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CAN MARKET SYSTEMS DEVELOPMENT BUILD RESILIENCE IN FRAGILE CONTEXTS?

A Case Study of *Managing Risk Through Economic Development* in Nepal

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MERCY CORPS

Executive Summary

In the Far West Region of Nepal, Mercy Corps' Managing Risks through Economic Development (M-RED) works to build the resilience of vulnerable communities by creating access to economic opportunities that directly contribute to disaster risk reduction (DRR). This "nexus" approach aims to develop agricultural market sectors that have both high income-earning potential and the ability to reduce exposure to floods and droughts at a community level. The program combines market development around these sectors with the promotion of green infrastructure (e.g., vegetation restoration, bamboo reinforcements) and land management techniques, which together reduce natural disaster risk and preserve assets and livelihoods in vulnerable communities. As one of Mercy Corps' first programs to integrate market systems development (MSD) and resilience intentionally, M-RED provides a unique opportunity to explore the value of using an MSD approach to achieve resilience-building.

M-RED partnered with government institutions, market actors and civil society organizations to strengthen the market system for sugarcane, while reclaiming unproductive land along riverbanks and reducing the damaging effects of future floods. The program did this by addressing systemic constraints to commercial sugarcane farming as well as engaging target farmers in complementary interventions that included mobilizing farmers for green infrastructure, and building capacity for early preparedness and response in the event that floods became more severe. The analysis also highlighted missed opportunities to promote resilience early in the program, all of which are now being addressed as part of the program's second phase. These include fostering market diversification and dynamism, addressing structural social barriers related to women's inclusion and increasing the availability of and access to risk-reducing financial inclusion measures.

Collectively, this assessment yielded the following recommendations for building synergies between MSD and resilience that help ensure that economic outcomes reduce risk and can be sustained over the long term.

Integrate holistic risk analysis into market assessments to better build resilience through MSD

Real or perceived immediate risks—rather than long term potential income gains—often drive decision-making among farmers and other market actors in thin market contexts, but MSD-focused programs often fail to consider the full range of shocks and stresses that threaten these actors. In contrast, M-RED's evaluation of the ecological risks faced by farmers as part of initial assessments helped the program select sectors that addressed community risks—specifically those associated with flooding—while also increasing their incomes. M-RED also sought to address farmers' economic risks associated with sugarcane, a crop highly susceptible to market price shocks, through risk pooling. Where social capital among community disaster management committee (CDMC) members was strong, this group-based farming model was successful in mitigating their economic risks. The team's contextualized knowledge of risk also contributed to their selection of a phased implementation design, as detailed below. A multifaceted understanding of the complex risk environment farmers and other market actors faced helped MRED select and support the development of key market sectors that contributed to farmers' resilience.

Pair interventions that strategically address immediate, significant risks with facilitative models to build resilient market systems

Due to skepticism around sugarcane demand given historical boom and bust patterns, M-RED experienced challenges encouraging farmers in vulnerable riverbank communities to invest in the nexus crop. To overcome these challenges, M-RED introduced a phased implementation approach, transitioning from significant subsidies (which initially boosted sugarcane production and encouraged independent crowding-in of sugarcane market

actors) to phasing out subsidies in productive sugarcane communities. This approach required forming and bolstering system-level partnerships with government and the private sector to improve communities' market access to inputs and sales markets for the nexus crops. It also required ensuring all parties understood the market size, dynamics and requirements for stabilizing and expanding nexus production to overcome long term market barriers. In addition to engaging with market actors, the program introduced complementary risk-reducing measures that reinforced the market intervention but helped farmers address more immediate, ecological shocks and stresses in the short term. These complementary interventions—which included capacity-building in green infrastructure techniques (e.g., bamboo reinforcements, vegetation restoration), facilitated dialogue about the need to regulate open grazing and strengthening farmers' access to a flood early warning system—increased farmers' confidence to engage in the new sugarcane investment.

Harness markets systems change to reduce risk and build resilience at scale

The central MSD focus on strengthening and catalyzing market systems to bring benefits to the poor can also be an effective tool for sustainably reducing risk and building resilience at scale. M-RED's nexus approach was successful enough in its first two years of implementation that many target communities independently scaled up their activities by the third year, and communities outside the intervention area replicated the model. A new mill subsequently opened and another expanded in the area without program support. In addition to independently engaging in the sugarcane markets along the same river basin, many non-M-RED communities replicated green infrastructure techniques and adopted other risk-reducing practices, such as stricter local regulations around open grazing. Spontaneous replication patterns for the nexus sugarcane crop suggest that households and market actors made calculated investment decisions based on their perceptions of risk, and that these shifted over the course of the program. M-RED farmers were generally interested in group investing when it created risk pools for highly uncertain investments. However, individual farmers who observed both the potential for profits and risk-reduction benefits of sugarcane became more confident in replicating and investing in sugarcane planting individually, bringing flood protection benefits to the whole community.

Facilitate market diversification, financial access and planning capacity to build long term resilience

While independent replication of sugarcane production and increased processor investments provide initial evidence of market systems change as a result of M-RED, there were still considerable barriers to entry and expansion within the sugarcane market, including farmers' inability to access sources of financial capital to expand or start up sugarcane production. The sugarcane market also remained volatile and sugar mills managed their cash flow by paying farmers only after they completed their sales. These factors deterred farmers who perceived investing in sugarcane at the expense of other farm production as too risky. Insufficient sugarcane production put new and expanding sugar mills at risk of shutdown if they did not maintain a sufficient and steady supply stream. These dynamics suggest a need for resilience-building programs that utilize an MSD approach to fostering dynamism and diversity within the market, including facilitating market access to other nexus crops—effectively mitigating financial and other market-related risks. The importance of integrating financial management and financial service access capabilities as a central component of resilience building is also critical to building actors' capacity to manage financial risks, while helping boost and diversify resilient investments.

Address restrictive social norms to maximize markets' effects on resilience

This research revealed how social norms drove local decision-making as much as perceptions of financial gain did, influencing behavior with detrimental effects for resilience. Specifically, social norms around gender in M-RED communities barred women from decision-making at the community level, limited their management of household finances and restricted their market access. This proved to be a major deterrent in the market expansion and success of a banana nexus intervention, where women's groups were supported to invest in banana

plantations in severely flood-prone rice paddy areas inland of the river. Gender norms in this case hampered a critical risk reduction measure for the community in a context where nearly 80% of the male population had migrated and where women were left as the caretakers of the land. Building resilience through market systems thus requires a simultaneous investment in dialogue and awareness-raising around the social norms that can restrict markets for resilience and ultimately prove harmful to households and communities' ability to manage shocks and stresses. Based on lessons learned in the first phase, M-RED began household and community dialogues with men and women on the harmful effects of restricted mobility and financial decision-making for women during its second phase.

These findings reinforce the value of using market systems analysis and risk assessment to examine farmers' incentives and trade-offs in making market-based investments in resilience. Combining risk analysis tools with market systems intervention design can help programs select the sector that most effectively integrates resilience and economic objectives, while deepening our understanding of incentives at all levels. Ultimately this approach can help inform more nuanced intervention approaches that balance, for example, communal needs and risk reduction with individual economic incentives and market forces.

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List of Acronyms

CDMC	Community disaster management committees
DRMC	Disaster risk management committees
DADO	District Agriculture Development Office
DRR	Disaster risk reduction
ESS	Effective Seed Storage
EWS	Early warning system
FGD	Focus group discussion
KII	Key informant interview
M-RED	Managing Risk through Economic Development
MOU	Memorandum of understanding
MSD	Market systems development
MVMW	Making Vegetable Markets Work for Smallholder Farmers in Southern Shan and Rakhine States
PAHAL	Promoting Agriculture, Health and Alternative Livelihoods
ToT	Training of Trainers
WIF	Women Initiative Fund

Why Study the Links Between Market Systems Development and Resilience?

Contextualizing This Case Within the Larger Assessment

Mercy Corps has traditionally worked to achieve lasting poverty reduction at scale in complex contexts through a market systems development (MSD) approach. MSD helps teams analyze supply and demand for goods and services—ranging from farm products to water supply systems—that can support economic growth and improve social outcomes. The approach guides teams to identify barriers that prevent this supply and demand exchange from working effectively on behalf of the poor, as well as specific market-based solutions. Finally, the process leads teams to identify and develop partnerships with the local, national and regional actors critical to addressing these constraints and creating the right conditions for markets to deliver improved products or services sustainably.

Foundational to the MSD approach is the tenet that project implementers should adopt a light-touch role, creating linkages between market actors and stimulating market systems to deliver the selected product or service over the long-term, rather than having the project team deliver these directly within its short lifespan. MSD has evolved into a well-established, impactful model for achieving transformational change in economic systems that has led to sustained income growth and improved economic well-being among poor and marginalized populations in many cases.

More recently, Mercy Corps has developed a resilience approach to project design and implementation. The approach evolved in response to growing concerns that frequent and often cyclical shocks and stresses have reversed development gains—particularly in more politically and ecologically fragile geographies. The resilience approach draws on the systems thinking embedded in MSD, but provides a broader lens for understanding the social, economic and ecological systems within which communities live and identify shocks and stresses that contribute to fragility and unpredictability in these systems. The resilience approach also seeks to understand who is most vulnerable to these impacts, and what resilience capacities are required to prevent risk from undermining progress toward development goals.

While both MSD and resilience take a systems perspective—focusing on how to improve system performance for the benefit of marginalized or underserviced communities—recent research and

Two Systems-Based Approaches

Systems-based approaches draw on systems thinking to unpack complex systems elements and form a greater understanding around their interconnectedness and interdependencies. Mercy Corps defines market systems development and resilience—two systems-based approaches—as follows:

Market Systems Development: An approach to working through public and private sector actors to address the underlying systemic constraints that hinder target populations' access to, and participation in, the market. Because locally embedded actors have wide-reaching connections with local populations, they can reach more people and change norms in market systems well beyond the life of the program.

Resilience: The capacity of households and communities in complex socio-ecological systems to learn, cope, adapt and transform in the face of shocks and stresses. Mercy Corps takes a systems approach to identifying which shocks and stresses pose the biggest threats to relief, recovery or development goals in a given context; who is most vulnerable and how; and what capacities households and communities need to stay on track and get ahead.

programmatic learning suggest they are not synonymous, or even automatically reinforcing.[1] MSD traditionally focuses on improved economic outcomes for the poor (e.g., increased income among a target population), more recently under the assumption that these outcomes can the help the poor improve social well-being. On the other hand, resilience building is a means or pathway to sustaining and enhancing a broad range of development goals (e.g., income, social empowerment, health, food security) in a given complex risk environment—even in the face of intensifying shocks and stresses. For Mercy Corps, introducing the resilience approach into a relatively well-established MSD approach provides opportunities to enhance program impact for the poor, but the requirements of considering multiple systems and risks can be challenging, as they introduce a new level of complexity into a relatively high-performing and bounded MSD model. To better understand where and how practitioners can better apply resilience and MSD approaches together in a way that is mutually reinforcing, this research set out to assess the relationship between them in three unique contexts. Over a period of six months, we asked the following questions aimed at better understanding the synergies, challenges and tradeoffs that emerge when attempting to build resilience and achieve market systems outcomes:

- **Can MSD—with a primary focus on increasing market access and incomes—help build resilience in fragile contexts? If so, which elements of an MSD approach support resilience?**
- **What are the risks of applying an MSD approach to poverty alleviation in fragile contexts without considering resilience?**
- **Can applying a resilience approach to MSD programs implemented in fragile contexts help ensure their long term success and sustainability?**
- **Can the principles of MSD strengthen Mercy Corps' resilience approach?**

Mercy Corps explored these questions through three MSD-oriented programs in its South and Southeast Asia portfolio, each of which integrated resilience theory in their design to varying degrees: 1) Making Vegetable Markets Work for Smallholder Farmers in Southern Shan and Rakhine States (MVMW), an MSD program in Myanmar with no explicit resilience analysis or component in its design; 2) Effective Seed Storage (ESS), a food security program in East Timor with a central intervention focused on developing markets for seed silos to help address food security risks; and 3) Managing Risk through Economic Development (M-RED), a program in Nepal's Far West Region designed to build resilience to natural disasters using a market-based approach, and the subject of this case study. This set of programs provides three distinct vantages from which to examine the implications of, and determine recommendations for, applying MSD and resilience approaches in fragile contexts.

Introduction

In the Far West Region of Nepal, Mercy Corps' Managing Risks through Economic Development (M-RED) program aims to build the resilience of vulnerable communities by creating access to economic opportunities that directly contribute to disaster risk reduction (DRR). This "nexus" approach strives to develop agricultural market sectors that have both high income-earning potential and the ability to reduce exposure to floods and droughts at a community level. The program combines market development around these sectors with the promotion of associated green infrastructure (e.g., vegetation restoration, bamboo reinforcements) and land management techniques, which together reduce natural disaster risk, subsequently preserving assets and livelihoods among

1 Mercy Corps' More Than Markets paper explores the limitations of a pure MSD approach in Northern Uganda, ultimately making a case for the critical role of resilience in achieving the full benefits of market systems work.

vulnerable communities. As one of Mercy Corps' first programs to explicitly integrate market systems development (MSD) and resilience, M-RED provides a unique opportunity to explore resilience building among farmers as a means of achieving both economic and disaster risk reduction objectives in the face of shocks and stresses.

Methodology

Because M-RED is a resilience program that uses a market systems approach, the team had a strong foundation in resilience and had conducted a shock and stress analysis for the target communities as part of the design process, which ultimately informed the market-based approaches for reducing these risks.[2] To help answer the key research questions, the research team first conducted a secondary data review, focusing on the M-RED impact evaluation, case studies, annual reports and other program documents. This review helped frame a brief mapping exercise—incorporating new knowledge of shocks, stresses, who is most vulnerable and their required resilience capacities—that helped identify appropriate farmers, other market actors and government officials for key informant interviews (KIIs) and focus group discussions (FGDs). These actors were selected not only based on their participation in M-RED activities, but also based on the roles they played in strengthening and sustaining resilience capacities across a wider range of stakeholders in the program's operational area. These KIIs and FGDs helped the team explore: 1) which elements of the MSD approach build resilience, 2) the effectiveness and tradeoffs of applying a resilience lens to MSD programs in fragile contexts, and 3) the ways in which MSD principles can strengthen resilience.

Program Context: Understanding Fragility in Far West Nepal

Systemic Constraints

Several major systemic constraints (i.e., persistent, endemic challenges and barriers impeding development) have fundamentally undermined opportunities to increase and preserve economic and social well-being and ecological gains for farming communities in Nepal's Far West Region. In the agricultural sector, government extension services' minimal capacity and outreach have done little to improve farmers' limited proficiency with modern agricultural techniques, ultimately undermining farm productivity. The remoteness of these areas, coupled with underdeveloped markets, have meant that farmers have weak links to input supply chains and virtually no access to industry-level buyers, undercutting their ability to expand or enter new agricultural markets, despite profit and risk-reducing potential. Restricted access to financial services and low financial literacy compound these issues, leaving farmers with limited capital to save and invest in their livelihoods, and forcing them to spend most of their income on meeting daily household consumption

Understanding Risk and Fragility

Using systems mapping, interviews, focus groups and secondary research, the program team identified the following as key drivers of fragility and risk.

Systemic Constraints

- Limited access to capital for farm investment
- Low financial literacy
- Discriminatory practices based on gender and/or ethnicity/caste
- Limited outreach and low capacity extension services
- Limited modern agricultural information and skills
- Weak market linkages and access

Shocks and Stresses

- Floods, drought and rainfall variability
- Agricultural pests and disease
- Unstable demand for sugarcane
- Migration
- Socio-political conflicts

2 This strategic focus on resilience separates this program (and case) from the others in this series—Effective Seed Storage (ESS), where the market systems approach addressed some food security risks, and Making Vegetable Markets Work for Smallholder Farmers in Southern Shan and Rakhine States (MVMW), which did not explicitly introduce resilience into its program design.

needs.[3] In this context, community members have rarely prioritized disaster risk reduction measures as part of the farming system or household decision-making processes.

In addition to market system constraints, long-standing discriminatory social norms and practices based on gender, caste and ethnic affiliation have marginalized women, girls and "lower" castes. Specifically, these norms limit access to and control over decision-making and key productive resources such as land, water and finances, and strictly dictate the nature of labor force participation. These social factors often undermine productivity and innovation in agricultural sectors.

Photo Credit: Nepal/C. Tamang

Governance systems have also failed to deliver services with the potential to protect communities from frequent natural disasters (see below). Though formal government bodies responsible for disaster risk management exist at the district and village levels, these structures are historically under-funded by government, lack capacity or a widely recognized role in the community, and are plagued by patronage, fund mismanagement and poor coordination. Historically, external development actors have worked exclusively through local disaster risk management committees (DRMC) at the village-level, but these groups have been poorly connected to their district counterparts. DRMCs have been almost entirely dependent on external agencies for priority setting, training, conducting outreach and maintaining a funding and supply pipeline—ultimately making them unsustainable.[4] Households themselves have often been unaware of committee functions with few mechanisms to hold their members accountable.

Shocks and Stresses

A range of interconnected economic, ecological and social shocks and stresses stem from or have amplified these development challenges. In its design phase, the M-RED team collaborated with target communities to better understand the complex risks that threaten communities' lives and income potential. They found stream deforestation and summer monsoons have led to unpredictable, swelling rivers—often flooding farmlands, obstructing markets, road and school access and threatening homes, lives and livelihoods. Climate change continues to shift these weather patterns, making them more intense and erratic, leading to extreme drought, flooding and temperature conditions that undermine the predominant agricultural system. [5] These temperature fluctuations have caused some crop pests to disappear or move to higher altitudes, but new ones have appeared. Economic shocks, particularly linked to regional border blockades and food price shocks, have also threatened local farmers.

When significant ecological and economic shocks wipe away crops and undermine the income potential of small-scale farming, many rural men migrate to urban centers and foreign countries for alternative work. Nearly half of all Nepali households have either a current or former migrant with numbers increasing rapidly. While migration provides some additional income and often serves as a coping strategy, those at home often receive remittances infrequently and the pace and scale of migration can dissolve family support structures, undermining

3 Vulnerable farmers in Terai face barriers to formal financial services such as banks being located only in commercial centers and a lack of substantial collateral to obtain loans. Farmers' need for small sized loans typically unavailable commercially.

4 In March 2017, the Government of Nepal began a process of decentralization, which involved redistricting of local level administrative boundaries, and the first local elections were held in the country in 20 years. This process is reorganizing local government bodies, including disaster risk management committees, further complicating the historical relationship between administrative authorities and local communities.

5 At the time of publication, M-RED operational areas were facing repeated flood episodes, including four in August 2017 that destroyed 29 houses and damaged 19 hectares of productive land. Three lives were lost.

community cohesion and the ability to solve problems collectively. Male migration has also significantly increased the work burden for women, the elderly and children, without expanding their decision-making power or control over resources.

Photo Credit: Nepal/Emilie Rex

Program Background

Phase 1 of M-RED was a $5 million, 3.5-year program implemented in Nepal, Timor-Leste and Indonesia. Mercy Corps designed M-RED in response to traditional DRR programming conducted in low-income communities, which typically saves lives and property, but often fails to mitigate economic losses effectively and depends heavily on external funds and direct delivery from external, non-governmental actors to support both preparedness and relief measures. To achieve more sustainable natural disaster resilience outcomes, M-RED piloted a "nexus" approach integrating traditional community-based DRR with economic and market system development interventions, testing whether programs could incentivize DRR through potential income growth.

This case study focuses on the sugarcane and banana nexus interventions piloted in 21 and 12 flood-prone communities respectively, across Nepal's Kailali and Kanchanpur districts in the Far West Terai Region. With the support of the M-RED program, farmers sourced supplies from local mills and planted sugarcane on silted and erosion-prone riverbanks, reclaiming riverbeds to prevent river cutting and lower the impacts of future flooding. The M-RED team identified sugarcane for its protective properties and strong market potential, simultaneously making productive use of marginal lands and generating income for farmers. The economic benefit of these DRR measures was intended to incentivize the planting of risk-reducing crops and applying complementary green infrastructure techniques over the long term. M-RED partnered with government institutions, market actors and civil society organizations to strengthen the market system for sugarcane, address systemic constraints to commercial farming and build capacity for DRR.

The Market Intervention: Market Development for Nexus Crops

In partnership with key stakeholders, including local government officials, members of community disaster management committees (CDMCs) and farmers' groups, M-RED explored the existing livelihood base, natural hazards and market opportunities through integrated risk and market assessments. This process led the program to identify sugarcane and bananas as suitable nexus crops in the Terai areas. Sugarcane withstands inundation and helps to retain soil and trap sediment, subsequently reducing riverbank erosion while utilizing silted land for farming. In addition to this DRR function, sugarcane was found to be a viable cash crop with a growing market, providing an entry point for MSD. Bananas were also identified as a high-value cash crop with a strong existing market that could replace rice paddy areas frequently prone to inundation beyond the riverbed.

To develop a viable market for the sugarcane nexus crop, M-RED pursued the following series of activities:

- **Creating partnerships with input suppliers and industry-level buyers:** Once sugarcane was identified as the appropriate nexus intervention based on a market and resilience assessment (including a market stakeholder mapping exercise) the program established partnerships with the local Makhali sugar mill, local

agricultural input suppliers, agrovets and the District Agriculture Department Office (DADO), jointly agreeing on a pathway for bolstering sugarcane production in flood-prone areas and increasing sugarcane supply to local processors.

- **Building capacity of farmers in sugarcane production through market linkages:** The multi-stakeholder partnerships initially resulted in the joint development of a capacity-building process and increased extension support for sugarcane production. The Makhali sugar mill and DADO jointly designed a sugarcane production training that covered topics such as which varieties to plant, seasonality, irrigation and protection for marginal soils. Agrovets (small-scale, local input suppliers) were then engaged as extension agents to deliver the training to farmers capitalizing on their strong trust, social networks and existing roles supplying inputs, such as seeds, fertilizers, pesticides. The agrovet business model incentivized their consistent presence and support within the community, which the government historically failed to provide.

- **Determining cost-share mechanisms and initiating production:** The program team ultimately facilitated the signing of a memorandum of understanding (MOU) between the privately owned Makhali mill, DADO and local farmers associations to determine a cost-sharing mechanism that would incentivize initial investments in sugarcane production. At the outset, the MOU with the sugar mill determined that the program contributed roughly 50% of input costs, including seeds and fertilizers. After two years, the costs were reduced to 15%, and the agreement was extended to additional processors. The sugar mill also began advancing the costs of seeds to farmers on credit and leasing equipment and machinery to prepare the land.

- **Expanding nexus community linkages with industry-level buyers for their sugarcane crops:** After its first two years, the program identified new investors. In Kanchanpur district, the program supported the Makhali mill to conduct a wider assessment of potential sugarcane plantation areas both within and outside of M-RED target communities. As a result, the sugar mill expanded its operations, and a new mill opened independently. In Kailali, which was far from the original Makhali mill, Mercy Corps supported a private investor opening a large-scale molasses mill. The area previously had only a small, local molasses mill that offered farmers extremely low prices for their crop. The MOU with the larger molasses mill dictated that Mercy Corps would cover the costs of a transformer, and the molasses mill paid for all other start-up costs.

- **Women's Initiative Fund (WIF) for banana nexus crops:** Because social norms prevented women from engaging in decision-making processes around the (mostly male-dominated) sugarcane nexus intervention, the program initiated a Women's Initiative Fund (WIF) to support banana planting and cultivation. A market analysis identified that bananas were a viable crop that would reduce regular inundation in rice paddy areas inland of the riverbed. Recognizing that a strong, viable market for bananas already existed, the intervention focused less on market linkages and more on providing seed money and capacity-building support for banana cultivation and harvesting among local women's groups, including women who were already members of the CDMC. The goal was to support women's economic empowerment—enabling women to manage small-scale banana plantations and sell the crop to local traders—while reducing disaster risk.

Supporting Interventions

In addition to its core market interventions, the M-RED program introduced additional interventions designed to complement the market-oriented approach and strengthen risk reduction outcomes. These included:

- **Building local capacity in community disaster preparedness and response:** To incentivize disaster risk reduction within the local institutions who were mandated to engage in it, M-RED mobilized CDMCs and engaged the groups in a participatory resilience and market assessments, which included shock and stress mapping

and a market analysis. The process was designed to increase awareness around disaster risk, sensitize the groups to the economic opportunities in disaster risk reduction, and inform participatory resilience and development planning processes at the village level. Once CDMCs were more engaged and motivated, they also received training in traditional disaster preparedness and response, and were linked to early warning systems-strengthening interventions (see below). Through participatory consensus-building processes, Mercy Corps also supported them in establishing a small emergency fund from the sale of sugarcane to help recover losses following floods.

- **Strengthening adoption of green infrastructure initiatives:** A core component of the participatory development and resilience planning process included identifying green infrastructure techniques that could help protect land and property from flood risk, but which fell outside of the core market interventions. This involved providing training CDMCs on green infrastructure techniques—designed to mitigate the impacts of and reduce exposure to flooding. Importantly, the green infrastructure measures reinforced the productivity of the sugarcane intervention.

- **Establishing and scaling community-based early warning systems:** M-RED also actively engaged with district early warning committees, composed of members of the district disaster relief committee and other local organizations. Mercy Corps coordinated with the committees to strengthen a district-village-household communication channel for flood early waring information through the District Emergency Operating Center, ultimately connecting this information to CDMCs and households. Specifically, M-RED connected the Center with improved rainfall information sources by facilitating communication with upstream communities and central government weather monitoring systems, as well as upgrading monitoring stations at the community level. Mercy Corps also provided technical capacity to the Center to communicate water thresholds with CDMCs and strengthen evacuation planning more effectively.

The first phase of MRED, running from 2013–2016, showed promising results. Cumulatively, communities planted sugarcane on 187 hectares of marginalized land and sold $122,361 in sugarcane to sugar and molasses mills as part of the nexus intervention. The sugarcane intervention also scaled up within target communities and saw individual and group replication in external communities. The quantitative impact evaluation from Phase I also demonstrated that M-RED intervention communities were 9.5 times more likely to use structural mitigation to protect their land, and 5 times more likely to protect their fields with green infrastructure with the highest confidence level of statistical significance, relative to comparison groups. They were also much more likely to report being active in DRMCs than comparison groups. As the program transitions into Phase 2 with a $4 million budget for 3 years, M-RED is continuing to build on the nexus model, investigating interactions between social, ecological and market systems and how and why they impact communities' ability to build resilience to natural disasters.

This case study of M-RED draws out lessons of where and how a market systems development approach can directly support the building of resilience capacities, where tradeoffs exist, and what approaches or considerations are necessary to help ensure that economic objectives meet the imperative of risk reduction in vulnerable contexts.

Key Findings

Evaluating the Synergies Between Market Systems Development and Resilience

This analysis of M-RED yielded insights into the synergies—where the combined MSD and DRR model contributed to resilience outcomes and economic opportunities—as well as the challenges and inherent trade-offs the team experienced when trying to achieve both objectives successfully. These lessons learned illustrate both the substance of these approaches—what the team focused on—as well as how they implemented them. Overall the research found that targeting market sectors based on an analysis of ecological risks and market potential had clear dividends for flood resilience, and reduced the vulnerability of M-RED communities to natural disasters. At the same time, the predominant focus on ecological risk reduction versus wider market systems change and inclusion may have limited the full potential of the program to boost incomes, create more vibrant and dynamic markets and ensure a wider group of households were financially protected from disasters. This section provides a case narrative organized by major finding exploring the synergies, challenges and tradeoffs in making market systems development work for resilience. Appropriately crafted subsidies foster long term market access for risk-reducing products and services

Complex risks influence farmers' decision-making and determine trade-offs between market and resilience investments

The research team found that local perceptions of risk were a key factor driving farmers' decision-making about whether, where and how to invest in the sugarcane nexus intervention and each decision came with trade-offs. Initially a number of risk factors—including lack of familiarity with the crop, uncertainty about optimal growing conditions and community-held misgivings rooted in sugarcane's historical boom and bust cycles—meant farmers perceived the combined risks would outweigh the potential economic benefits. This uncertainty about a consistent and sufficient buyers' market due to the historical collapse of the sugarcane market was among the highest of these risks. After M-RED supported a local disaster risk analysis that helped

Balancing Ecological and Market Risks in Sector Selection and Program Design

In promoting the sugarcane nexus intervention, the M-RED team had to reckon with the historical sugarcane boom and bust patterns that left farmers skeptical of demand and factories tentative about investment. Until 2016, Mahakali Mill was the only factory catering to farmers in Kanchanpur and Kailali. The entrance of M-RED and other farmers into the lucrative sugarcane market saw an excess supply of 1.6 million quintals of sugarcane in 2015, and the local farmers' group reported that many farmers resorted to burning their crop, and confidence in the factory had plummeted. In response, Mahakali Mill expanded its crushing capacity, and Bageshwor Mill began operating in Kanchanpur close to the border with Kailali. Soon both mills were facing supply shortages and potential closing if they failed to break even within 2-3 years. Even though the sugar mills offered better pricing than local molasses mills, some farmers still preferred the lower risk involved in selling at least partially to the latter, further exacerbating shortages at the former.

While the DRR benefits of planting sugarcane are evident, farmers' hesitations underscore the need for informing programming with a deeper understanding of a full range of risks, as well as a complete market and risk analysis of the chosen crop variety.

farmers better internalize ecological shocks, particularly in areas most heavily exposed to floods, the crop's potential to protect land and property ultimately motivated farmers to invest.

To reduce some of the initial risks that farmers associated with this new investment, M-RED facilitated communal management of the plantations through the CDMC structures. In this model, groups—rather than individual households—collected income. In several communities, households have been highly successful in collectively farming sugarcane on riverbanks, earning impressive profits, reinvesting them in expanding plantations and sharing income. The flood resilience and land restoration benefits evident in the first year were often enough to incentivize groups to reinvest the shared income in plantation expansion and equipment. A portion was also allocated for a community emergency fund that allowed members to access small loans for personal emergencies or recovery after a shock.

In this case, farmers' perception of ecological risks increased relative to that of market ones, but overreliance on the crop at a community level introduced new risks. As communities increasingly planted sugarcane for flood resilience, the local mill could not process the supply, and—despite witnessing land protection benefits—crop returns were lower than expected for many farmers, potentially threatening the current expansion of the whole market. In addition, the effectiveness of this collective model in reducing farmers' risk depended heavily on group characteristics (e.g., leadership quality, land constraints, social cohesion within and between communities). In other, less cohesive communities, collectively investing time and resources in a new resilient crop variety increased risk, as farmers shifted away from their standard individual cultivation practices to a new crop, but poorly functioning groups quickly abandoned tending and harvesting sugarcane altogether after the initial season.

Carefully crafted market subsidy strategies, anchored in strong partnerships, can create market systems change in support of resilience

Encouraging farmers and market actors to invest in new crops in a complex risk environment often requires a carefully structured subsidy strategy. Initially, M-RED contributed just over 50% of production costs, including costs of seeds and other key inputs, and communities provided labor and all costs associated with irrigation systems, including fuel. By the second year, communities were purchasing seeds and leasing land-tilling equipment on credit. Ultimately, when the economic incentives for M-RED farmers began to outweigh the risks and financial burden, they began to implement the interventions individually, as illustrated in Table 2. Once investors also started seeing more substantial returns after the first year, they assumed a higher percentage of their own costs. As risk aversion decreased through the third year and the collective benefits became more palpable, market actors in M-RED operational areas, from mills to farmers, were more willing to invest.

Importantly, M-RED created a demonstration effect where farmers who observed the benefits of improved practices among early adopters begin to replicate or sustain the models. The program documented 28 cases of replication of nexus interventions, 10 of which we confirmed as individual farmers' investments. While only communities relatively close to those originally included in M-RED have copied nexus interventions without external support, at the time of this writing, district government and private sector entities were partnering with M-RED to invest in sugarcane development in vulnerable communities outside of the original program target area. The level of independent replication of sugarcane production is strong evidence of a shift in the market system that could support resilience at a wider scale.

M-RED Intervention	*Individual Replication*	*Group Replication*	*Unspecified*[6]
Nexus	13	10	5
Green Infrastructure	0	11	9

Table 2: Replication Tally Reported by Communities and Stakeholders During Assessment Interviews

Several critical ingredients contributed to a successful transition from a more direct service delivery model to one that facilitated linkages and relationships, and allowed for a rapid reduction in subsidies even in a risk-prone market context. Specifically, the M-RED team developed well-targeted partnership strategies to build technical capacity among market actors, reinforce community and household connections with district and regional institutions and those in power, and arrange co-financing and cost-sharing agreements with government and private sector entities. MOUs outlining cost-sharing expectations were pivotal to forming long term partnerships between farmers, other market actors, the government and the program, building confidence in future investments at all levels. For example, the MOU between DADO, the privately owned Mahakali Mill, and a local sugarcane farmer's organization reduced farmers' transportation costs, co-financed production investments and helped support a sustainable market for their product by ensuring the mill would purchase the farmers' crops. In the second year of production, Mahakali Mill provided improved sugarcane saplings, fertilizers and pesticides at discounts and lent machines to farmers free of cost to ensure sufficient supply.

Partnerships with small-scale, local input suppliers—or agrovets—were also central to the facilitative approach. After acquiring foundational training through the Training of Trainers (ToT) initiative, which M-RED delivered in partnership with government, agrovets then trained prospective sugarcane farmers (largely CDMC committee members) in the early stages of the program. Associated costs were largely wrapped into existing business models, as agrovets had already established relationships and demonstration plots with communities, and their success relied on their continued and consistent presence and support for local agricultural production. For example, agrovets already supported demonstration plots in local communities that allowed farmers to learn new agricultural techniques and problem solve around challenges. Based on trust cultivated through these processes and repeated

Photo Credit: Nepal/C. Tamang

M-RED in Action

Agrovet Hikim Chaudry saw his income and customer base triple after partnering with M-RED, even with two new agrovets in his locality. He said he is a more confident businessman, and new communities and farmers have approached him for technical advice and relevant inputs after seeing results in M-RED communities. Hikim continued to advocate for the benefits of sugarcane to other communities and successfully convinced his friend to make use of his marginal land to plant sugarcane.

6 In these cases, the assessment team was unable to determine whether a group or individual replicated the sugarcane intervention.

transactions with farmers, the agrovets began allowing farmers to buy inputs on credit. These factors, combined with their business incentives, made agrovets stronger candidates for sugarcane extension services than DADO government extension agents. As farmers became more informed, demand for agro-inputs and services started to rise and the agro-input market has become more competitive. Agrovets reported that sugarcane allowed them to expand their business offerings, increasing sales and income.

M-RED's government partnership also allowed government entities to avoid the role of direct service provider and assume an important facilitative function instead, creating a higher leverage point where the program was likely to reach more beneficiaries and be more sustainable. For example, the government paid for much of the sugarcane production training, facilitated opportunities for technology demonstration, and leased equipment free of charge in early stages of the program. Once established, M-RED quickly transitioned these functions to the private sector, and the government used its knowledge, resources and connections in non-M-RED communities to introduce the model and provide sugarcane production incentives.

M-RED's approach demonstrated that building resilience through market systems in complex risk environment often requires a sequenced approach anchored in strong partnerships, and may start with direct interventions that help manage short-term risks while phasing deliberately into the more facilitative ones that build long term resilience. Critical to this model is appropriately crafting subsidies, with the right partners, to facilitate the transition.

Targeting sectors and funds for excluded groups is supportive but often insufficient to address systemic social barriers to resilience

Beyond the need to ensure all household members benefit from resilience dividends, women's critical role in agricultural production in Nepal makes their engagement and empowerment essential to resilience building at household and community levels. M-RED communities are experiencing high levels of male outmigration, leaving women responsible for all aspects of agriculture, from tilling to harvesting, in addition to their traditional household responsibilities including water management, food preparation and allocation and childcare. Unfortunately, traditional norms bar women from financial decision-making at both household and community levels, and while women engage in small-scale marketplace transactions, large expenditures, loans and profit-making activities are fundamentally considered the domain of men. These norms remain in place even where the male head-of-household is out of the village, thus limiting the household's investment and income-earning potential, and imperiling the household during crisis. M-RED's disaster and market assessments conducted at program start-up highlighted that women are the most vulnerable group during and after a disaster, as they are cut off from information and more likely to be at home or in fields prone to flooding. Even in communities where CDMC members are mostly women due to male migration, the few remaining men retain decision-making power.

To address these issues and emerging flood risk reduction needs in target communities, M-RED began a Women's Initiative Fund (WIF), focused on a banana nexus intervention. Ongoing risk awareness and market analysis activities conducted in partnership with the CDMCs revealed that bananas could help mitigate frequent inundation of paddy fields inland of the river bank while providing women access to economic and social networking opportunities restricted in the sugarcane intervention. The lower labor intensity associated with banana cultivation made it an even more appropriate choice given that male outmigration has significantly increased women's time poverty. Through WIF, 12 women's groups, ranging from 20 to 25 women each, planted bananas, reducing inundation and yielding earnings of $1,000-$3,000 per group in local market sales during the first banana harvest. Recognizing the strong economic potential the banana market, a number of these WIF groups planned to expand production, develop marketing strategies and investigate strategies for adding value to their bananas.

Despite women's eagerness to invest in their own economic well-being and community resilience, their overall lack of agency hampered progress, and market growth and replication happened faster in places where men were present to make decisions and take ownership. This was the case in Nimuwaboji where women in a WIF group planted bananas on leased private land. While the crops grew well and the group saw profitable price offerings and comparatively low costs, two men—not women—from the same community replicated the banana plantation on their land. In other cases, men began to make financial decisions when bananas became profitable and used banana income to expand their own sugarcane business. In some places, women replicated the planting of alternative crops on flood-prone lands, but did not choose crops from which they could profit due to their limited connection to markets.

These scenarios suggest that communities need additional interventions to overcome social system barriers to resilience at individual, household and community levels, and that women's economic empowerment for resilience also requires a strategic focus on social and behavior change. Traditionally removed from markets, women have less social capital with market actors and limited capacity to negotiate market transactions. This required M-RED to refocus attention on engaging banana buyers and agrovets in gender-sensitive interventions. In addition, to ensure that diverse nexus market interventions can support risk reduction, programs like MRED must engage household and community members in dialogue around decision-making norms, increasing awareness around how women's exclusion is detrimental to resilience at individual, household and community levels.

Market diversification and dynamism is critical to addressing risk holistically and building resilience

Increased sugarcane production and processing investments provide strong evidence that market development in a new but targeted agricultural sector can help address ecological shocks and reduce economic risk in support of long term household resilience. At the same time, M-RED has struggled to adequately support other nexus products in reaching their full market potential. This analysis found that diversifying market interventions is critical to managing risk more holistically given the ongoing vulnerabilities within the sugarcane market described above, and the abundance of ecologically at-risk areas which have not experienced its benefits.

Specifically, while government support mechanisms, coupled with the agrovet partnership, helped farmers promote, sustain and scale-up sugarcane production, many communities still faced significant barriers to economic viability, including production barriers such as inadequate land holdings and transportation costs for those communities farther from the mills and an inability to access the mills during the rainy season. Some of these barriers also put groups and individuals who have increased their cost-share in this sector or who financed production independently at higher risk of incurring losses. Additionally, despite new market entrants, fluctuation in production continued to threaten sugar mills, putting them in constant risk of shut down and further threatening farmers. Farmers managed this risk partially by selling to molasses mills—despite receiving lower prices—effectively diversifying their buyer networks to protect themselves.

Financial inclusion, which M-RED is supporting in its second phase, is also critical to diversifying market sectors in order to increase farmers' access to new nexus products or ensure their risk is distributed across multiple agricultural sectors. This includes access to the right type of loan products to support business start-up and expansion, both for the producer and buyer. Limited access to and availability of capital was a key constraint in broader scale sugarcane replication; M-RED did not pair Phase 1 subsidies with a parallel intervention providing access to capital for expansion, ultimately constraining sector growth. The team recognizes that Phase 2 must include new partnerships with financial institutions, which could facilitate even larger investments in sugarcane while supporting the most vulnerable farmers. For example, mills could obtain larger loans, using their land as collateral, and help finance farmers. Ultimately, financial inclusion that enables household livelihoods to shift toward more secure investments must be a central aspect of any market and resilience strategy.

Complementary risk-reducing interventions can increase MSD impacts on resilience

The study found that complementary interventions focused on risk reduction also helped ensure M-RED was able to maximize both MSD and resilience benefits. For example, CDMCs gravitated toward green infrastructure because—despite a lack of economic incentives—flooding and river cutting risks in the Terai are high and communal work helps distribute the significant manual labor involved in these risk reduction measures. Green infrastructure improvements saved 40 hectares of marginal land in communities and raised awareness about the risks of open grazing—in fact, all M-RED communities have stopped this practice. Several communities have sold grasses planted using green infrastructure techniques at a profit, while eliminating their reliance on imported grasses from India to make baskets, roofs and brooms. In comparison to previous years, 2016 saw less severe flooding from a tributary of the river where green infrastructure had been employed, and the communities maintained improved road access during flood season. DRR work with local government and communities aimed at strengthening an early warning system that connected national governments with districts, districts with CDMCs, and CDMCs with households was critical in helping households evacuate during the floods of 2017. In addition, building CDMC awareness on disaster risks and impacts helped motivate the groups to set up a community emergency response fund with a portion of sugarcane profits.

Conclusion and Recommendations

M-RED partnered with government institutions, market actors, and civil society organizations to strengthen the market system for sugarcane, while reclaiming unproductive land along riverbanks and reducing the damaging effects of future floods. The program did this by addressing systemic constraints to commercial sugarcane farming as well as engaging target farmers in complementary interventions that included mobilizing farmers for green infrastructure, and building capacity for early preparedness and response in the event that floods became more severe. The analysis also highlighted missed opportunities to promote resilience early in the program, all of which are now being addressed as part of the program's second phase. The missed opportunities include fostering market diversification and dynamism, addressing structural social barriers related to women's inclusion and increasing the availability of and access to risk-reducing financial inclusion measures.

The following recommendations synthesize the key findings, providing a set of considerations for ensuring program design and implementation maximize both resilience and economic outcomes.

Integrate holistic risk analysis into market assessments to better build resilience through MSD

Real or perceived immediate risks—rather than long term potential income gains—often drive decision-making among farmers and other market actors' in thin market contexts, but MSD-focused programs often fail to consider the full range of shocks and stresses that threaten these actors. In contrast, M-RED's evaluation of the ecological risks faced by farmers as part of initial assessments helped the program select sectors that addressed community risks—specifically those associated with flooding—while also increasing their incomes. M-RED also sought to address farmers' economic risks associated with sugarcane, a crop highly susceptible to market price shocks, through risk pooling. Where social capital among community disaster management committee (CDMC) members was strong, this group-based farming model was successful in mitigating their economic risks. The team's contextualized knowledge of risk also contributed to their selection of a phased implementation design, as detailed below. A multifaceted understanding of the complex risk environment farmers and other market actors faced helped MRED select and support the development of key market sectors that contributed to farmers' resilience.

Pair interventions that strategically address immediate, significant risks with facilitative models to build resilient market systems

Due to skepticism around sugarcane demand given historical boom and bust patterns, M-RED experienced challenges encouraging farmers in vulnerable riverbank communities to invest in the nexus crop. To overcome these challenges, M-RED introduced a phased implementation approach, transitioning from significant subsidies, which initially boosted sugarcane production and encouraged independent crowding-in of sugarcane market actors, to phasing out subsidies in productive sugarcane communities. This approach required forming and bolstering system-level partnerships with government and the private sector to improve communities' market access to inputs and sales markets for the nexus crops. It also required ensuring all parties understood the market size, dynamics and requirements for stabilizing and expanding nexus production to overcome long term market barriers. In addition to engaging with market actors, the program introduced complementary risk-reducing measures that reinforced the market intervention but helped farmers address more immediate, ecological shocks and stresses in the short term. These complementary interventions—which included capacity-building in green infrastructure techniques (e.g., bamboo reinforcements, vegetation restoration), facilitated dialogue about the need to regulate open grazing and strengthening farmers' access to a flood early warning system—increased farmers' confidence to engage in the new sugarcane investment.

Harness markets systems change to reduce risk and build resilience at scale

The central MSD focus on strengthening and catalyzing market systems to bring benefits to the poor can also be an effective tool for sustainably reducing risk and building resilience at scale. M-RED's nexus approach was successful enough in its first two years of implementation that many target communities independently scaled up their activities by the third year, and communities outside the intervention area replicated the model. A new mill subsequently opened and another expanded in the area without program support. In addition to independently engaging in the sugarcane markets along the same river basin, many non-M-RED communities replicated green infrastructure techniques and adopted other risk-reducing practices, such as stricter local regulations around open grazing. Spontaneous replication patterns for the nexus sugarcane crop suggest that households and market actors made calculated investment decisions based on their perceptions of risk, and that these shifted over the course of the program. M-RED farmers were generally interested in group investing when it created risk pools for highly uncertain investments. However, individual farmers who observed both the potential for profits and risk-reduction benefits of sugarcane became more confident in replicating and investing in sugarcane planting individually, bringing flood protection benefits to the whole community.

Facilitate market diversification, financial access and planning capacity to build long term resilience

While independent replication of sugarcane production and increased processor investments provide initial evidence of market systems change as a result of M-RED, there were still considerable barriers to entry and expansion within the sugarcane market, including farmers' inability to access sources of financial capital to expand or start up sugarcane production. The sugarcane market also remained volatile and sugar mills managed their cash flow by paying farmers only after they completed their sales. These factors deterred farmers who perceived investing in sugarcane at the expense of other farm production as too risky. Insufficient sugarcane production put new and expanding sugar mills at risk of shutdown if they did not maintain a sufficient and steady supply stream. These dynamics suggest a need for resilience-building programs that utilize an MSD approach to fostering dynamism and diversity within the market, including facilitating market access to other nexus crops—effectively mitigating financial and other market-related risks. The importance of integrating financial management

and financial service access capabilities as a central component of resilience building is also critical to building actors' capacity to manage financial risks, while helping boost and diversify resilient investments.

Address restrictive social norms to maximize markets' effects on resilience

This research revealed how social norms drove local decision-making as much as perceptions of financial gain did, influencing behavior with detrimental effects for resilience. Specifically, social norms around gender in M-RED communities barred women from decision-making at the community level, limited their management of household finances and restricted their market access. This proved to be a major deterrent in the market expansion and success of a banana nexus intervention, where women's groups were supported to invest in banana plantations in severely flood-prone rice paddy areas inland of the river. Gender norms in this case hampered a critical risk reduction measure for the community in a context where nearly 80% of the male population had migrated and where women were left as the caretakers of the land. Building resilience through market systems thus requires a simultaneous investment in dialogue and awareness-raising around the social norms that can restrict markets for resilience and ultimately prove harmful to households and communities' ability to manage shocks and stresses. Based on lessons learned in the first phase, M-RED began household and community dialogues with men and women on the harmful effects of restricted mobility and financial decision-making for women during its second phase.

These findings reinforce the value of using market systems analysis and risk assessment to examine farmers' incentives and trade-offs in making market-based investments in resilience. Combining risk analysis tools with market systems intervention design can help programs select the sector that most effectively integrates resilience and economic objectives, while deepening our understanding of incentives at all levels. Ultimately this approach can help inform more nuanced intervention approaches that balance, for example, communal needs and risk reduction with individual economic incentives and market forces.

Appendix A: Glossary

- **Crowding-in:** Similar or competing market players copy and diversify pro-poor changes supported by an intervention.
- **Demonstration effect:** Independent replication of a particular behavior, or uptake of a technology or practice, as a result of observing the benefits of someone else exhibiting these same behaviors or practices.
- **Embedded credit:** Lending arrangements between market actors engaged in business (e.g. arranging delayed payment for goods such as inputs or pre-financing business activities such as agricultural production).
- **Facilitation or a facilitative approach:** Refers to temporary interventions to stimulate and strengthen (rather than displace) market functions and players in ways that create system-wide benefits for the poor.
- **Farm gate prices:** The net value of the product when it leaves the farm, after marketing costs have been subtracted.
- **Market systems development:** Market systems development works by identifying actors that can serve as leverage points for generating widespread, sustainable change in market systems.
- **Market systems change:** A change in the way supporting functions and rules perform that ultimately improves the poor's participation in a market system.
- **Resilience:** Mercy Corps defines resilience as the capacity of communities in complex socio-ecological systems to learn, cope, adapt and transform in the face of shocks and stresses.
- **Resilience Capacities:** The ability to deal with shocks and stresses. The means by which households, communities, and groups of communities cope, adapt and transform in the face of shocks and stresses. Target beneficiaries would need to overcome these threats.
- **Shocks:** Sudden onset, unexpected, high-impact events. These are dangerous natural phenomena, human activities, or conditions that may cause loss of life, injury, or other health impacts; property damage; loss of livelihoods and services; social and economic disruption; or environmental damage.
- **Social capital:** The quality and quantity of relationships and networks that people have.
  - **Bonding social capital:** How people connect within a group, based on shared characteristics. This could include gender, caste, or being part of the same neighborhood.
  - **Bridging social capital:** Connections across groups and communities to create horizontal networks.
  - **Linking social capital:** How people connect with district, regional or national institutions and those in power.
- **Stresses:** Ongoing pressures or seasonal factors—such as land degradation, unemployment, ongoing conflict, price instability, or climate variability—that undermine resilience capacities.
- **Systemic constraints:** Broad and generalized conditions endemic to a development context such as poor mobility, weak governance, or social inequality.
- **Systems-based approach:** A development program approach that recognizes the complexity, interdependence, and dynamism of social, political, economic, and ecological conditions in a particular context, and seeks to leverage or transform these conditions to achieve lasting development outcomes for poor and vulnerable populations.

Appendix B: Resilience Context

Systemic Constraint	Description
Limited Extension Services and Information	Government extension services have limited outreach capacity, and farmers possess limited information and skills necessary for modern agricultural production and management.
Weak Market Linkages and Access	Market linkages within input supply chains are weak, and non-existent or weak market access to industry-level sugarcane buyers undercuts farmers' ability to produce and sell quality products.
Limited Financial Services	Limited access to financial services and low financial literacy hinders farmers' ability to save and make investments that could improve their livelihoods and resilience.[7]
Social Norms around Gender and Caste	Women and marginalized groups have limited access to and control over productive resources (e.g., land, credit) and decision-making within the household and community. These long-standing traditional practices reinforce unequal treatment based on gender, caste and ethnicity, undermining the households' and communities' ability to cope, adapt or transform adequately in the face of shocks and stresses.

Shock/Stress	Description
Climate Disasters	Yearly summer monsoons increase river volume in the Terai (flood plains), leading to inundation of sand, river cutting (i.e., erosion of land by river) and flooding of farmlands, reducing land holdings and often devastating production. Some flooding threatens lives and houses, and cuts off access to roads, schools, markets and other resources. Deforestation upstream has been identified as a major cause of the siltation and river-shifting phenomenon experienced downstream. Climate change is exacerbating slow and rapid disasters, resulting in more unpredictable precipitation patterns and intense monsoons. Because the Far West Region receives monsoon rains traveling east to west last, the Terai districts are particularly vulnerable to incidences of drought as well as heavy rainfall. Cold waves in recent years have become more extreme in the Terai belt, posing a serious threat to lives and livelihoods.[8]

7 Vulnerable farmers in Terai face barriers to formal financial services such as banks being located only in commercial centers, the lack of substantial collateral to obtain loans, and the small size of loans actually required by farmers that are not commercially available.

8 Government of Nepal Department of Hydrology and Meteorology. (2016). *Cold wave in Terai lingering for longer period.* Retrieved from http://www.mfd.gov.np/content/?id=75

9 Diseases such as rust and foliar blight that, in the past, were found in tropical lowlands, have recently moved into higher elevations as a result of global warming. Retrieved from STRESS PAHAL. Mercy Corps. (2016). *Promoting Agriculture, Health and Alternative Livelihoods Program Strategic Resilience Assessment.* Retrieved from https://www.mercycorps.org/sites/default/files/MC%20Nepal%20PAHAL%20Program%20Stress%20Report.pdf

Shock/Stress	Description Cont.
Agricultural Pests and Diseases	Extreme temperature fluctuations have increased incidences of common crops, pests and diseases. While some pest species have disappeared or moved to higher altitudes, new ones have appeared.[9] These include armyworms, which have cause considerable damage to crops and cereals in the last 5 years. Human wildlife conflict concerning elephants is another recent development within the past 3-5 years that has caused considerable damage to houses, paddy and sugarcane plantations.
Migration	The Far West Region of Nepal has the highest rate of poverty in the nation, with communities comprised largely of marginalized groups and ethnic minorities. Unable to sustain themselves as farmers, migration of rural men to urban centers and to foreign countries has become a national issue. Almost half of all households in Nepal have either a current or former migrant and the number is increasing rapidly. Traditionally, seasonal migration to India to work blue-collar and service jobs is undertaken by men as a strategy to generate extra income. Migration is considered a less preferred but necessary coping method due to lack of local employment opportunities. Yet, it is often a source of significant household stress causing increased burdens on women, elderly and children left behind. Remittances are received infrequently and erratically, making household financial planning difficult. Degradation and loss of land due to river-cutting and flooding is increasing migration to India.
Unstable Demand for Sugarcane	The Terai's market for sugarcane has seen recent growth, but historical boom and bust patterns still leave farmers skeptical about the demand. Until 2016, Mahakali Mill was the only factory catering to Kanchanpur farmers and those in bordering communities in Kailali. With the addition of M-RED farmers and others who saw potential in the lucrative sugarcane market, the year 2015 saw excess supply of 1.6 million quintals of sugarcane. An association of sugarcane growers reported that in 2015 many farmers resorted to burning their plantations and had little confidence in the factory. The following year, Mahakali expanded its crushing capacity and Bageshwor Mill started operation in Kanchanpur close to its border with Kalali. At the time of this writing, both mills were facing shortages in sugarcane supply and the risk of closing if they were unable to break even within 2-3 years. These issues have discouraged the District Agriculture Development Office (DADO) from promoting it as a priority commercial crop in the past, inhibiting production expansion among mills.[10] Even though sugar factories offer better pricing than local molasses mills, some farmers still prefer to lower their risk by selling partially to molasses mills.
Socio-political Conflicts	When compared to the low and high hills, the Terai plains are more accessible by road, are in close proximity to India and local markets, and have comparatively more fertile land. A new wave of migration from hilly areas to the plains is causing social tensions. The Pahadi (i.e., people from the hilly areas) of different caste groups are moving to Terai areas where the Tharu caste group is predominant. Focus group discussions for this assessment revealed conflicts over land and grazing practices to be a recurring stress for areas with mixed Tharu and Pahadi settlements.

10 In Kailali, a sugar factory closed down in 2003 during the insurgency leavings farmers with excess supply of sugarcane, no buyers, and heavy losses.

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