsistencies during implementation. For example, some participants confirmed that the assets they worked on are completed. However, other FGD participants reported that the assets they started were not yet completed:

[28] World Food Programme. 2021. *Internal audit of WFP operations in Mali*.
[29] World Food Programme. 2022. *Follow-up review of the implementation of agreed actions from the 2021 internal audit of WFP operations in Mali - August 2022*.

Interviewer : Vous avez dit que vous réalisez des demi-lunes, mais elles ont été réalisées par le PAM ? Est-ce que ces demi-lunes ont été bien faites ?
Participant 4: Ces demi-lunes ont été bien faites.
Participant X: Elles permettent de garder l'humidité pendant plusieurs jours. Par exemple, il y a des endroits où les plantes ne réussissaient pas. Avec ces demi-lunes, les cultures ont réussi.

Interviewer: You mentioned building half-moons; were these constructed by WFP? Are these half-moons well made?
Participant 4: Yes, these half-moons were well made.
Participant X: They help retain moisture for several days. For example, there are areas where plants previously didn't thrive. With these half-moons, the crops have succeeded.

FGD: Kenekolo – Koulikoro

Participante 1: L'actif réalisé est le périmètre de maraichage qui n'est pas totalement fini.
Participante 2: Non, aucun actif n'est terminé.
Intervieweur: Si non, pourquoi ?
Participante 1: Selon moi le financement est venu en retard c'est pourquoi.

Participant 1: The asset completed is the vegetable garden area, which is not completely finished.
Participant 2: No, no assets are finished.
Interviewer: If not, why?
Participant 1: In my opinion, the funding arrived late, that's why.

FGD: Dioulabougou – Gao

Transfer modality

71. FGD participants mentioned that they had a WFP ration card to receive transfers at the start, but later they received money through electronic payment cards, especially LSS transfers. These shifts in transfer modalities led to some delays in transfer distribution.

Intervieweur: Quels ont été les inconvénients que vous avez ressentis en participant à ce projet ?
Participante 1: Les inconvénients sont le retard dans le payement des AGR et le manque d'information. Les AGR ont pris trop de temps avant d'être exécutés cela à pousser certaines personnes à penser que l'argent a été consommé par le chef de quartier.
Intervieweur: Les transferts et les travaux communautaires ont-ils été effectués au bon moment de l'année ?
Participante 2: NON, nous n'avons pas trouvé l'argent au bon moment.
Participante 1: Nous préférons recevoir l'argent dans un délai court et au bon moment.

Interviewer: What were the inconveniences you experienced while participating in this project?
Participant 1: The inconveniences are the delay in payment of income-generating activities and the lack of information. The income-generating activities took too long before being executed, leading certain people to believe that the money was consumed by the district chief.
Interviewer: Were the transfers and community work carried out at the right time of year?
Participant 2: NO, we didn't find the money was at the right time.
Participant 1: We prefer to receive the money quickly and at the right tim

FGD: Sossokoira – Gao

Use of transfers

72. FGD participants reported spending transfers primarily on food and on basic household items such as soap and oil. Some FGD participants reported sharing a portion of transfers with non-participant neighbours while also saving for future needs. Also, some FGD participants mentioned purchasing livestock to sell it later, and settling debts.

Nutrition support received

73. FGD participants reported that children were provided with Cereal Plus nutrition supplements. Breastfeeding women received nutrition assistance consisting of rice, sugar, oil, and soap, distributed four times concurrently with food distribution, from July to October2022. Pregnant women received pregnancy kits valued at CFA 15,000, which they collected every two months. To qualify for the pregnancy assistance kit, pregnant women needed to meet a simple criterion: regular attendance at medical check-ups, such as prenatal consultations.

School meals

74. FGD participants across programme and comparison groups reported that their children received school meals. Only one village mentioned that there was no school canteen in their village, and another village mentioned that, although there were plans to have a school canteen, this had not materialized.

75. Parents expressed support for these meals, noting that it reduced household expenses. FGD participants also highlighted the potential of a school canteen to encourage school attendance and increase enrolment, particularly among families facing financial constraints. However, some participants complained about the quality of rice used in the school meals and mentioned that sometimes their children refused to eat at school.

Lean season support

76. FGD respondents across programme and comparison groups reported receiving support during the lean season. Some individuals received 15,000 francs on an electronic payment card, but not all eligible people in each village received the monetary assistance during the lean season.

Rainfall shortages

77. FGD respondents across programme and comparison groups reported being affected by rainfall shortages in the previous year. As a result, they faced a range of significant challenges and issues. These included poor crop yields, food scarcity, elevated food prices, sales of livestock, and borrowing to secure food.

> **Participante**: Nous sommes toujours dans la difficulté causée par le manque de pluie. La hausse des prix des vivres est due au manque de pluie. Nous avons vendu nos bétails pour survenir à nos besoins urgents. Nous avons aussi emprunté des dettes pour acheter des vivres.
>
> **Participant:** We are still facing difficulties caused by the lack of rain. The increase in food prices is due to the lack of rain. We sold our livestock to meet our urgent needs. We also incurred debts to buy food.

8. Main findings

78. This section presents the main findings from the impact evaluation in Mali. Subsection 8.1 presents average impacts at endline (up to two years of programme implementation) on key outcomes including food security, psychological well-being, livelihoods and income-generating activities, household finance, and migration and remittances. Section 8.2 further analyses the effects of resilience programme for those eligible/ineligible for the COVID-19 Safety Net, and tries to isolate the impacts of the programme. Annex E contains the statistical results.

8.1 Average impacts two years after the start of the evaluation

Food security

79. **This section describes the impacts for the two main food security outcomes: the Food Consumption Score (FCS) and Food Insecurity Experience Scale (FIES).** The FCS shows how often households consume food items from different food groups during the seven days before the survey. The FCS ranges from a score of 0 to 112, where a higher FCS value implies better food security outcomes. FCS categories have been designed using the adjusted thresholds of Poor (FCS score between 0-28), Moderate (FCS score between 28.5-42) and Acceptable (FCS score above 42). The FIES score highlights the food insecurity a household experienced over the last 12 months, with food insecurity experiences including being worried about not having enough food, being unable to eat nutrition foods, eating a smaller variety of foods, having to skip a meal, eating less, running out of food, being hungry and not eating, and going a day without eating. The scale is reversed so that a maximum score of 8 indicates that a household has not had any of these experiences, and a score of 0 indicates that it has experienced them all.

80. **This impact evaluation finds positive but not statistically significant improvement in FCS and FIES at endline, two years after the start of the programme.** Figure 6 shows that the mean of the FCS was 39.96 in comparison villages. This indicates that villages in the comparison group experienced moderate food security. In contrast, the programme villages had a mean FCS score of 40.73. While the mean FCS is slightly greater in programme villages than in comparison villages, the difference (0.77) between the two is not statistically significant (see Table E2.1a, Annex E). Similarly, the mean FIES score was 2.95 in comparison villages, and 3.03 in programme villages, for an estimated impact of 0.08, which is not statistically significant. Since the COVID-19 Safety Net intervention was implemented in the same geographic areas as the integrated resilience programme, these results indicate that the resilience programme had no measurable impacts on food security outcomes above and beyond the safety net.

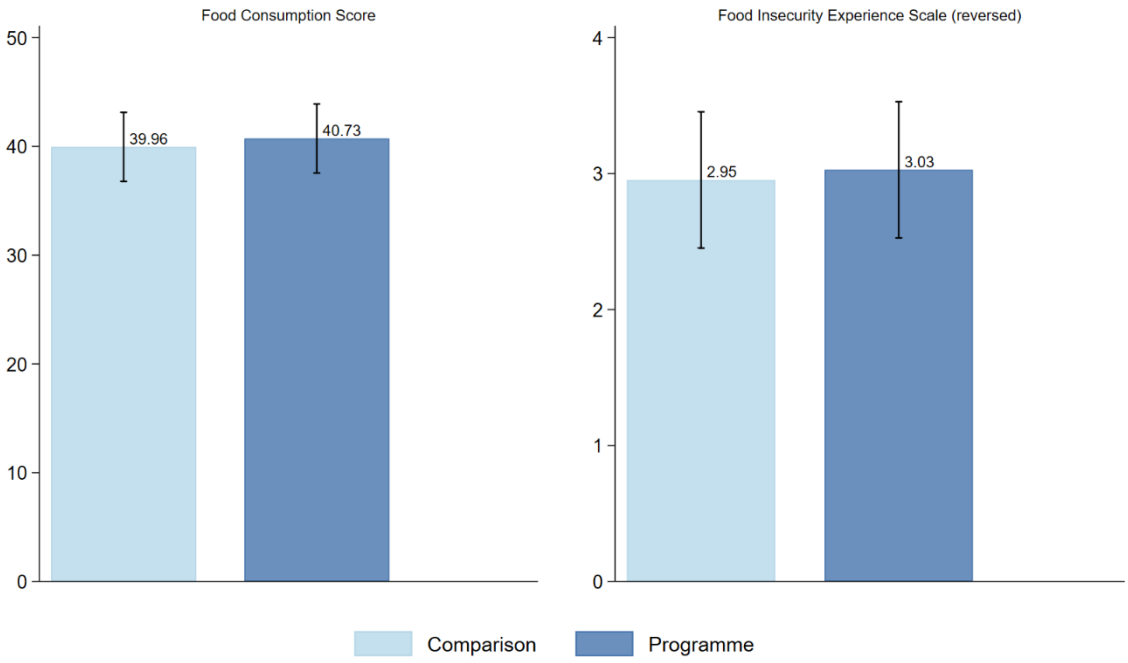
81. Since some of the programme and comparison villages are close to each other,[30] the evaluation also performed sensitivity checks to document the robustness of the results by considering only comparison villages that are further away, and as such less likely to be affected by potential spill-overs. Specifically, when excluding comparison villages that are less than 1.5 km away, the estimated impact of the FCS is 0.72 (similar to 0.73 in the full sample) and not statistically significant, while the estimated impact on the FIES score is 0.095 (similar to 0.075 in the full sample and not statistically significant).[31]

82. In comparison to results for the overall window, and in other countries that used the same impact evaluation approach for their resilience programme, the size of the estimated impact tends to be more muted, but not by much (see Figures 6 and 7). However, there is much more variation (i.e.

[30] In Niger the average distance was 3.1 km.
[31] Similar robustness checks were completed for other indicators but are not presented as the conclusions are similar.

wider confidence interval) around the estimated impacts in Mali. This pattern of results is consistent with the substantial observed variation in programme implementation over time and space documented in Section 6. So, it is possible that more consistent programme implementation would have led to less variation in the estimated impacts (i.e. narrower confidence interval), and we could measure statistically significant impacts on food security.

Figure 7: Impacts on food security

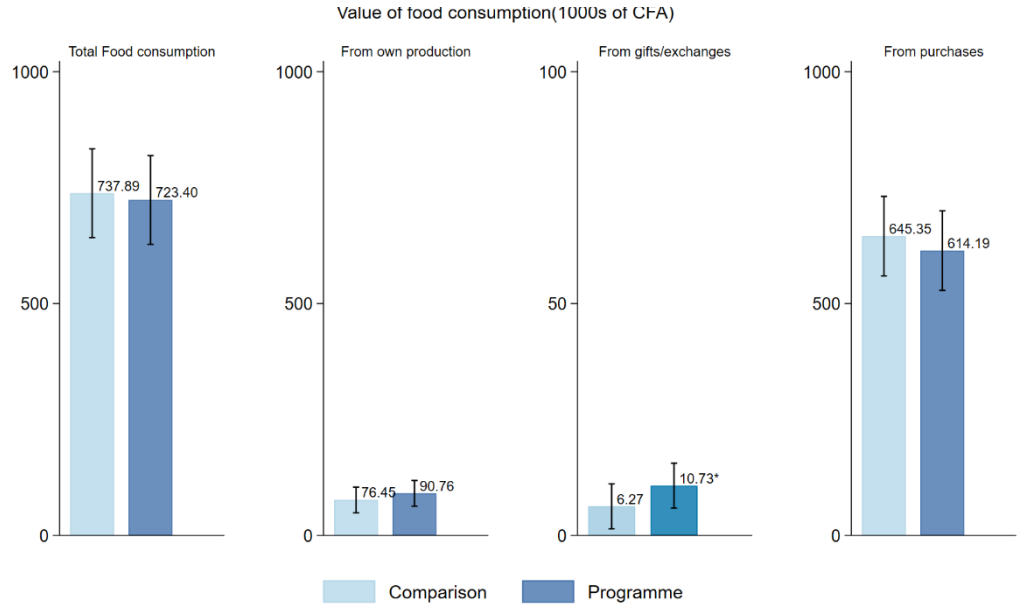


83. **The impact evaluation finds a small impact on the quantity of food consumed from gifts and exchanges, but does not find a significant impact on aggregate measures of consumption such as total food consumption, or food purchased or consumed from own production.** Total yearly food consumption amounts to CFA 737,890 in comparison communities, and CFA 723,396 in programme villages, for a small difference of CFA 15,000 that is not statistically significant, as shown in Figure 7. This impact on total food consumption is in line with the results on food security documented above.

84. When examining the components of food consumption, most of the food consumed is purchased or obtained from own production. The impact evaluation does not find a statistically significant difference between comparison and programme villages (Table E2.2 in Annex E).

85. However, the impact evaluation finds a small increase in food consumed from gifts and exchanges between community members, which is statistically significant. Specifically, households in the programme villages consume CFA 10,731 from gifts from others and exchanges made between community members, which is CFA 4,469 more than households in comparison villages. This suggests that the programme induced sharing of resources between community members.

Figure 8: Impacts on food consumption and its main components

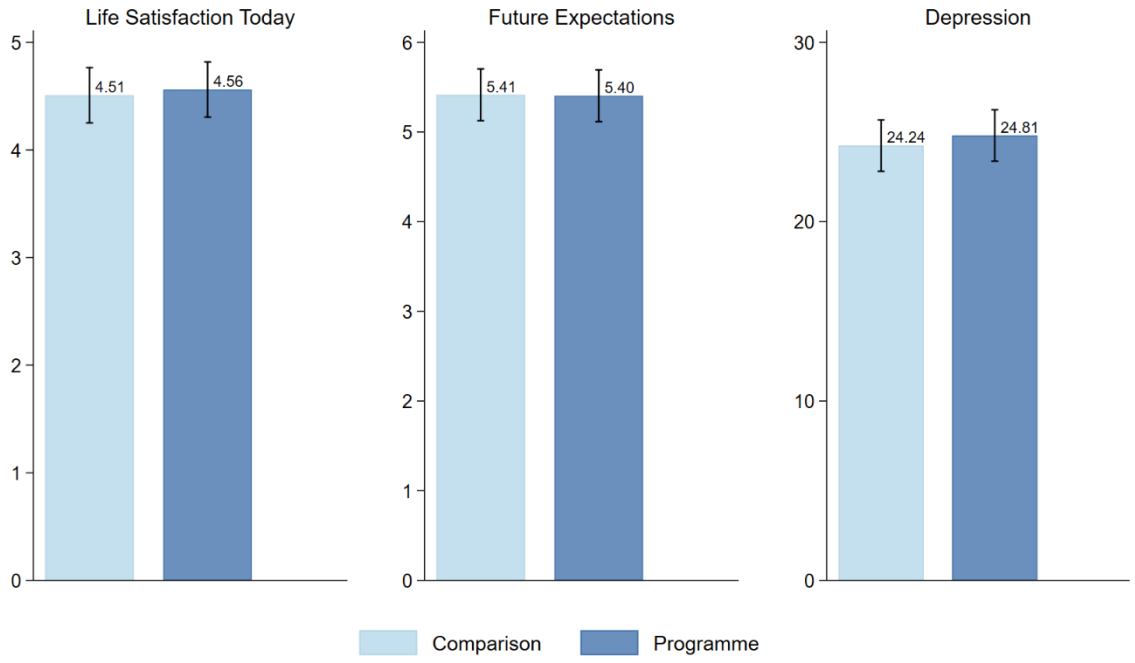


Psychological and social well-being

86. **The impact evaluation does not find statistically significant differences between programme and comparison villages on dimensions of psychological well-being** (Figure 8 and Table E2.3-E2.4 in Annex E). Psychological well-being is measured through a range of scales that were previously used in the Sahel by Bossuroy et al. (2022). It includes a MacArthur Scale of life satisfaction today (on a scale from 1 to 10, with 1 being the worst possible life and 10 being the best possible life), of social status (again on a ladder from 1 to 10) and an index of future expectations (measures of life satisfaction and social position for themselves and their children in two years, also on a scale from 1 to 10). Next it contains a self-efficacy scale, capturing the respondent's ability to solve problems or overcome difficult situations (minimum of 8 and maximum of 32, with higher numbers indicating higher self-efficacy). It also includes an index from a CES-D depression scale built from ten questions, such as the number of days over the last week the respondent felt bothered, sad, without energy, alone, etc.), with a minimum of 0 and a maximum of 70. Also related to depression, another measure captures disability due to symptoms of depression, such as not being able to do daily work, having a headache, and digestive problems, with a minimum of 0 and maximum of 28. The last measure is a stress index based on ten questions on the frequency of feelings of stress in life events, with a minimum of 0 and maximum of 40. For the depression, disability and stress scales, a higher value is associated with more symptoms of depression or stress.

87. Across the three main indicators of psychological well-being – life satisfaction today, future expectations, and depression – the impact evaluation does not find statistically significant impacts. The mean score for life satisfaction today was 4.51 in comparison villages, with a small but non-significant increase of 0.05 (4.56) in programme villages. For future expectations, the mean score was 5.41 in comparison villages, with a non-significant decrease of 0.01 (5.40) in programme villages. Regarding depression, the mean score was 24.24 in comparison villages, with a non-significant difference increase of 0.56 (24.81) in programme villages. These results, shown in Figure 8, are consistent with findings on economic measures of well-being, such as food security and consumption, which showed no significant improvements in programme villages compared to comparison villages.

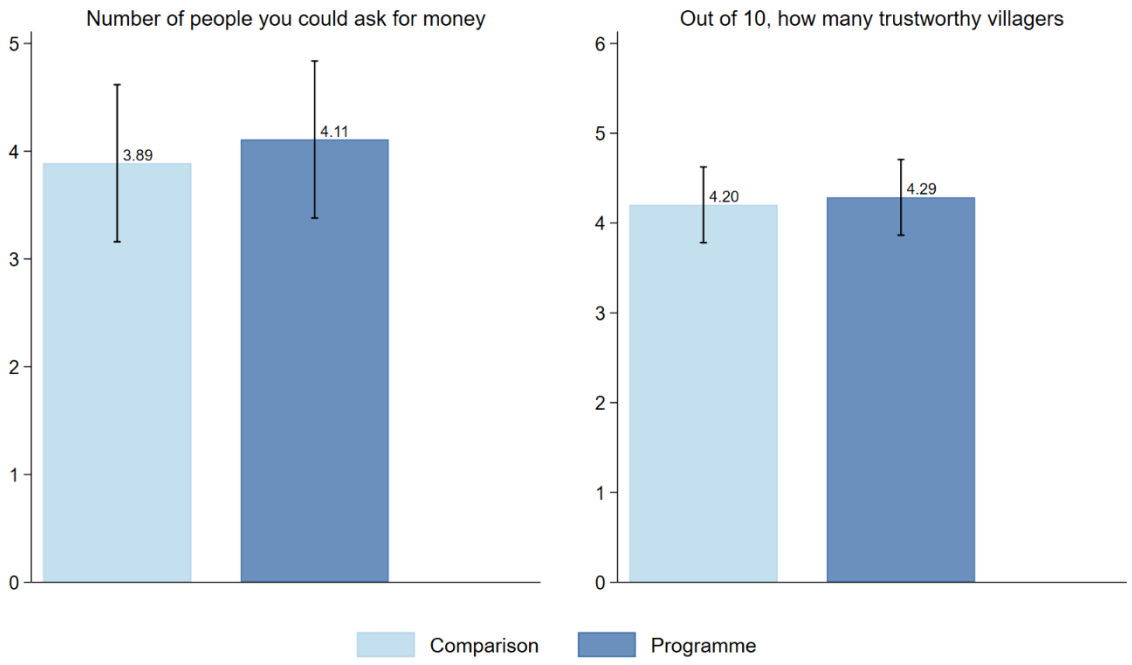
Figure 9: Impacts on psychological well-being



88. The evaluation measured impacts on dimensions of social well-being, which could also proxy some aspects of households' social capital that link to resilience capacities. These measures highlight households' ability to mobilize financial support, including: the number of people the respondent can ask for money in case of need; and measures of social cohesion, including trust in other community members. The last set of measures relates to collective action, including the number of groups the respondent is a member of, or the number of days spent volunteering for the community, and whether the recipient contributed to community projects.

89. **The impact evaluation does not find statistically significant impacts on social capital indicators** (Figure 9 and Table E2.4). Respondents reported that they could ask 3.89 people for money in case of needs in comparison villages, with a slight non-significant increase of 0.22 (4.11) in programme villages. The mean number of people in the village reported to be "trustworthy" was 4.20 in comparison villages, with a non-significance increase of 0.09 (4.29) in programme villages.

Figure 10: Impacts on social-well being



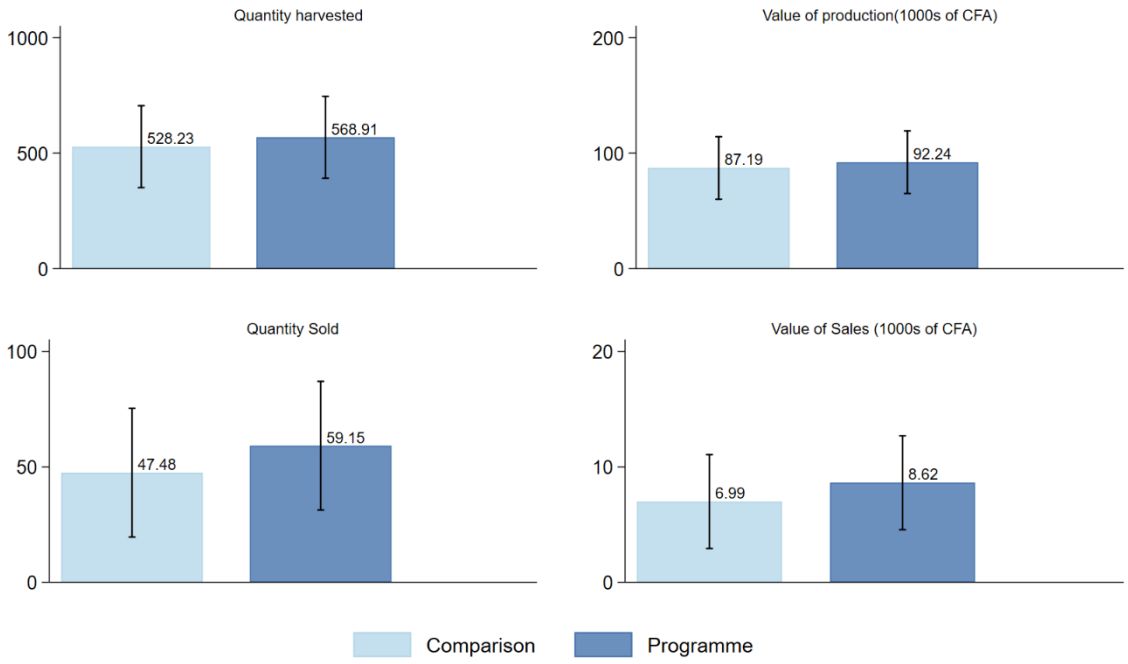
Impacts on income-generating activities and livelihoods

90. As discussed in Section 7, one of the pathways for improving resilience observed by impact evaluations in the window is through increased incomes. The impact evaluation therefore considers how the WFP resilience programme in Mali affected households' income-generating **activities and livelihoods. First, the focus is on agriculture, including quantity harvested, value of production, quantity sold and value of sales for all households** (Table E2.6a, Annex E), and then for the subset of households that cultivated land at endline (Table E2.6b, Annex E). **Second, livestock activities are analysed, including whether households hold livestock, how much, and of what type** (Table E2.7, Annex E). Lastly, the analysis covers involvement in off-farm household business activities, including whether households operate off-farm businesses, how many, and the revenues they generate (Table E2.8, Annex E).

91. **Across all households in programme villages, the impact evaluation does not find statistically significant changes in agricultural livelihoods or on the area cultivated and quantity harvested**. The quantities and values from crops harvested and sold are all slightly larger in programme villages relative to comparison villages, however, the differences between programme and comparison villages are not statistically significant (Figure 10).[32] The share of households cultivating land (59 percent) tends to be lower by 8 percent in programme village than comparison villages at endline.

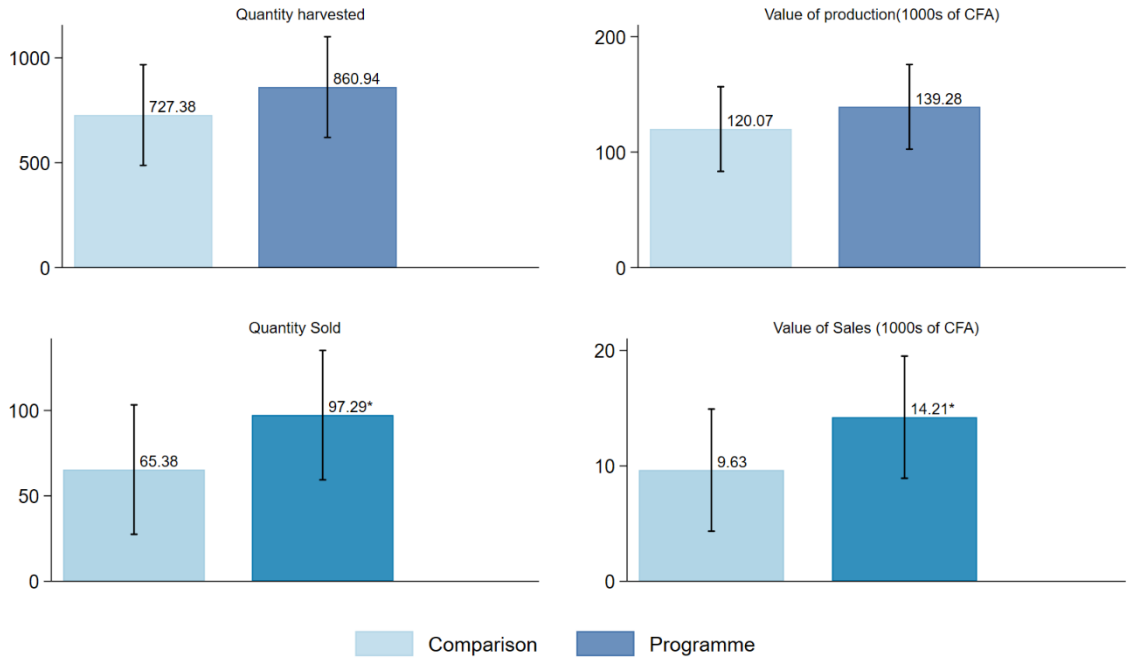
[32] The crops considered in the analysis are those that 80 percent or more households cultivate. These main crops are millet, cowpea, sorghum, rice paddy, and maize.

Figure 11: Impacts on agricultural livelihood outcomes (all households)



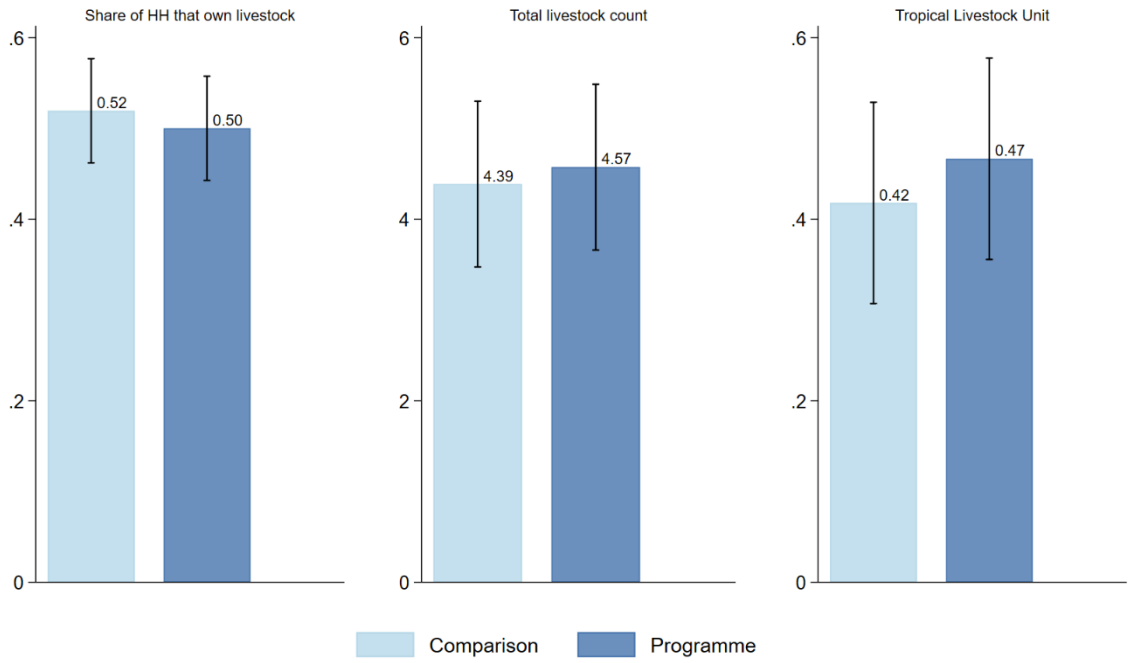
92. **However, the impact evaluation does find that, among the subset of households cultivating land, the resilience programme in Mali induced households to sell larger amounts to the market**. When focusing on the subset of households that cultivate land at endline, the quantity of main crops sold, and the value of sales from those crops, increases (significant at the 10 percent level) (Figure 11). The quantity sold increases from 65 kg in the comparison villages to 97 kg in the treatment villages, and the value of sales increases from CFA 9,630 to CFA 14,214 in the treatment villages. This indicates that, among cultivating households, the resilience programme induced households to sell larger amounts to the market.

Figure 12: Impacts on agricultural livelihoods outcomes (among those who cultivate land at endline)



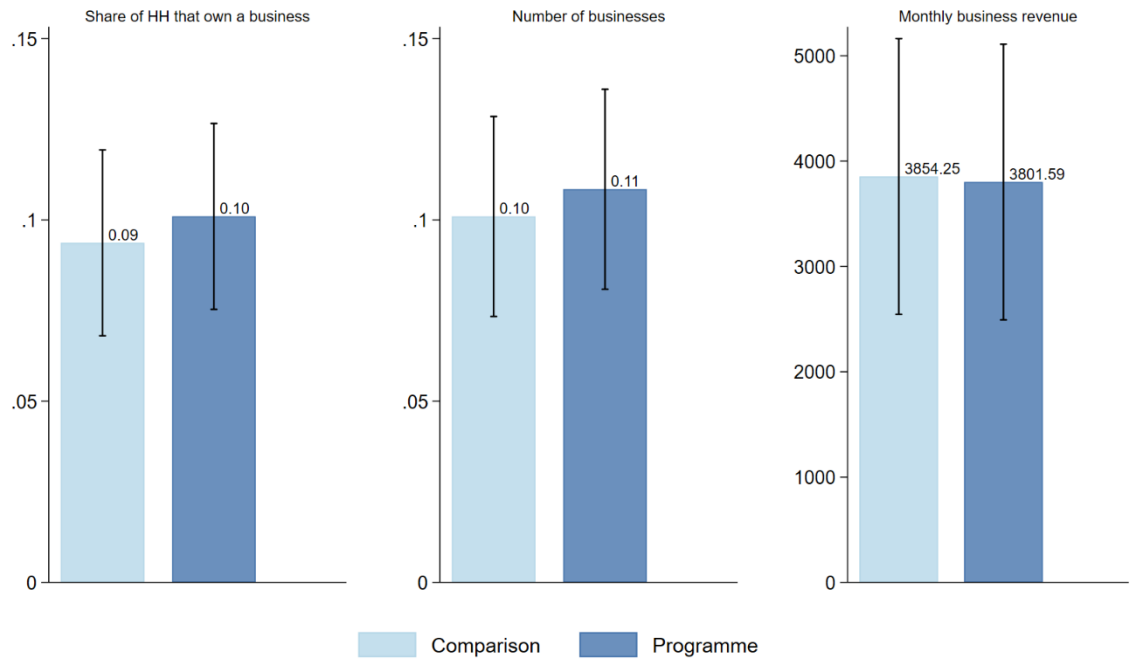
93. **The impact evaluation does not find statistically significant changes in households' livestock holding.** The share of households owning livestock is similar in comparison and programme communities (at around 50 percent). Households in programme villages have slightly more heads of livestock (4.57) than in comparison villages (4.39), such as chickens, goats and sheep, but differences are not statistically significant between programme and comparison villages. Similar patterns are found for a livestock index aggregating the various animals in tropical livestock units (Figure 12).

Figure 13: Impacts on livestock



94. **The impact evaluation does not find statistically significant changes in off-farm income-generating activities.** The share of households that operate off-farm income-generating activities is 10 percent in programme villages and 9 percent in comparison villages, a difference that is not statistically significant. The number of businesses is 0.10 in comparison villages, with an increase of 0.01 in programme villages. Monthly business revenue is CFA 3,854.25 in comparison villages, showing a slight decrease of CFA 52.66 in programme villages. These differences are not statistically significant, indicating that business revenues, profits, or assets are comparable across programme and comparison villages (Figure 13).

Figure 14: Impacts on off-farm income-generating activities

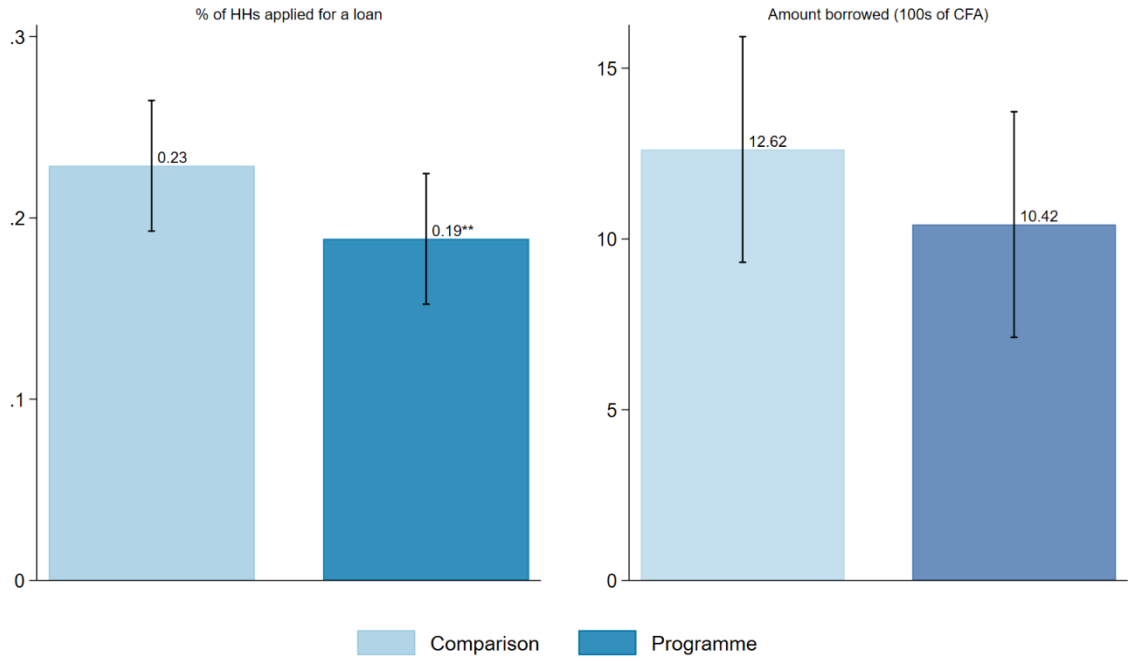


Impact on loans

95. **The impact evaluation finds that the programme reduces the share of households that seek loans**. The share of households applying for loans is 23 percent in comparison villages and 19 percent in programme villages, a statistically significant difference at the 5 percent level, indicating that the resilience programme improved household financial stability and reduced their need to borrow money (Table E2.11, Annex E). Households in the comparison group borrowed an average of CFA 12,620, while those in the programme group borrowed CFA 10,422, a reduction of CFA 2,198 on average, though this difference is not statistically significant due to high variance. In terms of other dimensions of financial behaviour, the impact evaluation does not find significant changes in household assets, savings, or transfers (Figure 14). [33]

[33] For those who obtained a loan, the amount borrowed averaged CFA 55,203.9 in the control group, with a reduction of CFA 2,696.2 for those in the programme group, which is not statistically significant. For those who save, the amount saved averaged CFA 7,461.9 in the control group, with a reduction of CFA 113.6 for those in the programme group, also not statistically significant. Similarly, for those who transferred cash, the amount transferred averaged CFA 35,977.7 in the control group, with a point estimate increase of CFA 3,550.4 for those in the programme group, which is not statistically significant.

Figure 15: Impacts on credit



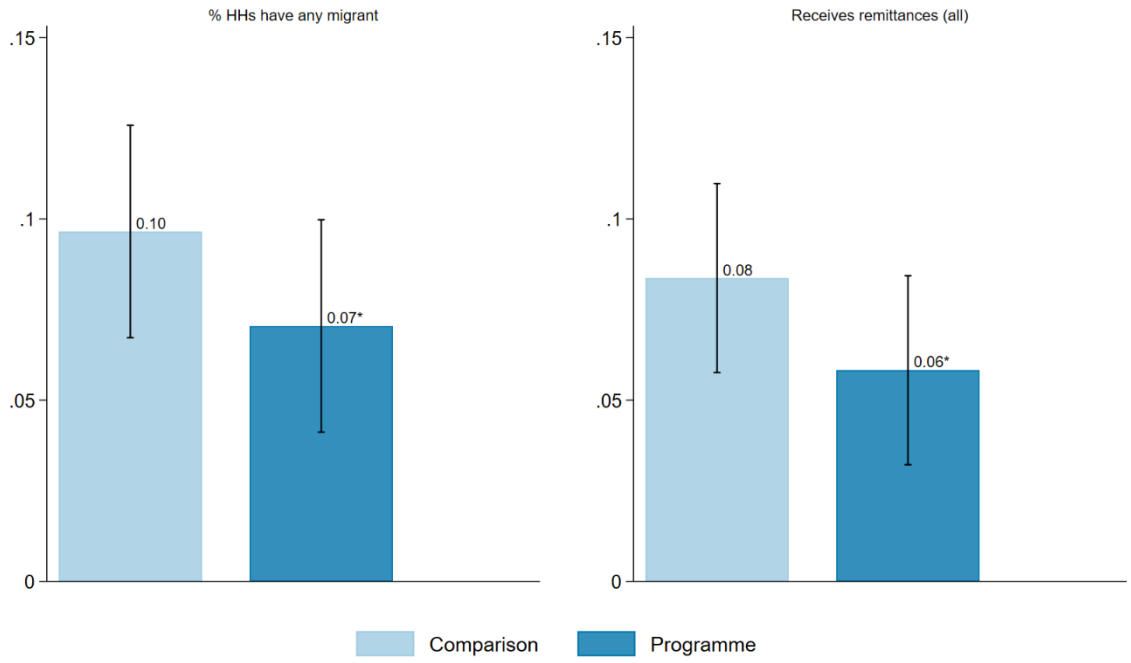
Impact on migration and remittances

96. The evaluation also looked at the impact on migration and remittances from internal and external migrants.

97. **The impact evaluation finds a statistically significant decrease in the share of programme households that have a migrant, and consequently in the share of programme households that receive any remittances in programme villages.** The share of households that have a migrant living elsewhere in the country or outside the country slightly decreases from 10 percent to 7 percent, inducing an impact that is statistically significant at the 10 percent level (Figure 15). Consequently, the share of households that receive remittances slightly decreases from 8 percent to 6 percent, an impact statistically significant at the 5 percent level.

98. These effects are driven by a reduction in households having an internal migrant (from 8 percent in the comparison group to 6 percent in the programme group) and receiving remittances from those internal migrants (from 7 percent in the comparison group to 5 percent in the programme group). An "internal migrant" refers to a household member living elsewhere in the country whereas an "external migrant" refers to a household member living outside the country (Table E2.12, Annex E). In contrast, no effect is observed on international migration. These results suggest that the programme reduced the need for households to migrate, possibly due to enhanced prospects in the communities and reduction of migration "push factors".

Figure 16: Impacts on remittances and migration



8.2 Unpacking the effects of the resilience programme for those eligible/ineligible for the COVID-19 Safety Net

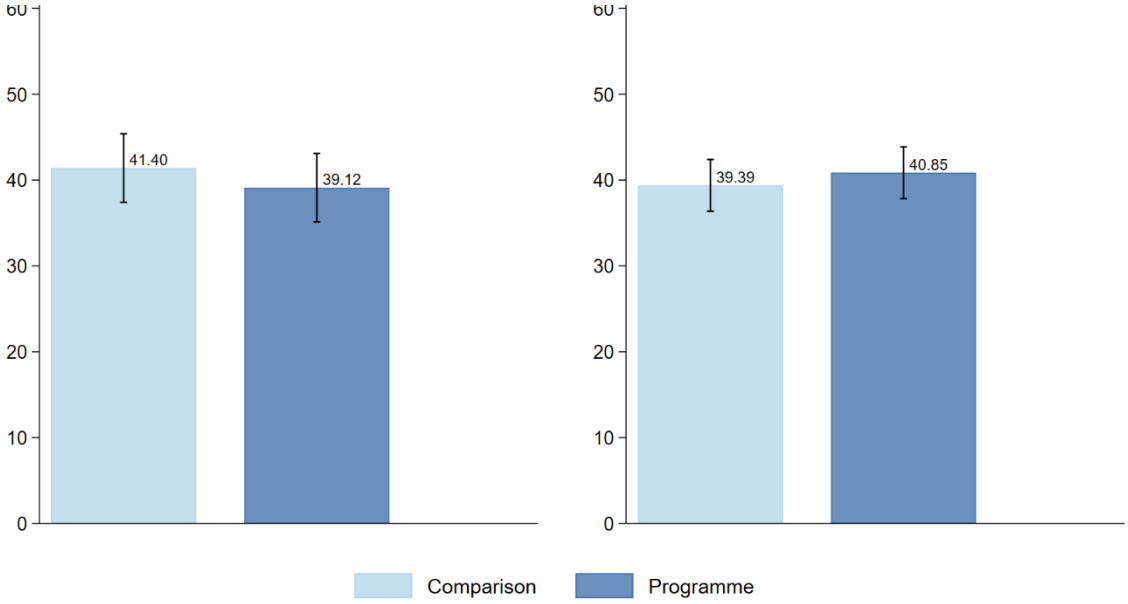
99. As mentioned in Section 8.1, the impact evaluation does not find statistically significant differences (impact) in measures of food security between programme and comparison communities up to two years. However, one of the specificities of the resilience programme in Mali relative to programmes in other countries is that it was layered on top of a COVID-19 Safety Net, as detailed in Section 2.

100. The COVID-19 Safety Net provided cash transfers to households in the bottom tercile of the FCS at baseline in both the resilience programme and comparison communities. As such, the impact evaluation is designed to measure the additional impact of the resilience programme above and beyond COVID-19 Safety Net support. The impact evaluation is also designed to separately estimate the effects for the poorest households (also targeted by the COVID-19 Safety Net) and the less-poor households (not targeted by the COVID-19 Safety Net). As such, we can examine whether the impact of the resilience programme is stronger among those (less-poor households), who were not eligible for the COVID-19 Safety Net.

101. **Differences between programme and comparison households tend to be greater when comparing household that were not eligible to receive the COVID-19 Safety Net. This suggests that the smaller impacts on the food security of poorer households can partially be explained by the COVID-19 Safety Net.** Figure 16 (built from Table E3.1, Annex E) suggests that the FCS is higher by 1.5 points among less-poor households eligible to the COVID-19 Safety Net in programme rather than in comparison communities. In contrast, the results suggest that there were no additional improvements in the FCS for poorer households t in the resilience programme compared with the households already covered by the COVID-19 Safety Net.

102. The COVID-19 Safety Net supported the poorest households in both the programme and comparison communities during the pandemic. These transfers could have met some of the immediate food needs of the poorest households, making any additional benefits of the resilience programme less significant in terms of measurable improvements in food security. As seen in Figure 16, when we disaggregate by poverty status, the difference in outcomes between programme and comparison communities appears smaller among the poorest compared to the less poor, although in both cases it is not statistically significant. The inconsistencies reported in programme implementation could help explain why households did not benefit from the same kinds of improvements in agricultural production or livelihoods measured in Niger and other countries in the impact evaluation window. The combination could help explain why the resilience programme in Mali has no statistically significant additional impact on food security after two years.

Figure 17: Impacts on food security by poverty status



8.3 Resilience and high-frequency results

103. In addition to baseline and endline surveys, impact evaluations in the Climate and Resilience Window collected high-frequency data to observe dynamic changes in outcomes. This section presents the results from documenting the impacts of the resilience programme on food security indicators over time, including across seasons and exposure to shocks. The statistical results are displayed in Table E6 and Annex E. It then complements the analysis with additional information on coping strategies and subjective resilience at endline, which provides additional information about the extent that the programme strengthened resilience and complement results on resilience capacities.

104. The evaluation documents the impact on food security shown by the FCS over time as households experience shocks and seasonal changes. At the end of the 2021 agricultural season, a drought occurred in the months before harvest. This was also the active period for resilience programme activities in the highest share of communities (see Figure 5). The high-frequency data indicates that food security deteriorated quickly around the same time across all communities. For instance, in the comparison villages, the FCS was 41.43 in September 2021, dropping to 37.44 by January 2022. The decline in food security was not as pronounced in programme villages compared to comparison

villages. While both groups saw a decrease in FCS, the drop was slower in the villages that were part of the resilience programme, going from 44.18 in September 2021 to 37.87 in January 2022. This suggests that the programme may have helped mitigate the rapid deterioration of food security.

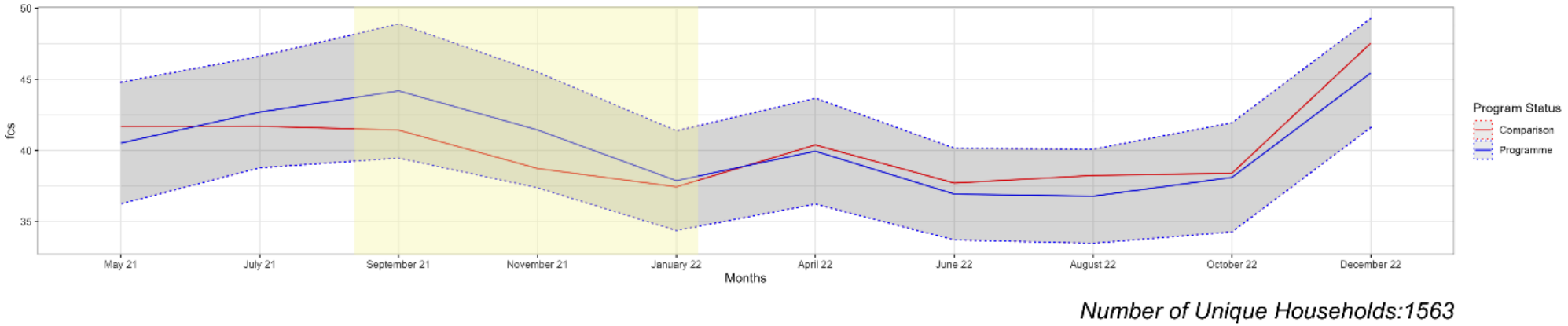
105. The slower deterioration in FCS also corresponds to the period when FFA was active in a larger share of communities (see Figure 5). The programme's impact – shown by the difference in FCS between the programme and comparison villages – was the largest during this period, although not statistically significant.

106. Figure 17 plots the average monthly FCS among programme and comparison groups throughout the study, while Figure 18 shows the impact of the programme on FCS – the horizontal line is zero, with the dots showing the relative difference between programme and comparison groups.

107. In 2022, the incidence of drought shocks was less acute. The pattern suggesting larger differences in food security between programme and comparison villages in the September–December period was not observed. Impacts on food security are close to zero throughout the year, including during the lean season, and immediately after harvest (Figure 18).

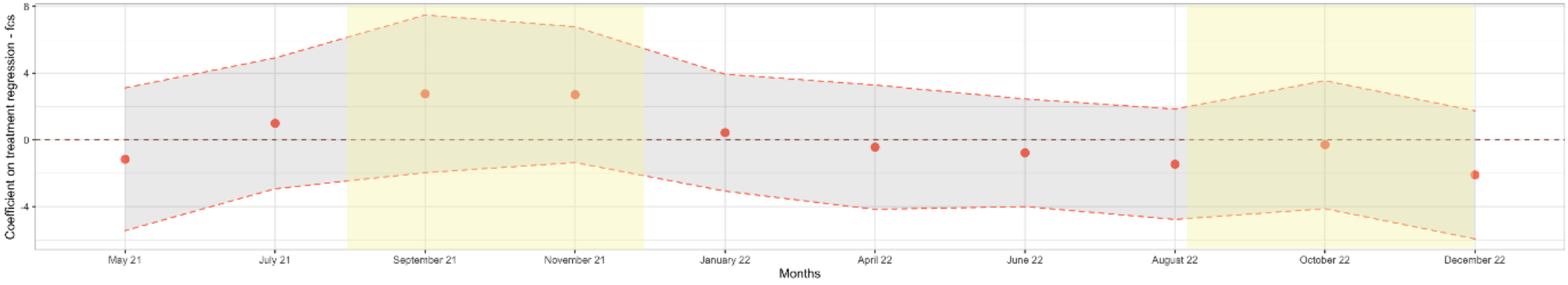
108. The evaluation shows the impact on subjective resilience and coping strategies (Table E2.15-E2.16 in Annex E). The subjective resilience scale captures whether households feel more resilient along ten dimensions, including: feeling like they can bounce back from challenges; deal with hardship; rely on support from family and friends; or are prepared for future threats. The scale generates a score: between 0 and 32 showing low resilience; between 33 and 65 medium resilience; and above 66 high resilience. The Livelihood Coping Strategy Index (LCSI) is constructed by pooling livelihood coping strategies intro three categories – Stress, Crisis, and Emergency – and taking the maximum value across these three components.

Figure 18: Food Consumption Score across months



Number of Unique Households:1563

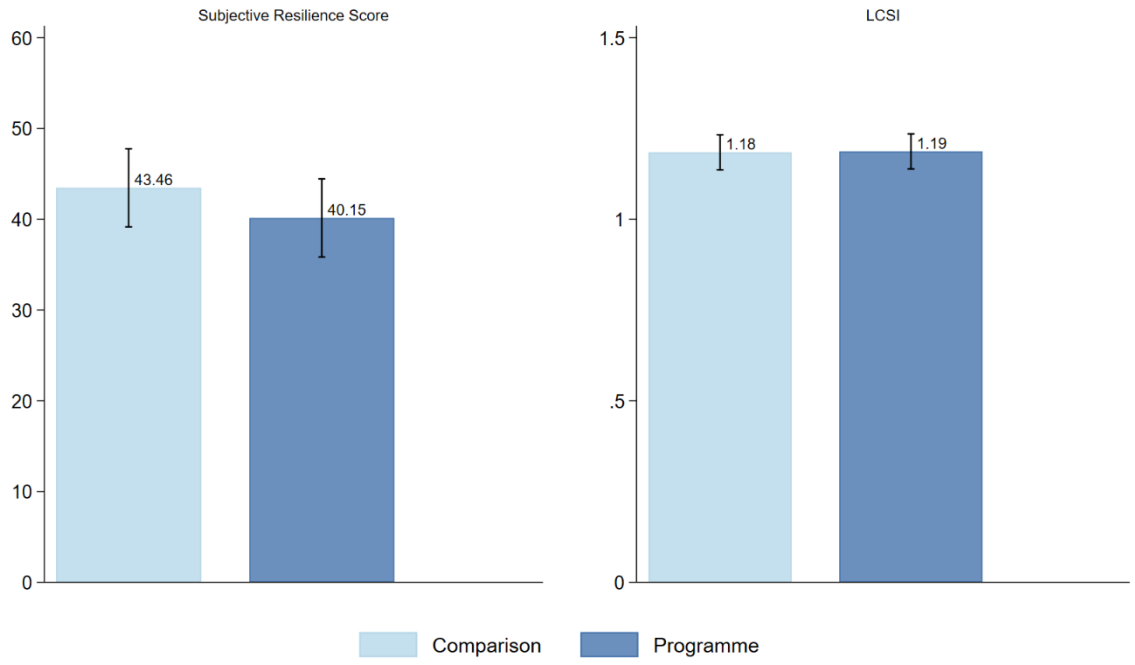
Figure 19: Impacts on food security across months



Number of Unique Households:1563

109. **The impact evaluation does not find an improvement in subjective resilience or in coping strategies after two years.** The results in Figure 19 show that the subjective resilience score and the use of coping strategies (LCSI) are similar between programme and comparison villages. The subjective resilience score is 40.15 in programme villages and 43.46 in comparison villages, a difference that is not statistically significant. The livelihood coping strategy index is also similar in both groups (around 1.18). These results suggest that the resilience programme did not significantly impact on subjective resilience, or the coping strategies employed by households after two years beyond what was already achieved through the regular COVID-19 Safety Net. Both groups reported similar levels of ability to access financial help or mobilize money from others in the community after experiencing shocks.

Figure 20: Impacts on subjective resilience score and LCSI



9. Key highlights

110. This impact evaluation investigates the impact of the Sahel Integrated Resilience Programme in Mali – including food assistance for assets (FFA), lean season support (LSS), smallholder agriculture market support (SAMS), nutrition/health, and education – on the food security, well-being, and resilience of households in the communities supported by WFP. Using a cluster randomized controlled trial (RCT) design, the impact evaluation compares households in villages where the integrated resilience programming was implemented, to a counterfactual group from comparison villages where the resilience programming was not implemented. In both sets of villages, a COVID-19 Safety Net also supported the poorest households, so that the impact evaluation measures impacts above and beyond the safety net.

111. Resilience is understood as a household's ability to adapt to its environment, absorb shocks and stressors, and transform its capacities. To measure changes in resilience, this impact evaluation combined comprehensive baseline and endline survey data, covering broad household capacities, with high-frequency data, measuring food security and well-being dynamics. We used high-frequency data to analyse impacts on food security indicators over time, including across seasons and during exposure to shocks. We further measured a broad set of household capacities related to livelihoods (such as agricultural production, asset ownership, off-farm income-generating activities) to understand the mechanisms that create impacts on food security dynamics and resilience. We also measured psychological and social well-being, which highlight other benefits beyond the food security and economic impacts of the intervention.

112. Based on the programme theory of change, we hypothesized that, in the short term, the WFP resilience programme would support people to maintain their food security by meeting households' immediate food needs, including those that may arise during a shock or during the lean agricultural season. In the medium term, the WFP resilience programme is expected to support households by strengthening capacities to improve food security more permanently, including when exposed to multiple or recurring shocks. For instance, these capacities include livelihoods, assets, savings, and social support.

113. Implementation of the resilience programme in Mali was challenging. The COVID-19 pandemic, widespread insecurity, and drought all created constraints for programme implementation. The start of the programme in targeted villages was delayed. During implementation, the WFP Country Office reported a notable variation in programme implementation across villages and over time. The start and duration of FFA work varied significantly across villages included in the impact evaluation, as did the timing of their implementation during the year. Other programme components were not consistently implemented everywhere, and certain components were active for a limited number of months. The country office also encountered delays in making cash transfers, and several assets were not completed by the time the endline data was collected. All these factors may have contributed to the impact evaluation measuring smaller impacts than found in other countries in the window. Following an internal audit conducted by WFP in 2021, the country office undertook ambitious steps to improve operations and strengthen programme implementation. However, this happened while the impact evaluation was already quite advanced, so it is unlikely to have recorded the positive gains in operations that resulted from these changes.

114. During the course of the study, there were implementation challenges that could have made it more difficult for the impact evaluation to detect programme impact. These challenges include adjustments in the process to target beneficiaries for the FFA component, a lower-than-expected number of households receiving FFA, and close proximity between some treatment and control villages.

115. In this context, the impact evaluation of the Integrated Resilience Programme in Mali does not find statistically significant differences in food security between programme and comparison communities after two years of the programme. Similar patterns are found on other dimensions of psychosocial well-being and on other economic outcomes, such as consumption and livelihoods.

116. The impact evaluation did find a small and statistically significant impact on the quantity of food consumed from gifts and exchanges. This suggests that the programme induced some sharing of resources between community members. The evaluation also finds a small and statistically significant increase in the value of sales among those who cultivate land at endline.

117. Using high-frequency data, the impact evaluation finds signs of greater impacts on food security between September and December 2021, around the time a drought shock occurred, and when a higher share of villages participated in FFA, which suggests that the programme helped households to absorb the effects of that shock. However, these effects were not statistically significant and were not apparent the following year. Also, the impact evaluation does not find an improvement in subjective resilience or in coping strategies after two years.

118. In Mali, the integrated resilience programme was layered onto a COVID-19 Safety Net delivered to the poorest households across the programme and comparison communities. The impact evaluation does not find impacts of the resilience programme on food security for either those eligible or ineligible for the COVID-19 Safety Net. However, impacts on food security tend to be higher among the (less poor) households ineligible for the COVID-19 Safety Net. This suggests that the lack of impact on food security for the poorest could be partially explained by the effects of the resilience programme being diluted by the safety net.

119. The impact evaluation in Mali shows impacts in dimensions that are distinct from the pathways observed in other countries in the Climate and Resilience Window. Results show that the programme reduces the share of households that seek loans. The evaluation also shows a slight decrease in households that have a (internal) migrant, and consequently in households that receive remittances in programme villages. These mechanisms are distinct from the main impact pathways through agricultural livelihoods and productivity observed in Niger and South Sudan. This may partly reflect the highly fragile setting for the resilience programme implementation in Mali.

10. Considerations for future programming

120. The impact evaluation shows mixed results from the WFP resilience programme in Mali after two years of implementation. It also finds scope for improvements that could further boost impacts on food security, livelihoods, and resilience capacities. The evaluation also identified factors that should be considered when delivering similar programmes in the future.

10.1 Strengthening programme implementation and monitoring

121. A first tier of considerations relates to programme implementation and monitoring. This is not directly based on the impact evaluation results, but links to variations in programme implementation observed during the impact evaluation period.

Consideration #1. Improve the programme monitoring system to track which households participate in specific programme components, and how much and when each household receives transfers.

122. A stronger household-level monitoring system would support a more consistent implementation of programme components. Household-level monitoring processes have been successfully put in place biometric registration in other WFP programmes in the Climate and Resilience Window (e.g. South Sudan). A key step would be to start from a comprehensive registry of households, each with unique identifiers. This could be tied to efforts to build a social registry in Mali as part of establishing a national adaptive social protection system. Once the list or registry of households has been made, the original list and identifiers could be used to implement targeting procedures and to document participation in programme components and receipt of transfers over time. This could also support better tracking of programme benefits and costs per household, which has not been possible to estimate to date.

Consideration #2. Ensure more robust and consistent implementation of programme components.

123. Administrative data shows variation in the degree of integration of programme components over time and space. If some components are not fully implemented or integrated as intended, programme impacts may be diluted. Although not guaranteed, more consistent quality of programme implementation may enhance impacts, and may also lead to higher predictability for households on the duration and timing of transfers.

Consideration #3. Ensure continued feasibility and capacity prior to and during the conduct of a rigorous impact evaluation

124. Section 3.5 highlights some implementation challenges and limitations that affected the impact evaluation. The WFP Mali Country Office requested the impact evaluation in response to strong donor demand, and the design was developed through in-country workshops and discussions. However, it became clear early in the process that monitoring systems and implementation needed to be strengthened, and the COVID-19 pandemic introduced significant new challenges. The decision to continue the IE despite these challenges was based on the Country Office's request.

However, WFP should re-consider pausing or stopping future impact evaluations once they are no longer feasible.

10.2 Testing options to improve the content of the resilience programme package

125. The impact evaluation findings from Mali suggest that programme adjustments could enhance the ability of households to manage ongoing stressors, (such as lean seasons), and further strengthen households' ability to deal with shocks. A range of programme content adjustments could be considered to potentially achieve larger, more permanent, or sustained impacts. To maximize their effectiveness, further testing and refinement of these adjustments would be worthwhile.

Consideration #4. Carefully reconsider which programme components are necessary to meet specific resilience objectives, and which could be adjusted for settings where implementation is challenging.

126. In highly fragile settings, where implementation capacity is limited and access to beneficiaries is more challenging, programmes could consider more streamlined packages of support that prioritize cash-based programming modalities over other components that are more difficult to implement. Multi-layered resilience interventions may have limited impacts if the various project components are not implemented in a cohesive way to the same beneficiaries. However, there is robust evidence for the positive impacts of cash transfers, even in fragile and conflict-affected settings.

Consideration #5. Consider whether some innovations could be introduced to achieve larger impacts at lower cost. Test such changes on a pilot basis and document their impacts before broader roll-out.

127. Under this consideration, we look at some suggestions based on the findings from Mali and a similar programme in Niger, as well as global evidence from similar settings. These suggestions are not formal recommendations, but rather an invitation to WFP programme teams to reflect on the results and identify a subset of potential improvements that could be tested on a pilot basis before being introduced more systematically.

128. The Mali programme could include a savings component to obtain stronger effects on savings, assets, and livestock, and help households smooth food security throughout the year. Village Savings and Loan Association, or other savings groups, have been shown to be appropriate and effective in the context of the Sahel (Bossuroy et al, 2021, Stoeffler et al. 2020). A savings group component could be added to the programme, and the distribution of savings timed with the beginning of the lean/planting season.

129. The Mali programme could further enhance support to off-farm livelihoods and diversification to achieve impacts on earning capacities at other times of the year. For instance, economic inclusion programmes have a stronger focus on livelihood diversification and off-farm income-generating activities, with large and sustained impacts on food security and livelihoods including in Niger (Bossuroy et al., 2021), Afghanistan (Bedoya et al., 2023) or India (Banerjee et al., 2021).

130. As results from other countries become available, the window will likely update its learning priorities for the future. The suggestions above can inform the next phase of learning as part of the window and for resilience policy more generally.

10.3 Measuring long-term impacts and cost-effectiveness

131. The impact evaluation documents up to two years of programme implementation, and would need a longer timeframe to assess whether these impacts will increase over time. One assumption behind the WFP resilience programme in the Sahel is that a multi-year engagement is needed to achieve sustained effects. The evaluation cannot yet test whether this assumption is supported in Mali.

132. At this stage, the evaluation was unable to undertake a formal cost-benefit analysis and assess whether the programme offers value for money. Future impact evaluations should include the planned collection of cost data from the beginning so that a cost-benefit analysis can be conducted. Also, not all of the possible benefits of the integrated resilience programme are captured in this evaluation. In particular, the environmental and ecosystem-level outcomes are beyond the scope of this report. For more information on these outcomes, see Mishra et al (2023).

The Office of Evaluation continues to generate evidence on resilience and published two evaluations in 2024: the Mali Country Strategic Plan Evaluation and the Sahel Corporate Emergency Response Evaluation.

The evaluation of WFP's emergency response to the prolonged crisis in the Sahel and Central Africa (2018–2023), which included Mali, found that WFP's resilience strategy, especially the layering and sequencing of activities is in line with national priorities. This has shown positive effects on food security and household resilience to climate shocks on average, especially in Sahelian countries where the integrated programme was significantly scaled up. However, full integration remains constrained by insecurity, limited flexible funding, donor earmarking, and internal organizational silos. Despite these challenges, early evidence points to promising outcomes in food security, agricultural production, and social cohesion, especially in conflict-affected "buffer zones".

The evaluation of Mali's Country Strategic Plan (2018–2023) found that WFP made considerable efforts to integrate resilience-building activities, particularly through partnerships with other UN agencies on joint projects. This approach contributed to delivering on WFP's "changing lives" agenda in Mali. However, the evaluation also highlighted that the intended programmatic integration of resilience and crisis response remained weak. The lack of clear operational arrangements and limited visibility of resilience results underscored the ongoing challenges in effectively implementing the humanitarian-development-peace nexus approach.

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Acronyms

AAHRPP	Association for Accreditation of Human Research Protection Programs
BMZ	German Federal Ministry for Economic Cooperation and Development
CBPP	community-based participatory planning
CSP	country strategic plan
DIME	Development Impact Evaluation (World Bank)
ECOWAS	Economic Community of West African States
FCS	Food Consumption Score
FFA	food assistance for assets
FGD	focus group discussion
FIES	Food Insecurity Experience Scale
IPC	Integrated Food Security Phase Classification
IRB	Institutional Review Board
ITT	intent to treat
LCSI	Livelihood Coping Strategy Index
LSS	lean season support
NGO	non-governmental organization
OEV	Office of Evaluation (World Food Programme)
PAP	Pre-analysis plan
RBC	Regional Bureau of West Africa
RCT	randomized controlled trial
SAMS	smallholder agriculture market support
SMART	Standardized Monitoring and Assessment of Relief and Transitions
UCT	unconditional cash transfer
WFP	World Food Programme

Annex A. Quantitative surveys

The questionnaires were developed with input from the World Food Programme (WFP) Country Office and extensively piloted with local communities in Mali to ensure that questions were gender sensitive and relevant to the context. The duration of the endline survey was approximately two hours. Data was collected using Android tablets running the SurveyCTO data collection software.

The impact evaluation team formulated extensive protocols to guide data collection for the enumerator teams. Training for enumerators was conducted in a classroom over two weeks and included field pilots. The training protocols included gender considerations such as involving female enumerators in the data collection process. Also, the pilot testing of the instruments made sure that the questions were gender sensitive.

During the data collection, high-frequency consistency and performance quality checks were conducted daily. These checks included flagging missing observations, duplicate observations, unusual survey duration, an unusual number of "no-consent" responses, and other inconsistent patterns in the data. Any anomalies were immediately pointed out to the Data Collection team for correction. To ensure that data collection met the highest data quality standards, the team also performed a set of back-checks. This refers to drawing a random 10–20 percent sample of households and revisiting them to validate some of their answers. Cross-checking the data allowed us to provide immediate feedback to the field teams in case of divergences or other problems. The data collection followed the agreed timeline with the country office, and no significant challenges were faced.

Of the total 4,841 households surveyed and kept in the sample at baseline, 4,498 (or 93 percent) of the households were surveyed at endline. This high response rate was achieved thanks to thorough data quality checks and field protocols.[34]

Table A1: Survey sample sizes

Phase	Sample frame	Response rate (of sample frame)
Baseline	4,893	99%
High-frequency survey	1,563	97%
Endline	4,842	93%

The team did not find significant differential attrition between the programme and comparison groups.

While specific outcomes are discussed in detail in Section 8 of the report, the main outcome categories of interest for the impact evaluation are as follows:

[34] The Baseline Report includes results for 4,841 households.

Table A2: Main outcomes of interest

Outcome type	Outcome name	Definition	Measurement level	Source
Primary	Consumption and food security	Food Consumption Score (FCS)/Food Insecurity Experience Scale (FIES)/consumption	Household/ individual	Baseline, endline, and high-frequency surveys
Secondary	Assets	Number and value of assets owned by the household from a contextually predefined list	Household	Baseline and endline surveys
Secondary	Income-generating activities	Participation in non-farm business, agriculture and livestock, or wage employment and revenue from these activities	Household/ individual	Baseline, endline, and high-frequency surveys
Secondary	Shocks and coping mechanisms	Shocks encountered by the household, including the severity of shocks, and coping strategies used Selection of shocks from a predefined list	Household/ individual	Baseline, endline, and high-frequency surveys
Secondary	Financial outcomes	Current savings levels, the number of loans they have taken and their current outstanding debt, insurance products currently owned, and cash transfers undertaken, including remittances	Household/ individual	Baseline and endline surveys
Secondary	Migration	Migration of household members	Household/ individual	Baseline and endline surveys
Secondary	Psychosocial well-being	Stress, life satisfaction, self-efficacy, aspirations, Center for Epidemiological Studies Depression Scale.	Household/ individual	Baseline and endline surveys
Secondary	Women's empowerment	As defined by Cash-based transfer/gender window (normative and positive time use and agency)	Household/ individual	Baseline and endline surveys
Secondary	Social capital	Social cohesion, closeness of community index, financial support index, collective action index	Household/ individual	Baseline and endline surveys

Annex B. Qualitative surveys

Before endline data collection, qualitative data collection was carried out from December 2022 to January 2023, approximately one month after the last round of high-frequency data collection. The evaluation team conducted ten focus group discussions (FGDs), to inform the endline questionnaire design and gather insights that could complement and/or explain the main results observed from the quantitative findings.

FGDs were held in the regions of Gao and Koulikoro. Two FGDs were conducted in comparison communities and eight in programme communities, and were organized according to the types of food assistance for assets (FFA) that villages were engaged in: four FGDs with assets related to agriculture/soil management; two FGDs with assets related to water resources or fishing; one FGD with assets related to reforestation, pastoral land, or "other"; and one FGD with assets related to agriculture/soil management.

Eight FGDs included both males and females, while for gender inclusion, two FGDs consisted of female participants only. For programme villages, each FGD featured a group size of six to eight participants, with the condition that all participants in programme communities came from households registered for FFA.

The evaluation team avoided conducting FGDs in communities with a high risk of conflict. Incentives for participants were aligned with what was provided during high-frequency surveys.

Teams conducting FGDs consisted of the impact evaluation field coordinator and a note-taker from the survey firm.

The interviews focused on the following thematic areas: awareness of or experience participating in the integrated resilience programme; participation in FFA; targeting, timing, frequency and modality of lean season support, nutrition and school feeding interventions; resilience capacities; and changes in beneficiaries' activities and outcomes. In addition, in programme communities, the evaluation team asked about the assets built and how participants were benefiting from the assets.

All FGDs were transcribed in French.

Annex C. Estimation

The impact evaluation analysis is aligned with the pre-analysis plan registered with the American Economic Association's registry for randomized controlled trials. The pre-analysis plan includes detailed information on primary outcomes, research design, randomization method, randomization unit, clustering, sample size (total number, number of clusters, and units per intervention arm), and regression specifications. The purpose of the pre-analysis plan is to outline the set of hypotheses and analyses that will be performed on the data before it is collected, ensuring transparency of the process.

To estimate the impacts of the resilience programme on the different outcomes of interest (primary and secondary outcomes), we run the following specification:

$$Y_{ht} = \beta_0 + \beta_1 \text{TREATMENT} + X_{h0} + \varepsilon_{ht} \quad (1)$$

Where Y_{ht} is the outcome variable; programme is an indicator for whether a village is mapped to a site that was assigned to receive the integrated resilience programme; X_{h0} is a vector of controls which includes baseline variables (including the baseline outcome when available and other baseline controls selected through a double-selection LASSO procedure), and randomization strata (commune and asset type). The primary coefficient of interest is β_1 which captures the estimated impact on households in villages assigned to the resilience programme. We cluster standard errors at the community level, given that sampling was stratified per village.

Annex D. Baseline characteristics

To document the composition of the households in the sample (e.g. age, sex, etc.) we summarize household demographic characteristics. The majority of households in the Mali sample are headed by a male with no education. Annex Table 3 shows that 24 percent of households are headed by a female. Only 18 percent of all household heads have completed primary education. As shown below, there are, on average, about seven members per household. A household in the sample typically owns approximately two assets. Mobile phones, carpets, mattresses, and chairs were the most common assets owned by households.

Table A3: Household characteristics in Mali

	Mean	SD	N
Head of household			
% female household head	23.76	42.57	4,714
% household heads with any primary education	18.18	38.57	4,686
Household size	6.62	3.65	4,714
Household			
% household with school-age children enrolled in school	30.00	34.81	4,118
Total household assets owned by household	2.09	1.98	4,714
Total farm assets owned by household	3.04	1.92	4,714
% households with a member who migrated	18.70	38.99	4,691
Food Consumption Score (FCS)			
FCS	32.72	21.75	4,665
% FCS poor (0-28)	51.32	49.99	4,714
% FCS borderline (28.5-42)	16.97	37.54	4,714
% FCS acceptable (Above 42)	31.71	46.54	4,714
Shocks and coping strategies			
Number of shocks experienced	2.81	1.96	4,714
Number of coping strategies used	1.43	1.71	4,714
Agriculture			
% households growing crops in main agriculture season	88.27	32.18	4,714

Note: Categorical variables are displayed as yes/no variables where a respondent answering "yes" ascribes a value of 1, and "no" a value of 0. The mean value represents the proportion of the sample that belongs in a given category. For example, 24 percent of the sampled heads of household are women. FCS ranges from 0 to 112. Higher FCS values imply better food security outcomes. FCS categories have been designed using the adjusted thresholds of Poor (0-28), Moderate (28.5-42) and Acceptable (above 42), following the recommendation of the World Bank country offices. Households were asked about 22 coping strategies. Specific topics asked about ere: reduction in food consumption, spending savings, selling livestock or food stock, withdrawing children from school, reducing health/education expenditure; the remaining strategies were part of a longer list that households could self-report. For more details on the main outcomes at the baseline, see the full Baseline Report

Annex E. Baseline balance and quantitative analysis

E1: Baseline balance between treatment and control group

	Mean Treatment	SD Treatment	Mean Control	SD Control	Mean difference	t-test	p-values
HH size	5.87	3.46	6.06	4.03	-0.19	(-1.78)	(0.07)
% Female HH head	13.70	34.39	13.31	33.97	0.39	(0.40)	(0.69)
Total HH assets owned by HH	1.91	1.95	1.79	1.84	0.12*	(2.28)	(0.02)
Total Farm assets owned by HH	0.74	1.46	0.74	1.38	-0.01	(-0.17)	(0.86)
% of HH head employed in the last 12 months	0.19	0.40	0.19	0.39	0.01	(0.46)	(0.65)
% of adults employed in the HH in the last 12 months	11.44	23.79	11.73	24.65	-0.29	(-0.42)	(0.68)
Per capita HH wage income (Monthly)	9795.03	144763.16	8727.63	86997.30	1067.40	(0.31)	(0.75)
HH revenue from crops sales (Annual)	29.15	72.39	23.11	63.03	6.04**	(3.10)	(0.00)
Livestock count	3.86	8.00	3.04	6.97	0.82***	(3.79)	(0.00)
" Profit from sold livestock and products	2.72	13.40	1.89	10.89	0.83*	(2.38)	(0.02)
Food Consumption Score (FCS)	36.80	20.41	37.51	21.09	-0.71	(-1.18)	(0.24)
Household Dietary Diversity Score (HDDS)	6.12	2.42	6.15	2.43	-0.03	(-0.44)	(0.66)
Food Insecurity Experience Scale (FIES)	3.79	3.43	3.74	3.43	0.05	(0.49)	(0.63)
% Minimum Dietary Diversity for Women (MDD-W)	10.02	30.06	9.00	28.64	1.02	(0.55)	(0.58)

Continued

	Mean Treatment	SD Treatment	Mean Control	SD Control	Mean difference	t-test	p-values
HH total consumption - Monthly	41978.94	41101.44	42784.65	43122.31	-805.71	(-0.66)	(0.51)
Food Expenditure Share (FES %)	64.85	24.58	65.90	24.16	-1.05	(-1.50)	(0.13)
Per-capita total consumption - Monthly	8433.02	8929.64	8569.69	9070.75	-136.67	(-0.53)	(0.60)
Life satisfaction today (1-10)	4.02	1.68	4.09	1.74	-0.07	(-1.48)	(0.14)
Cohens stress index (0-40)	19.38	4.10	19.05	4.39	0.33**	(2.65)	(0.01)
Female Locus of Control (0-10)	5.57	1.57	5.35	1.52	0.21	(0.66)	(0.51)
Number of shocks experienced	2.51	2.62	2.28	2.23	0.23***	(3.32)	(0.00)
Number of coping strategies used	0.51	1.19	0.61	1.28	-0.10**	(-2.88)	(0.00)
% of HHs used any savings mechanism	9.65	29.53	9.91	29.88	-0.26	(-0.30)	(0.76)
% of HHs applied for a loan	10.72	30.94	8.91	28.50	1.80*	(2.11)	(0.03)
% HH received remittances (from HH member)	60.00	49.37	59.26	49.60	0.74	(0.08)	(0.94)
% of HHs received financial and non financial-transfers	1.79	13.25	2.07	14.23	-0.28	(-0.71)	(0.48)
Financial support index (FZ-score)	-0.04	0.96	0.00	1.00	-0.04	(-1.46)	(0.15)
Social cohesion and closeness to community Z-index	0.01	1.02	-0.01	0.98	0.03	(0.96)	(0.34)
Groups and collective action index (Z-score)	3.65	117.75	0.00	1.00	3.65	(1.55)	(0.12)
Observations	2519		2322		4841		

E2.1a: Average (ITT) impacts at endline

	(1) FCS	(2) FIES
Treatment Assignment	0.734	0.0746
	(1.594)	(0.252)
Observations	4411	4140
Control Mean	39.96	2.953
Lasso Controls	Yes	Yes
Region FE	Yes	Yes

This table reports treatment effects on FCS (Food Consumption Score) and reversed FIES (Food Insecurity Experience Scale. FCS is winsorized at the 99th percentile. Standard errors have been clustered at the village level and region fixed effects have been included.
*** p<0.01, ** p<0.05, * p<0.1

E2.1b: Secondary food security indicators

	(1)	(2)	(3)	(4)	(5)	(6)
	HDDS	FCS-N	MDD-W	MDD-C	MFF-C	MAD-C
Treatment Assignment	-0.0732	-0.0581	-0.0452	-0.0691**	0.0216	-0.0161
	(0.232)	(0.849)	(0.0343)	(0.0333)	(0.0451)	(0.0215)
Observations	4452	4409	2121	488	488	488
Control Mean	6.619	11.50	0.190	0.148	0.271	0.0551
Lasso Controls	Yes	Yes	Yes	Yes	Yes	Yes
Region FE	Yes	Yes	Yes	Yes	Yes	Yes

This table reports treatment effects on Household Dietary Diversity (HDDS), Food Consumption Score - Nutrition (FCS-N).Minimum Dietary Diversity for Women (MDD-W),Minimum Dietary Diversity for Children (MDD-C), Minimum Meal Frequency for children (MFF-C), Minimum Acceptable Diet for children (MAD-C) Standard errors have been clustered at the village level and region fixed effects have been included. *** p<0.01, ** p<0.05, * p<0.1

E2.2: Consumption

	(1)	(2)	(3)	(4)	(5)	(6)
	Total Consumption	Non-Food	Food	From own production	From gifts/exchanges	From purchases
Treatment Assignment	-42366.2	-25762.5	-14494.1	14313.0	4459.3*	-31155.7
	(72916.4)	(32172.8)	(48182.0)	(13967.3)	(2439.8)	(43158.7)
Observations	4498	4362	4498	4498	4498	4498
Control Mean	1045527.6	311554.5	737889.9	76451.6	6271.3	645348.7

Lasso Controls	Yes	Yes	Yes	Yes	Yes	Yes
Region FE	Yes	Yes	Yes	Yes	Yes	Yes

This table reports treatment effects on value of food consumption, non food consumption and total consumption. Value of food consumption includes value of consumption from own production, consumption from gifts and exchanges, and consumption from purchases. All values are winsorized at the 98th percentile. Quantities of food consumption from own production, consumption from gifts and exchanges, are winsorized at the 95th percentile. Standard errors have been clustered at the village level and block fixed effects have been included. *** p<0.01, ** p<0.05, * p<0.1

E2.3: Psychological well-being

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Life satisfaction today	Subjective social status	Future expectations	Satisfaction with life scale	Self-efficacy	Depression	Disability	Cohen's stress index
	(1-10)	(1-10)	(1-10)	(5-25)	(8-32)	(0-70)	(0-28)	(0-40)
Treatment Assignment	0.0527	0.0464	-0.0103	-0.0786	-0.180	0.563	0.362	0.132
	(0.129)	(0.140)	(0.145)	(0.421)	(0.517)	(0.720)	(0.312)	(0.268)
Observations	4449	4425	4498	4319	4305	4109	4242	4259
Control Mean	4.508	4.243	5.414	12.32	21.13	24.24	7.598	18.98
Lasso Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Region FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Table includes a MacArthur Scale of life satisfaction today (on a scale from 1 to 10, with 1 being the worst possible life and 10 being the best possible life), a scale of social status (1 to 10) and an index of future expectations (measures of life satisfaction and social position for respondents and their children in two years, on a scale from 1 to 10). The self-efficacy scale captures the respondent's ability to solve problems or overcome difficult situations (8 to 32, with higher numbers indicating higher self-efficacy). The depression scale from the Center for Epidemiologic Studies Depression (CES-D) ranges from 0 to 70 (higher values meaning more depression). The disability scale ranges from 0 to 28 and the Cohen's stress index ranges from 0 to 40, with higher numbers meaning more stress. Standard errors have been clustered at the region level and block fixed effects have been included. *** p<0.01, ** p<0.05, * p<0.1

E2.4: Social well-being

	(1) Number of people you could ask for money	(2) Count on community for financial help (0/1)	(3) Probability of raising money (0/1)	(4) Count on community for personal help (0/1)	(5) Out of 10, how many trustworthy villagers	(6) Community wants to undermine your success (0/1)	(7) Tension between community in last 6 months (0/1)	(8) Closeness to community (0/1)	(9) N social groups member of	(10) N days spent volunteering	(11) Work towards community projects (0/1)
Treatment Assignment	0.220	-0.0317	-0.0299	-0.0260	0.0832	0.00253	0.00264	-0.0350	0.00577	-0.0993	-0.0565
	(0.362)	(0.0321)	(0.0352)	(0.0312)	(0.212)	(0.0332)	(0.0307)	(0.0346)	(0.0330)	(0.202)	(0.0353)
Observations	1366	4288	4498	4164	4315	2751	3259	4315	4498	4498	4498
Control Mean	3.888	0.595	0.383	0.633	4.203	0.359	0.285	0.378	0.377	1.381	0.719
Lasso Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Region FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Number of people you could ask for money and the number of social groups have been winsorized at the 98th percentile. Standard errors have been clustered at the village level and region fixed effects have been included. *** p<0.01, ** p<0.05, * p<0.1

E2.5: Agriculture – Participation and inputs

	(1) Cultivated land	(2) Cultivated in rainy season	(3) Cultivated in dry season	(4) Used fertilizers	(5) Used pesticides	(6) Used paid labor
Treatment	-0.0826**	-0.0503	-0.000243	-0.0381	-0.00588	-0.00532
	(0.0314)	(0.0419)	(0.0156)	(0.0286)	(0.0207)	(0.00785)
Observations	4325	4325	4267	4218	4318	4325
Control Mean	0.726	0.497	0.0399	0.163	0.0832	0.0298
Lasso Controls	Yes	Yes	Yes	Yes	Yes	Yes
Region FE	Yes	Yes	Yes	Yes	Yes	Yes

Standard errors have been clustered at the village level and region fixed effects have been included. *** p<0.01, ** p<0.05, * p<0.1

E2.6a: Agriculture – main crops

	(1) % HHs cultivating crops	(2) Area Cultivated	(3) Quantity Harvested	(4) Value of Production	(5) % HHs selling crops	(6) Quantity sold	(7) Value of sales
Treatment	-0.0806**	0.0165	40.68	5041.2	-0.0000896	11.67	1631.0
	(0.0362)	(0.102)	(89.22)	(13643.2)	(0.0281)	(14.02)	(2045.0)
Observations	4325	4325	4325	4325	4276	4325	4325
Control Mean	0.678	0.966	528.2	87194.8	0.141	47.48	6993.7
Lasso Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Region FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Table shows values for main crops including Millet, Cowpea, Sorghum, Rice-Paddy, and Maize. Area cultivated is in hectares. Quantity harvested and sold are in kg per household. Value of production and sales are in FCFA. Standard errors have been clustered at the village level and region fixed effects have been included. All values are winsorized at 98th percentile. *** p<0.01, ** p<0.05, * p<0.1

E2.6b: Agriculture – Main crops – Conditional on those households cultivating land

	(1) % HHs cultivating crops	(2) Area Cultivated	(3) Quantity Harvested	(4) Value of Production	(5) % HHs selling crops	(6) Quantity sold	(7) Value of sales
Treatment	-0.00356	0.154	133.5	19206.9	0.0435	31.91*	4583.9*
	(0.0220)	(0.134)	(121.1)	(18445.3)	(0.0346)	(19.05)	(2661.9)
Observations	2955	2938	2938	2955	2936	2955	2955
Control Mean	0.933	1.328	726.1	120068.7	0.193	65.38	9630.5
Lasso Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Region FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Conditional on HH cultivating land, table shows values for main crops including Millet, Cowpea, Sorghum, Rice-Paddy, and Maize. Area cultivated is in hectares. Quantity harvested and sold are in kg per household. Value of production and sales are in FCFA. Standard errors have been clustered at the village level and region fixed effects have been included. All values are winsorized at 98th percentile. *** p<0.01, ** p<0.05, * p<0.1

E2.7: Livestock

	(1) Owned livestock	(2) Revenues from livestock sales	(3) Livestock Index (TLU)	(4) Total livestock count	(5) N chickens	(6) N goats	(7) N other animals	(8) N sheeps
Treatment Assignment	-0.0190	865.1	0.0487	0.186	-0.0546	0.401	-0.0472	0.108
	(0.0288)	(1472.4)	(0.0552)	(0.460)	(0.185)	(0.333)	(0.0542)	(0.153)
Observations	4485	4498	1358	4459	4498	1357	4498	4497
Control Mean	0.519	3964.4	0.418	4.388	1.467	1.976	0.236	1.264
Lasso Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Region FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

TLU denotes Tropical Livestock Unit, which were calculated by assigning the following weights to each livestock category. Chicken (0.01), Cow (0.70), Goat (0.10) and Sheep (0.10). The number of animals owned was multiplied by the weights above and aggregated to formulate the Livestock Index (TLU) at the household level. Total livestock count is the total number of animals owned by a household. Revenue from livestock sales has been winsorized at 2nd and 98th percentile. Standard errors have been clustered at the village level and block region effects have been included.
*** p<0.01, ** p<0.05, * p<0.1

E2.8: Off-farm business activities

	(1) Own a business	(2) Number of businesses	(3) Number of months worked by manager last year	(4) Monthly business profit	(5) Monthly business revenue
Treatment Assignment	0.00794	0.00728	0.0558	-16.55	-63.43
	(0.0129)	(0.0139)	(0.110)	(159.6)	(656.6)
Observations	4498	4498	4498	4498	4498
Control Mean	0.0937	0.101	0.764	1003.8	3854.3
Lasso Controls	Yes	Yes	Yes	Yes	Yes
Region FE	Yes	Yes	Yes	Yes	Yes

Standard errors have been clustered at the village level and region fixed effects have been included Monthly profit and revenue has been winsorized at 98th percentile. *** p<0.01, ** p<0.05, * p<0.1

E2.9: Wage employment

	(1) HH with wage employment (0/1)	(2) HH with wage job inside agriculture (0/1)	(3) HH with wage job outside agriculture (0/1)	(4) Total number of days worked	(5) Monthly wage earnings (in CFA)
Treatment Assignment	0.00408	-0.00110	-0.000645	-1.265	-2070.7
	(0.0466)	(0.0212)	(0.0146)	(1.035)	(2460.7)
Observations	1319	1250	4088	1319	1319
Control Mean	0.161	0.0497	0.0911	4.038	8376.6
Lasso Controls	Yes	Yes	Yes	Yes	Yes
Region FE	Yes	Yes	Yes	Yes	Yes

Standard errors have been clustered at the village level and region fixed effects have been included. Monthly wage earning has been winsorized at 98th percentile. *** p<0.01, ** p<0.05, * p<0.1

E2.10: Assets

	(1) Owned HH asset (0/1)	(2) Number of HH assets	(3) HH asset value (in CFA)	(4) Owned Farm asset (0/1)	(5) Number of Farm assets	(6) Farm Assets value (in CFA)	(7) Owned Business asset (0/1)	(8) Business Assets value (in CFA)
Treatment Assignment	-0.00830	-0.134	-5349.9	-0.0257	-0.0950	-3520.5	0.00670	-199.7
	(0.0277)	(0.189)	(12086.7)	(0.0327)	(0.0778)	(2489.4)	(0.0128)	(856.3)
Observations	4498	4455	4417	4498	4371	4371	4498	4498
Control Mean	0.756	2.429	89868.6	0.352	0.758	25500.0	0.0928	5301.0
Lasso Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Region FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Standard errors have been clustered at the village level and region fixed effects have been included. Asset values have been winsorized at 98th percentile. HH Assets include mobile phones, furniture, TV etc., Farm Assets include cart, axe, shovels, sowing devices etc. Business assets include material and equipment used in business. *** p<0.01, ** p<0.05, * p<0.1

E2.11: Savings and loans

	(1) Applied for a loan (0/1)	(2) Amount Borrowed (in CFA)	(3) Saved (0/1)	(4) Amount of Savings (in CFA)	(5) Received in-kind transfer from another HH (0/1)	(6) Value of Transfer Received (in CFA)
Treatment Assignment	-0.0403**	-2198.9	-0.00311	-28.92	-0.00361	-643.0
	(0.0181)	(1662.7)	(0.0177)	(190.4)	(0.00455)	(604.7)
Observations	4498	4477	4498	4498	4498	4498
Control Mean	0.229	12620.9	0.125	929.8	0.0196	3453.7
Lasso Controls	Yes	Yes	Yes	Yes	Yes	Yes
Region FE	Yes	Yes	Yes	Yes	Yes	Yes

Table includes annual amount borrowed, amount of savings and value of transfer received in CFA. Standard errors have been clustered at the village level and region fixed effects have been included. *** p<0.01, ** p<0.05, * p<0.1

E2.12: Migration

	(1) % HHs have any migrant	(2) Receives remittances	(3) % HHs have an internal migrant	(4) Receives remittances (internal)	(5) % HHs have an external migrant	(6) Receives remittances (external)
Treatment Assignment	-0.0261*	-0.0254*	-0.0215*	-0.0192	-0.00963	-0.0109
	(0.0147)	(0.0131)	(0.0129)	(0.0116)	(0.00900)	(0.00684)
Observations	4464	4498	4393	4439	4419	4418
Control Mean	0.0965	0.0837	0.0802	0.0703	0.0369	0.0253
Lasso Controls	Yes	Yes	Yes	Yes	Yes	Yes
Region FE	Yes	Yes	Yes	Yes	Yes	Yes

Internal migrant refers to the case where there is any household member living elsewhere in the country whereas external migrant refers to households where any member is living outside the country. Standard errors have been clustered at the village level and region fixed effects have been included. *** p<0.01, ** p<0.05, * p<0.1

E2.13: Education

	(1) Currently enrolled (Ages 5 to 8)	(2) Currently enrolled (Ages 9 to 12)	(3) Currently enrolled (Ages 13 to 18)	(4) Education expenses (Ages 5 to 18)
Treatment Assignment	-0.0453	-0.0398	-0.0364	1551.9
	(0.0286)	(0.0330)	(0.0251)	(2521.8)
Observations	3543	2445	2906	1166
Control Mean	0.221	0.361	0.252	17107.1
Lasso Controls	Yes	Yes	Yes	Yes
Region FE	Yes	Yes	Yes	Yes

Education expenses (in CFA) include tuition expenses, school books and materials, school uniforms, and other expenses such as transportation and meals. Education expenses for the past 12 months is winsorized at the 98th percentile. Standard errors have been clustered at the village level and Region fixed effects have been included. *** p<0.01, ** p<0.05, * p<0.1

E2.14: Shocks

	(1) Number of shocks experienced	(2) Food price increase (0/1)	(3) Ag inputs price increase (0/1)	(4) Drought (0/1)	(5) Floods (0/1)	(6) Animal diseases (0/1)	(7) Crop/pest disease (0/1)	(8) Output price decrease (0/1)	(9) Serious illness (0/1)
Treatment Assignment	0.116	0.0028	-0.0253	-0.0526	0.0164	0.00762	0.0183	-0.00567	0.0143
	(0.256)	(0.0448)	(0.038)	(0.0381)	(0.0365)	(0.027)	(0.0377)	(0.02)	(0.0204)
Observations	4498	4490	4490	4490	4490	4447	1362	4490	3128
Control Mean	3.081	0.629	0.534	0.381	0.276	0.179	0.164	0.13	0.101
Lasso Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Region FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Standard errors have been clustered at the village level and region fixed effects have been included. *** p<0.01, ** p<0.05, * p<0.1

E2.15: Coping strategies

	(1) LCSI	(2) RCSI	(3) Number of coping strategies used	(4) Reduced food consumption (0/1)	(5) Sold livestock (0/1)	(6) Used savings (0/1)	(7) Reduced health/education expenses (0/1)	(8) Sold food stock (0/1)	(9) Withdrew children from school (0/1)
Treatment Assignment	0.00255	-0.0157	-0.0522	-0.0142	0.00477	0.00291	0.00292	0.00314	0.00654*
	(0.0243)	(0.0426)	(0.0638)	(0.0354)	(0.0143)	(0.0112)	(0.00699)	(0.00633)	(0.00331)
Observations	4420	4490	4420	4303	4255	4247	4262	4280	4290
Control Mean	1.184	0.227	0.615	0.272	0.0777	0.0495	0.0262	0.0198	0.00564
Lasso Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Region FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

The LCSI (Livelihood Coping Strategy Index) is constructed by pooling livelihood coping strategies intro three categories of Stress, Crisis and Emergency and taking the maximum value across these three components. Reduced Coping Strategies Index (RCSI) is constructed from frequency and severity of five coping strategies that the household used in the previous 30 days. Coping strategies were inquired about over a 30 days and 12 months recall period, the above reports values from a 12 months period. Standard errors have been clustered at the village level and region fixed effects have been included. *** p<0.01, ** p<0.05, * p<0.1

E2.16: Subjective resilience

	(1)	(2)	(3)	(4)
	Subjective Resilience Score	Low Resilience Score (0-32)	Medium Resilience Score (33-65)	High Resilience Score (Above 66)
Treatment Assignment	-3.312	0.0719*	-0.0478	-0.0236
	(2.166)	(0.0405)	(0.0327)	(0.0265)
Constant	53.02***	0.131***	0.611***	0.286***
	(1.899)	(0.0358)	(0.0431)	(0.0310)
Observations	4498	4498	4498	4498
Control Mean	43.46	0.308	0.540	0.152
Lasso Controls	Yes	Yes	Yes	Yes
Region FE	Yes	Yes	Yes	Yes

The Subjective Resilience score is calculated using 10 core SERS indicators and ranges from 0 to 100. These sub-indicators were selected based on consultations with OEV and other WFP staff. These included 1. Your household can bounce back from any challenge that life throws at it. 2. Your household is better able to deal with hardship compared with others in your community. 3. If threats to your household become more frequent and intense, you would still find a way to get by. 4. Would you say that you strongly agree, agree, disagree, strongly disagree or neither agree nor disagree that: During times of hardship, your household can change its primary source of income or livelihood if needed. 5. Your household can rely on the support of family and friends when you need help. 6. Was there a time when your household ran out of food because of a lack of money or other resources? 7. Your household can rely on the support of politicians and government when you need help. 8. Would you say that you strongly agree, agree, disagree, strongly disagree or neither agree nor disagree that - Your household has learned important lessons from past hardships that will help you better prepare for the future. 9. Your household is fully prepared for any future threats and challenges that may occur in your area. 10. Your household frequently receives information warning you about future extreme weather events in advance. The Subject Resilience Score in control households is 43.46, which classifies households on-average having medium subjective resilience. Standard errors have been clustered at the village level and region fixed effects have been included. *** p<0.01, ** p<0.05, * p<0.1

E3: Impacts by Poverty Classification

E3.1 Primary Food Security Indicators

	(1)	(2)
	FCS	FIES
Treatment	1.439	0.110
	(1.536)	(0.303)
Classified as Poor	0.103	0.0634
	(1.434)	(0.184)
Treatment ×Classified as Poor	-2.330	-0.0726
	(2.004)	(0.258)
Observations	4411	4337
Control Mean	39.96	2.977
Lasso Controls	Yes	Yes
Region FE	Yes	Yes
P-value for treatment effect for poor	0.716	0.879

This table reports treatment effects on FCS (Food Consumption Score), and reversed FIES (Food Insecurity Experience Scale. FCS is winsorized at the 99th percentile. Standard errors have been clustered at the village level and region fixed effects have been included. *** p<0.01, ** p<0.05, * p<0.1

E4: Impacts by other heterogeneity dimensions

Food consumption score

	(1)	(2)	(3)	(4)	(5)	(6)
	FCS	FCS	FCS	FCS	FCS	FCS
Treatment	1.217	-1.948	0.503	0.811	-0.0968	0.944
	(1.542)	(3.079)	(1.687)	(1.671)	(1.920)	(1.368)
Female household head=1	0.160					
	(1.657)					
Treatment × Female household head=1	-3.510*					
	(2.031)					
Cultivated plots=1		-1.782				
		(1.533)				
Treatment × Cultivated plots=1		4.006				
		(2.937)				
Has off-farm business=1			0.0582			
			(1.297)			
Treatment × Has off-farm business=1			1.301			
			(1.751)			
TLU below median=1				0.864		

				(1.161)		
Treatment × TLU below median=1				-0.0929		
				(1.692)		
Savings below median=1					-1.232	
					(1.524)	
Treatment × Savings below median=1					0.918	
					(2.174)	
FCS below median=1						-1.666
						(1.169)
Treatment × FCS below median=1						-0.394
						(1.466)
Observations	4411	4411	4411	4411	4411	4411
Control Mean	39.96	39.96	39.96	39.96	39.96	39.96
Lasso Controls	Yes	Yes	Yes	Yes	Yes	Yes
Region FE	Yes	Yes	Yes	Yes	Yes	Yes
P-value for treatment effects on heterogeneity dimensions	0.150	0.174	0.643	0.879	0.874	0.749
Share of HHs	0.130	0.670	0.180	0.690	0.900	0.500

This table reports heterogeneity on treatment effects on FCS (Food Consumption Score). FCS is winsorized at the 99th percentile. Female HHs are ones headed by a female member. Below median TLU (Tropical Livestock Unit) is a dummy variable for households with below median TLU livestock. Below median savings is a dummy variable for households with below median savings. Below median FCS (Food Consumption Score) is a dummy variable for households with below median FCS. Standard errors have been clustered at the village level and region fixed effects have been included. *** p<0.01, ** p<0.05, * p<0.1

Food insecurity experience scale

	(1)	(2)	(3)	(4)	(5)	(6)
	FIES	FIES	FIES	FIES	FIES	FIES
Treatment	0.0665	0.0834	0.103	-0.117	0.258	-0.136
	(0.262)	(0.258)	(0.282)	(0.303)	(0.429)	(0.389)
Female household head=1	0.0661					
	(0.185)					
Treatment × Female household head=1	0.0555					
	(0.289)					
Cultivated plots=1		0.0221				
		(0.181)				
Treatment × Cultivated plots=1		-0.0228				
		(0.359)				
Has off-farm business=1			0.128			
			(0.246)			
Treatment × Has off-farm business=1			-0.195			
			(0.328)			
TLU below median=1				-0.386*		
				(0.196)		
Treatment × TLU below median=1				0.260		
				(0.256)		
Savings below median=1					0.0677	
					(0.312)	
Treatment × Savings below median=1					-0.210	
					(0.400)	
FIES below median=1						-0.0759
						(0.418)
Treatment × FIES below median=1						0.382
						(0.358)
Observations	4140	4140	4140	4140	4140	4140
Control Mean	2.953	2.953	2.953	2.953	2.953	2.953
Lasso Controls	Yes	Yes	Yes	Yes	Yes	Yes
Region FE	Yes	Yes	Yes	Yes	Yes	Yes

P-value for treatment effects on heterogeneity dimensions	0.928	0.945	0.835	0.591	0.833	0.380
Share of HHs	0.130	0.670	0.180	0.690	0.900	0.500

This table reports heterogeneity on treatment effects on FIES (Food Insecurity Experience Scale). Female HHs are ones headed by a female member. Below median TLU (Tropical Livestock Unit) is a dummy variable for households with below median TLU livestock. Below median savings is a dummy variable for households with below median savings. Below median FCS (Food Consumption Score) is a dummy variable for households with below median FCS. Standard errors have been clustered at the village level and region fixed effects have been included. *** p<0.01, ** p<0.05, * p<0.1

E5: Impacts for each High-Frequency Data Collection Round

	(1) Apr-May '21	(2) Jun-Jul '21	(3) Aug-Sep '21	(4) Oct-Nov '21	(5) Dec-Jan '22	(6) Mar-Apr '22	(7) May-Jun '22	(8) Jul-Aug '22	(9) Sep-Oct '22	(10) Nov-Dec '22
FCS	-1.162	0.990	2.758	2.710	0.430	-0.437	-0.775	-1.460	-0.288	-2.098
	(2.600)	(2.383)	(2.871)	(2.474)	(2.131)	(2.264)	(1.961)	(2.011)	(2.332)	(2.334)
Control Mean	41.68	41.71	41.43	38.73	37.44	40.39	37.71	38.24	38.39	47.55
FIES	0.038	-0.194	0.195	0.0354	-0.041	-0.025	-0.1458	-0.179	0.128	-0.161
	(0.409)	(0.418)	(0.309)	(0.207)	(0.324)	(0.304)	(0.270)	(0.268)	(0.316)	(0.222)
Control Mean	4.26	4.01	3.67	2.92	3.37	3.43	3.27	3.29	3.34	4.53
Observations	1510	1510	1510	1510	1510	1510	1510	1510	1510	1510
Lasso Controls	No	No	No	No	No	No	No	No	No	No
Region FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

This table reports treatment effects on FCS (Food Consumption Score) and reversed FIES (Food Insecurity Experience Scale. FCS is winsorized at the 99th percentile. This table contains a subset of the baseline sample which was surveyed during the high frequency data collection. This sub sample was divided into two cohorts and surveyed in consecutive months. Round pooled refers to the two-monthly period where the entire high frequency sample was surveyed. Standard errors have been clustered at the village level and region fixed effects have been included. *** p<0.01, ** p<0.05, * p<0.1

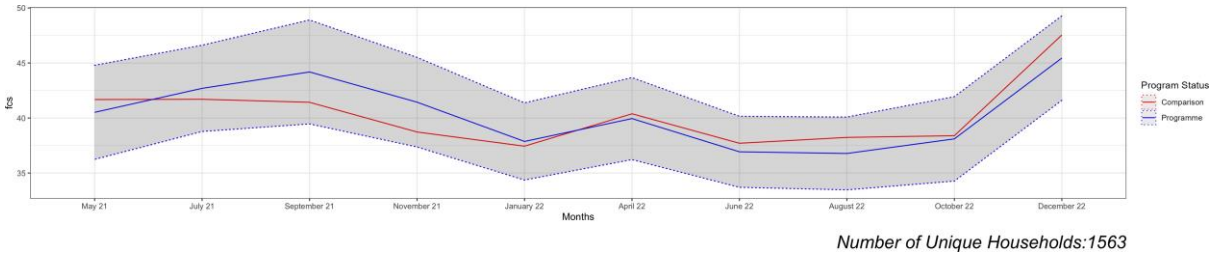
E6: Impacts aggregated across high-frequency data collection rounds

Outcomes	(1) All	(2) First Year	(3) Second Year
FCS	-0.095	1.207	-1.004
	(1.922)	(2.173)	(2.016)
FIES	-0.028	0.037	-0.094
	(0.245)	(0.275)	(0.244)
Observations	1510	1510	1510
Lasso Controls	No	No	No
Region FE	Yes	Yes	Yes

This table reports treatment effects on FCS (Food Consumption Score) and reversed FIES (Food Insecurity Experience Scale. FCS is winsorized at the 99th percentile. Overall

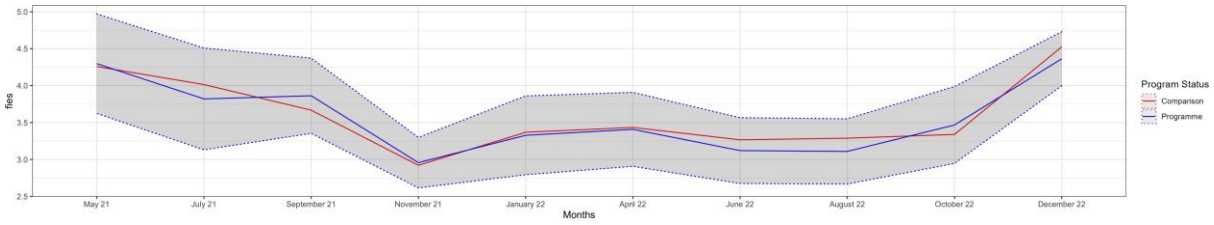
refers to the period from April 2021-March 2023, Year 1 refer to the period from April 2021-March 2022 and Year 2 refers to the period April 2022-March 2023. Standard errors have been clustered at the village level and region fixed effects have been included. *** p<0.01, ** p<0.05, * p<0.1

Figure 1: Trends in FCS (for each round)



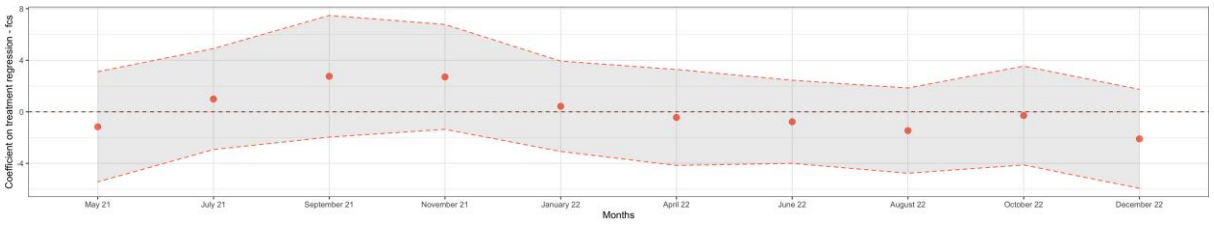
Number of Unique Households:1563

Figure 2: Trends in FIES (for each round)



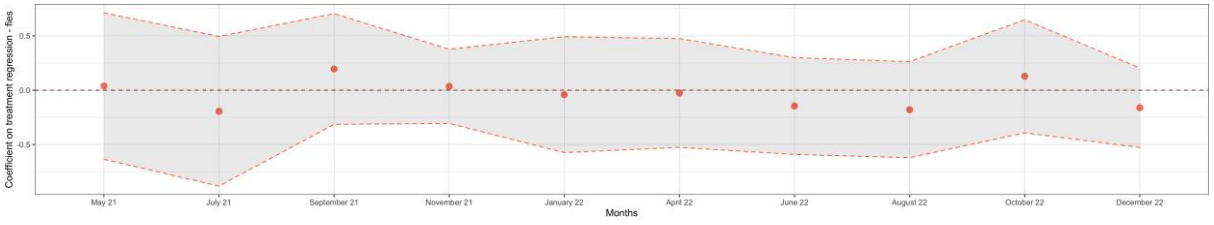
Number of Unique Households:1563

Figure 3: FCS coefficient plot (for each round)



Number of Unique Households:1563

Figure 4: FIES coefficient plot (for each round)



Number of Unique Households:1563

Annex F. Ethical considerations

World Food Programme (WFP) impact evaluations conform to 2020 United Nations Evaluation Group ethical guidelines. Accordingly, the WFP Office of Evaluation and World Bank Development Impact Evaluation (DIME) department are responsible for safeguarding and ensuring ethics at all stages of the evaluation cycle. This includes, but is not limited to: ensuring informed consent; protecting privacy, confidentiality, and anonymity of participants; ensuring cultural sensitivity; respecting the autonomy of participants; ensuring fair recruitment of participants (including women and socially excluded groups); and ensuring that the evaluation results in no harm to participants or their communities. During the inception phase, the following ethical issues, related risks, safeguards, and measures have been considered.

Programme exclusion

Refusing to take part in the study had no bearing on eligibility for WFP support.

Institutional Review Board (IRB) approval

The evaluation team obtained international approval (on 12 November 2020) for the Climate and Resilience Impact Evaluation Window design as well as the specific design and measurement elements in Mali from Solutions IRB, which is a private commercial Institutional Review Board fully accredited by the Association for Accreditation of Human Research Protection Programs (AAHRPP), and renewed every year. The evaluation team also obtained approvals from the National Institute of Statistics in Mali, ensuring that the evaluation was in compliance with local regulations and did not violate any local laws.

Informed consent

The evaluation and survey teams ensured that enumerators were fully trained to obtain informed oral consent from all evaluation participants. Every participant must consent to take part in our surveys. We are very explicit that refusal to respond to our survey does not come with any consequences for participation in WFP's resilience programming. The head of the household is the primary respondent for the survey. While most survey questions are addressed to the head of the household, a few questions may be directed to other household members, including women (such as questions on women's empowerment and food consumption for children aged from 6–23 months). To avoid respondent discomfort during surveys, we took precautions to ensure that questions were asked bearing in mind the privacy and comfort of respondents:

- Participants may skip any questions they do not wish to answer or withdraw from the survey at any time.
- Interviews were conducted at the participants' homes to help them to be comfortable answering questions.

Finally, all enumerators completed training lasting one to two weeks. Following the training, the surveys were piloted in the impact evaluation areas. The goals of the training are to ensure that enumerators follow survey best practices in terms of protocols and ethics, and that questions are asked in a uniform and contextually appropriate manner.

Confidentiality

The evaluation team ensured complete anonymity and confidentiality of all data collected from study participants. This means that the identity of study participants will remain hidden in all forms of data construction and analysis, and sensitive information will not be shared with anyone outside the evaluation team.

Transparency in evaluation designs

To increase the transparency of the work, the evaluation is registered through the American Economics Association's trial registry.

Considerations for rewarding participation

The evaluation team considered providing small cash transfers to participants in the high-frequency survey. However, following discussion with the country office, it was decided that it would be preferable to provide a small in-kind gift (a bar of soap) for each round of high-frequency data collection.

Annex G. Limitations

This annex outlines the general limitations of impact evaluations and how we have addressed them in this study.

External validity

The results of a single study might not generalize to other settings. However, the robustness of the findings across contexts can be assessed through a synthesis of results from all the countries that participate in the Climate and Resilience Window (see the Window pre-analysis plan for details). The use of coordinated survey instruments and data collection protocols will help to ensure that the data collected in Mali is comparable to other countries in the window and in other WFP-supported evaluation windows, to maximize the potential to draw more general conclusions.

Internal validity

This impact evaluation limited the risk to internal validity by using the most rigorous impact evaluation method available – a randomized controlled trial (RCT). In addition, as with any in-field RCT, spill-over across communities and differential attrition are potential risks for the evaluation. Survey response rates were high, and we did not observe any statistically significant differential attrition and thus, do not impact the internal validity of the results. The team worked closely with the cooperating partners on the ground to monitor potential spill-overs and collect data on exposure to the programme in both the programme and comparison group. At analysis stage, sensitivity checks were also performed to document the robustness of the results by considering only control villages that are further away, and as such less likely to be affected by potential spill-overs.

Programme participation

In contexts of insecurity, participation in the programme may be reduced due to difficulties accessing activity areas (such as, asset creation sites and nutrition centres). It is also possible that beneficiaries find alternative income sources that are more suitable for their needs, and choose not to participate in the resilience programme. If programme participation is low, it is difficult to detect statistically significant effects of the programme based on the original survey sample.

The impact evaluation team worked closely with the country office to consolidated programme monitoring data to track implementation of the various programme activities at each site. However, the programme monitoring system did not allow precise tracking of household-level participation to programme components or payments made over time. This limited the impact evaluation's ability to analyse and account for differences in participation in programme components at the household level, which could only be estimated using self-reported data collected in the high-frequency survey study sample. Finally, detailed cost data could not be obtained to perform a cost-benefit analysis.

Analysis limitation

The evaluation uses intent-to-treat (ITT) estimates. ITT analysis includes every household surveyed in the programme area, regardless of their subsequent participation or withdrawal from the programme (to avoid introducing additional bias due to participants' self-selection during implementation). This means that the analysis includes data from households that may or may not have fully participated in the programme. There are many possible observable (e.g. roads) and unobservable (e.g. attitudes) reasons why people do or do not participate in programmes when offered. Therefore, to know if a programme offered to a population is effective for an average household, the evaluation needs to include all households that are offered the opportunity to participate, irrespective of whether they choose to participate or not. Otherwise, one may not be estimating the impact of the programme, but instead the benefits on households already engaged in more resilient practices. The ITT estimate is the most reliable estimate of offering the programme to a population.

Gender

Although the resilience programme was designed in a gender sensitive way, with specific activities targeting women or considering the needs of women, the lack of household-level participation data from the monitoring system prevents the impact evaluation team from reporting programme participation by gender. Despite these limitations, we report heterogeneity of impacts by gender of the household head. For a more exhaustive analysis of gender dynamics in FFA programmes, please see the WFP-DIME Cash-based Transfers and Gender Window.

COVID-19

Finally, the start of the impact evaluation project coincided with the COVID-19 pandemic, which could have led to delays and other complications that were not present in previous phases of the programme. The resilience programme in Mali was implemented in phases, covering different geographical areas in each of them.

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