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Potential contributions of market-systems development initiatives for building climate resilience

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ABSTRACT

Market systems interventions are an increasingly common approach to agricultural development. While the impacts of these interventions on poverty reduction and market participation by smallholders has been studied, little is known about their contributions to building climate resilience. This paper analyzes the compatibility of market systems and climate resilience approaches to agricultural development, using the United States government's Feed the Future program as an empirical case study. Drawing on case studies in Ethiopia and Honduras, the paper examines the synergies and tensions between market systems and climate resilience approaches. The study finds that the market systems interventions have contributed to climate resilience, but also evidence of significant limitations due to fundamental tensions between market system and resilience approaches in terms of what their goals are, who they target, and how they approach their objectives. This study has important implications for the design and implementation of climate resilience programs and policies, as well as the expectations that agricultural development programs will be able to build climate resilience. Recognizing the inherent tensions that exist between market systems approaches and resilience approaches and explicitly discussing the trade-offs between the goals, target audiences, and primary mechanisms of each approach would represent an important step forward if market systems programs are going to contribute to climate resilience.

1. Introduction

Market-based approaches to agricultural development, particularly those that consider market systems, are being increasingly employed as a means to encourage economic growth in the agricultural sector. As agriculture represents a key pathway out of poverty for millions of smallholder farmers, growth in the agricultural sector plays a prominent role in the development agenda (De Janvry & Sadoulet, 2010; Dorosh & Mellor, 2013; Irz, Lin, Thirtle, & Wiggins, 2001; World Bank, 2008). A market systems approach is one that seeks to connect the poor to markets and use the private sector to encourage poverty reduction and economic growth. Programs using a market systems approach focus on strengthening value chains and identifying market opportunities for the poor (Altenburg, 2007; Donovan, Franzel, Cunha, Gyau, & Mithöfer, 2015; Humphrey & Navas-Aleman, 2010; Stoian, Donovan, Fisk, & Muldoon, 2012). One of the reasons that such approaches are popular is that they aim to mobilize private sector resources for development, rather than relying solely on limited public sources of finance, and thus are viewed as more sustainable than other approaches, although this assumption is examined critically from a resilience perspective in this article.

At the same time that we see a trend towards market-based approaches to agriculture, there is also growing recognition that climatic changes, in addition to low productivity, population growth, and environmental degradation, stress the ability of agriculture to meet the livelihood and food security needs of rural households, and that unless additional investments in agricultural resilience are made, recent poverty-reduction and food security gains could be reduced or even reversed (Lobell et al., 2008; Porter et al., 2014; Wheeler & von Braun, 2013; World Bank, 2010a). Agriculture is vulnerable to multiple climate risks, including temperature increases, increased drought and rainfall variability, diseases, and pests. Many staple crops have maximum temperature thresholds, beyond which yields decline significantly and nutritional content is compromised (Knox, Hess, Daccache, & Wheeler, 2012; Porter et al., 2014). For example, with a 1.5 °C increase in average temperature, 40% of maize-producing areas could become unsuitable for current varieties (World Bank and Potsdam Institute for Climate Impacts, 2013). Climate change will also indirectly influence food security through its impact on global food supplies and prices (Phalkey, Aranda-Jan, Marx, Hofle, & Sauerborn, 2015; Porter et al., 2014; Wheeler & von Braun, 2013).

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These two trends present an interesting question: To what extent do market-based approaches contribute to building climate resilience, and what challenges exist for integrating climate resilience in market systems programs? This paper explores the synergies and tensions between market systems and resilience approaches to development through an analysis of Feed the Future, a large agricultural development initiative of the United States government that uses a market systems approach. Numerous studies have analyzed the impacts of market-based agricultural development approaches on poverty reduction and inclusive growth (Bloom, 2015; Briones, 2015; Lowitt, Hickey, Ganpat, & Phillip, 2015; Michelson, Reardon, & Perez, 2012; Neven, Odera, Reardon, & Wang, 2009; Reardon, Barrett, Berdegué, & Swinnen, 2009; Rutherford, Burke, Cheung, & Field, 2016; Suzuki, Jarvis, & Sexton, 2011; Vagneron, Faure, & Loeillet, 2009). Few studies, however, have looked at the impacts of these programs on resilience and the ability of vulnerable households to adapt to climate change. Unlike projects specifically dedicated to climate adaptation, insights on tensions between resilience and other goals such as increasing productivity, raising incomes, and private sector engagement can be gained through an analysis of a program like Feed the Future.

The remainder of the paper will present background on market systems and resilience, a conceptual framework for the contributions of market systems to resilience and potential tensions between the two, the methodology for the case studies, and results of the analysis. It will conclude with implications for further research and policy recommendations.

2. Background

2.1. Market system interventions

Millions of people around the world are engaged in small-scale agricultural production, a significant portion of which is consumed by the household (Cohn et al., 2017). Many studies have shown how a lack of participation in markets limits the ability of households to move out of poverty, and argue that subsistence agriculture represents a "poverty trap" for poor households (Abro, Alemu, & Hanjra, 2014; Barrett, 2008; Dercon & Christiaensen, 2011; Hayami & Ruttan, 1985; Irz et al., 2001; Ruttan, 2001; Thomas & Slater, 2006). Market systems interventions aim to improve agricultural markets and encourage smallholders to participate in markets. Shifting production from subsistence crops for household consumption to production for markets, either through direct sales, or more frequently, through contract farming, is proposed as a key mechanism for reducing poverty (Barrett, 2008; Briones, 2015; Reardon et al., 2009). While this can consist of improved marketing and sale of traditionally-grown crops, often it includes the introduction of new, higher-value crops demanded by the market (Briones, 2015; Weinberger & Lumpkin, 2007). For example, a study in Honduras found that even if farmers adopted best practices for traditionally-grown maize and beans, the average household would require 5 hectares of land to generate enough income to rise above the poverty line (in a region with an average landholding of 0.5 hectares). The study thus concluded that poverty alleviation is only possible through the adoption of high-value crops and integration into larger markets (USAID, 2015).

Central to a market-systems approach is the recognition that smallholder farmers are part of a larger agricultural system, including global food markets, and transformation of the agricultural sector to one that supports poverty-reduction requires support to all of the components of the system, from production to marketing and consumption. Market system approaches seek to systematically analyze barriers across the value chain and design interventions to address them. Studies have identified multiple barriers for smallholder integration into markets including: lack of access to information and technology, poor financial services, inability to meet standards of new, more formalized markets, and weak linkages between producers and consumers (Aker, 2011; Feder, Just, & Zilberman, 1985; Foster & Rosenzweig, 2010; Just, Wolf, Wu, & Zilberman, 2002; Zeller, Diagne, & Mataya, 1998). For example, Roy and Thorat find that many attempts by smallholders to participate in high-value markets in India fail due to inability to meet food safety standards, but that marketing partnerships with farmer cooperatives can help to overcome these barriers (Roy & Thorat, 2008).

The impact of these programs on smallholder incomes and household welfare is mixed. Many studies have found that participation in markets does raise household incomes (Bloom, 2015; Neven et al., 2009; Reardon et al., 2009; Rutherford et al., 2016). Rutherford et al. (2016) found that participation in value chain interventions in Liberia led to higher farm productivity and incomes, but had no impact on other welfare indicators, including nutrition. Michelson et al. (2012) found that contracts with supermarkets led to lower prices than local markets, but less price volatility, a trade-off farmers appeared willing to make. While market system interventions aim to alleviate barriers for the poor to participate in markets, there is some evidence that they may not be reaching the most vulnerable households. Studies have found that there is significant danger that smallholders may be excluded from these market opportunities (Neven et al., 2009; Vagneron et al., 2009; Weinberger & Lumpkin, 2007). For example, in Kenya, Neven et al. (2009) found that most participants were well-educated, medium-sized farmers, not small, rainfed farms, and Vagneron et al. (2009) highlight the high barriers to entry for the pineapple sector in Cote d'Ivoire and Costa Rica. Tobin, Bates, Brennan, and Gill (2016) document ways that even programs designed to support smallholders favor larger producers, in this case producers of indigenous potatoes in Peru. In contrast, Briones (2015) found a negative correlation with farm size for tobacco contracts in the Philippines, suggesting that smaller farmers were more likely in this case to participate in contract schemes. One reason smaller farmers may be more likely to participate is because of the high labor requirements of many horticulture markets (Reardon et al., 2009). Similarly, looking at the pineapple sector in Ghana, Suzuki et al. (2011) found that large firms used contracts with small producers to manage their market risks, effectively passing on the risks to the small producers, presumably because smallholders felt that they had no other alternatives and were in a poor bargaining position. This evidence suggests that even if participation in markets increases farmer incomes, there may be other trade-offs in terms of resilience, which will be explored in more detail in this paper.

2.2. Climate resilience

Socio-ecological systems literature, which emphasizes the linkages between ecological and social resilience, has been the dominant framework for analyzing climate resilience, and is of particular relevance when considering resilience in the agricultural sector (Adger, 2000; Berkes & Colding, 2003; Folke, Hahn, Olsson, & Norberg, 2005; Gunderson & Holling, 2002; Holling, 1973; Walker et al., 2006). Socio-ecological resilience can be understood as "the capacity of a system to absorb disturbance and reorganize while undergoing change so as to still retain essentially the same function, structure, identity, and feedbacks" (Walker, Holling, Carpenter, & Kinzig, 2004). While originating in ecology, this conceptualization has been applied broadly across fields. For example, in food security analyses, resilience is often measured by the

length of time to return to normal or recover, or the time needed to absorb the negative effects of a shock (Béné, Headey, Haddad, & von Grebmer, 2016). Socio-ecological systems are considered complex adaptive systems, meaning that they are characterized by emergent and nonlinear behavior, the capacity to self-organize and adapt on the basis of past experience, and a high degree of uncertainty (Berkes & Colding, 2003; Biggs et al., 2012; Walker et al., 2006). Key principles for building resilience that have emerged from the socio-ecological systems literature include: maintaining diversity and redundancy, managing connectivity, and managing slow variables and feedbacks, as well as a number of principles related to the governance of the socio-ecological system (for a comprehensive overview see (Biggs et al., 2012)). Diversity can be defined as variation in the system, while redundancy is overlap in the system, both of which are important for ensuring options in the face of shocks or stresses. Connectivity refers to the interactions among components of the system, which allows for the sharing of materials and information, as well as enhanced governance. Slow variables are those that underlie the structure of the system, while feedbacks represent the dynamics among variables (Biggs et al., 2012; Low, Ostrom, Simon, & Wilson, 2003). These principles emphasize the importance of considering the system qualities that foster resilience and the processes that allows systems to adjust to change.

Literature on sustainable livelihoods and social vulnerability also offer insights into climate resilience in a development context (Barrett & Constas, 2014; Béné, Newsham, Davies, Ulrichs, & Godfrey-Wood, 2014; Cutter, Boruff, & Shirley, 2003; Feola, 2015; Scoones, 1998, 2009; Speranza, Wiesmann, & Rist, 2014). Unlike socio-ecological resilience, this perspective explicitly considers the outcomes for individuals, rather than the system as a whole, and views resilience as a normative goal. Barrett and Constas (2014) propose a definition of development resilience as "the capacity over time of a person, household or other aggregate unit to avoid poverty in the face of various stressors and in the wake of myriad shocks. If and only if that capacity is and remains high over time, then the unit is resilient." Drawing on the Sustainable Livelihoods Framework, resilience from this perspective depends on: 1) access to capitals, including: natural capital, financial capital, human capital and social capital, 2) livelihood strategies, including agricultural intensification/expansion, livelihood diversification and migration, and 3) the structures and processes (i.e. institutions and organizations) that allow these capitals and strategies to be combined in ways that lead to resilience (Scoones, 1998).

One of the critiques of resilience is that the term has been so widely used as to become meaningless, or that it can be adapted to meet any objective (Béné et al., 2017; Brown, 2014; Davoudi, 2012). Many organizations have developed their own operational definitions of resilience to inform their programming. For example, USAID defines resilience as "the ability of people, households, communities, countries, and systems to mitigate, adapt to, and recover from shocks and stresses in a manner that reduces chronic vulnerability and facilitates inclusive growth" (USAID, 2012). This definition adds an explicit reference to inclusive growth as a pathway to resilience, which is consistent with USAID's emphasis on market-driven approaches to development. Inclusive growth can be defined as economic growth that benefits the most vulnerable (US Government, 2016). To date inclusive growth has not been emphasized as a central element of resilience in the academic literature. This study contributes to this discussion by exploring the relationship between resilience and inclusive growth.

2.3. Compatibility of market systems and resilience approaches

Increasingly, there is recognition that agricultural systems as a whole can be analyzed from a resilience perspective. Tendall et al. (2015) argue that we need more holistic analyses of food system resilience. MacFadyen et al. (2015) argue that the simplified global food supply system is extremely vulnerable and we need to consider resilience not only in terms of yields, but from the perspective of other actors in the food system beyond producers. Calls to consider the resilience of the market system, however, are different from analysis of the impacts of market systems on the resilience of the most vulnerable actors in that system. In other words, resilience of the system and resilience of participating farmers are not necessarily the same.

Few studies have focused on ways in which market systems or value chain interventions build the resilience of smallholder farmers to climate change, but from the literature on the impact of market system and value chain interventions on development outcomes, and the literature on agricultural livelihoods and resilience, various pathways can be described. Many market systems interventions seek to increase productivity by providing technical assistance for farmers, improving the incentives for production, and addressing market failures for inputs. Other interventions focus on improving the prices that farmers receive for their product, through provision of market information, efforts to reduce transaction costs, and by coordinating activities through farmer cooperatives or other means of collective action. Together these efforts to improve productivity and market access are designed to enable subsistence producers to: 1) generate surplus production that can be sold to markets, 2) diversify their production into higher value crops, 3) receive better prices for their production. These outcomes allow farmers to increase their production and their income (capitals), as well as diversify their livelihood opportunities. The logic of this approach is that with higher production and incomes and greater diversification, producers will have greater access to food, a better ability to preserve assets in the face of shocks, and a higher capacity to accumulate assets and smooth consumption during shocks, all of which contribute to household resilience (Carter, Little, Mogues, & Negatu, 2007; Ellis, 1998; Lin, 2011; Zimmerman & Carter, 2003). Fig. 1 identifies mechanisms through which development interventions focused on strengthening market systems seek to build resilience of smallholder farmers.

Certain similarities in the analytical approach taken by both market systems and resilience analysis also make them compatible. Both approaches emphasize multi-scalar interactions and interdependencies across actors and elements in the system. As described above, market systems approaches place smallholder farmers within the context of the larger agricultural system and focus on using value chain analysis techniques to understand the relationships across value chains and from the producer scale up to the global scale. Similarly, resilience approaches (both socio-ecological and sustainable livelihoods), also emphasize the interactions of different components of the system, and the feedbacks across them. Because both approaches utilize systems thinking, they emphasize underlying drivers of vulnerability or poor performance rather than focusing on proximate causes (Irwin & Campbell, 2015). Many interpretations of resilience emphasize structure and stability, rather than change, in part because of the concept's origins in ecology. Increasingly, however, the resilience literature is recognizing that transformation of systems is central to the resilience agenda (Feola, 2015; Gillard, Gouldson, Paavola, & Van Alstine, 2016; Matyas & Pelling, 2015; Olsson, Galaz, & Boonstra, 2014). This emphasis on transformation parallels the emphasis within the development literature on agricultural transformations, suggesting opportunities for synergies between the approaches.

Despite the recognition that market systems need to be resilient and the evidence that market systems can improve smallholder livelihood outcomes, development interventions focused on building market systems may not necessarily build smallholder resili-

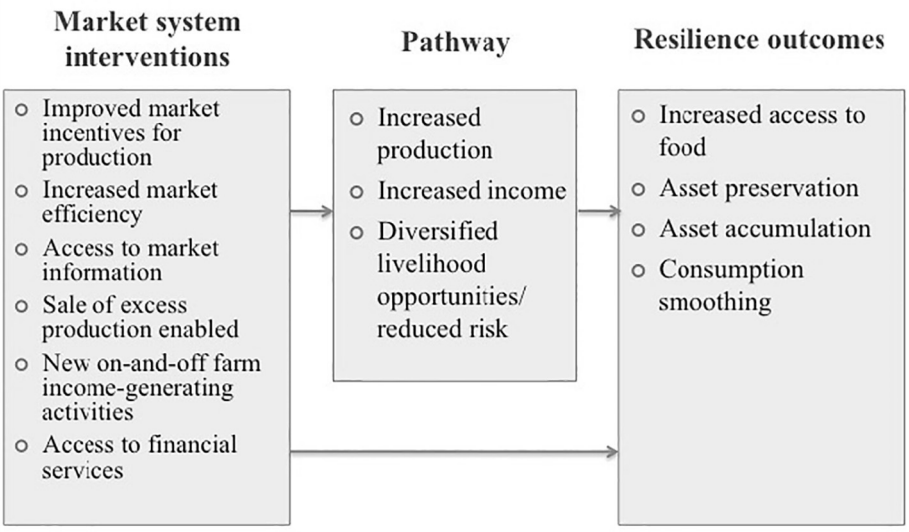

Fig. 1. Mechanisms through which market systems interventions build resilience. This diagram maps outcomes typically associated with market system interventions and demonstrates potential pathways through which they, either directly or through the intervening variables identified, contribute to resilience outcomes for households.

ence. Although market system interventions have poverty reduction as a goal, Bolwig, Ponte, Du Toit, Riisgaard, and Halberg (2010) find that remarkably few programs analyze how participation in value chains expose poor people to risks. A vulnerability and resilience perspective suggests that the analysis of participation in a value chain needs to consider not only the benefits but also the extent to which "value-chain governance and restructuring lock participants into reliance on a system that is disproportionately sensitive to shocks, and what measures might allow recovery" (Bolwig et al., 2010). Others have also noted that market systems approaches have been slow to join the "resilience bandwagon," suggesting that there may be important barriers to such approaches (Irwin & Campbell, 2015).

Through this analysis, I argue that due to inherent trade-offs between the two approaches, there are tensions between the two approaches that make it challenging for market systems approaches to address climate resilience. This paper presents a conceptual framework for exploring those tensions, based on the guiding principles for building resilience and building market systems. First, the goal of each approach is distinct, or *what* the intervention is seeking to achieve is different (although they may share an ultimate goal of improving producer livelihoods). The goal of a market-systems development project is to increase production that enters the market system, whereas the goal of a resilience-focused project is to support smallholder livelihoods, most of which are semi-subsistence (Bolwig et al., 2010; Humphrey & Navas-Aleman, 2010; Irwin & Campbell, 2015). Secondly, the target actors are also distinct, or *who* the intervention targets are different: market systems interventions target emerging commercial actors while resilience intervention regularly focus on the most vulnerable households (Irwin & Campbell, 2015; Tendall et al., 2015). Finally, the two approaches also differ in *how* they seek to achieve their goals, with market systems interventions seeking to improve the efficiency of the system, while resilience interventions emphasize the importance of redundancy in the system (Abro et al., 2014; Low et al., 2003). These tensions are summarized in Fig. 2,

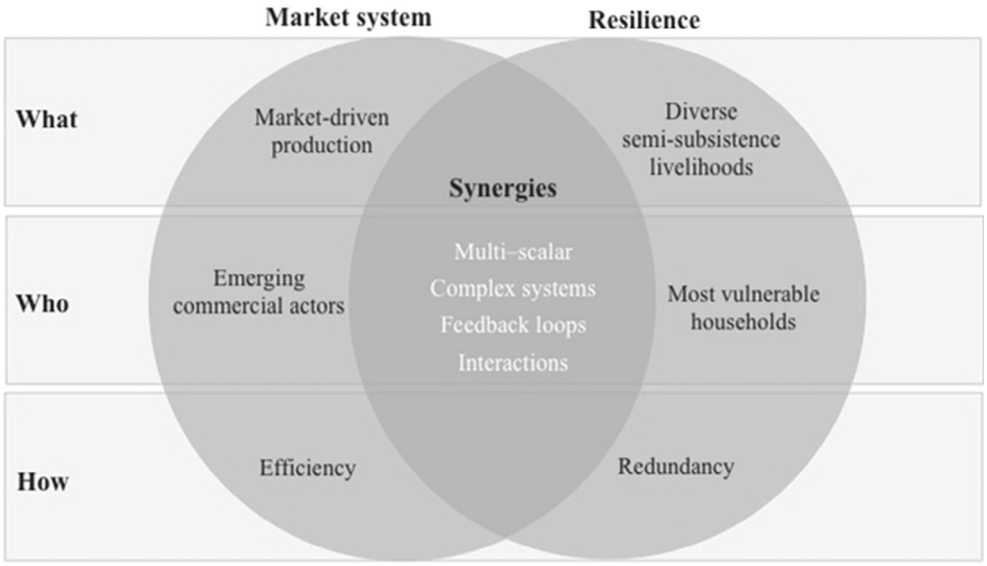

Fig. 2. Tensions and synergies between market system and resilience approaches to agricultural development. Based on literature on market systems and resilience, the primary goal of market systems and resilience interventions (what), the target population for interventions (who), and the main mechanism through which the goal is achieved (how) are identified. Areas of synergy are also identified.

highlighting distinctions between the two approaches, and the implications of these different approaches are explored through the case studies. As described above, there are also synergies between the two approaches, including their emphasis on activities at different scales, and feedbacks and interactions within the system.

3. Methodology

The analysis is based on comparative case studies of a global market systems agricultural development program, Feed the Future, in two of the countries in which it was operational: Ethiopia and Honduras.

3.1. Program selection

The Feed the Future Initiative was selected as a case study for several reasons: 1) Feed the Future is designed with a market systems approach to agricultural development and is the largest market systems agriculture and nutrition initiative globally; 2) increasing the resilience of vulnerable communities and households is an outcome of Feed the Future, along with four other outcomes that focus on productivity and markets (See Fig. 3); 3) climate-smart agriculture is a cross-cutting theme (along with gender and nutrition) for the program as a whole. In addition to its value as a case study of market systems and resilience, the size and scope of the initiative make it important to consider in its own right.

3.2. Country selection

Ethiopia and Honduras were selected as comparative cases because: 1) the United States government's Feed the Future initiative was active in both countries, and were among the largest portfolios in their respective regions; 2) subsistence agriculture represents the primary livelihood for a substantial portion of the population (over 85% of households in Ethiopia are employed in the agricultural sector, and while nationally only 36% of Hondurans are employed in agriculture, more than 60% of households in Western Honduras, which was the geographic focus of fieldwork, are engaged in subsistence agriculture) (Federal Democratic Republic of Ethiopia, 2015; Secretaria de Agricultura y Ganaderia de Honduras, 2014); 3) both countries have been identified as extremely vulnerable to climate change, particularly in their respective regions (Kreft, Eckstein, Junghans, Kerestan, & Hagen, 2014; Negra et al., 2014; Parker et al., 2014; World Bank, 2010b); 4) the socio-political, economic and cultural contexts in the two countries are quite different, as was the approach to achieving inclusive agricultural sector growth in Feed the Future. While some of the technical adaptation challenges and expected climate impacts are similar in the two countries, markets function very differently in the two contexts, creating different barriers to addressing resilience using a market systems approach. By examining market systems agricultural development efforts in two very different contexts, but under the same global program, the case studies helped to identify features that are likely to be relevant in a wide range of circumstances, as well as characteristics that are more likely to be context-specific.

Box 1: Feed the Future Initiative

What is it? Feed the Future is the United States government's global food security and nutrition initiative seeking to address poverty and hunger through inclusive agricultural sector growth and improved nutritional status.

Where does it operate? Feed the Future is active in 19 focus countries throughout the world, with 12 in Africa, 4 in Asia, and 3 in Latin America and the Caribbean, as well as some regional initiatives.

What is the level of investment? The total funding across the portfolio for FY2010-FY2014 (the first phase of the initiative) was 11.29 billion dollars. This analysis focused on USAID's programming, which was 4.69 billion (US Government, 2015).

3.3. Interviews

Fieldwork was conducted in Honduras and Ethiopia between 2013 and 2015. The cases focused on the major projects within each country's portfolio. Because of the large number of projects in the Ethiopian case (more than 50), not every project was included in the analysis, but all major projects were analyzed. The five largest projects, representing 78% of the investment, were

Fig. 3. Feed the Future goal, objectives and intermediate results. The Feed the Future initiative has two objectives (inclusive agricultural sector growth and improved nutritional status) that together contribute to the goal: sustainably reduce global poverty and hunger. Under the inclusive agricultural sector growth objective, five intermediary results are identified. Source: (US Government, 2015).

included, as well as all other projects that explicitly addressed climate change.

Interviews were conducted with a wide range of stakeholders including USAID staff, government counterparts, implementing partners, and Feed the Future beneficiaries (Table 1). In Honduras one hundred semi-structured interviews with project beneficiaries were conducted between October and November 2013 and twenty-eight interviews with stakeholders involved in Feed the Future Honduras were conducted between September and November 2014. Thirty interviews with stakeholders involved in Feed the Future Ethiopia were conducted between March and April 2014. Seventy and fifty interviews with other stakeholders in the environmental and agricultural sectors were conducted in Honduras and Ethiopia respectively to provide context. Sixty-five interviews, as well as multiple field visits that included focus groups with project beneficiaries, were conducted as part of the mid-term evaluation for Feed the Future Ethiopia, with the USAID Agricultural Knowledge, Learning, Documentation and Policy Project in December 2014–February 2015. Participants were identified through snowball sampling, and interview respondents were asked to identify other relevant individuals or organizations until all relevant stakeholders had been interviewed.

Due to the wide range of roles and expertise of stakeholders, interviews with key informants were open-ended. Interviews addressed the following themes: key aspects of project design and implementation, climate resilience considerations, challenges faced by individual projects and at the portfolio level, perceptions of Feed the Future, and comparative approaches by other projects. Interviews sought to understand Feed the Future from the perspective of USAID and its implementing partners, as well as other stakeholders in the agricultural and environmental sectors in each country. Interviews in Honduras were conducted in Spanish by the author and most interviews in Ethiopia were conducted in English. A limited number of interviews in Ethiopia, as well as some field visits, relied on translation by local project staff. Although the interviews and focus groups through translation provided insights of relevance for analysis, because the veracity of translations could not be verified, the formal analysis excludes these interviews. Human subjects approval was granted for this study by Tufts University.

Semi-structured interviews with farmers were conducted in Honduras. Two of the six regions in which USAID-ACCESO was active were selected. The department of Lempira was selected because it has high poverty rates and limited access to markets. The department of Santa Bárbara was selected because it has a variety of microclimates and crops and access to markets, due to both its geographic proximity to major cities and transportation infrastructure. Respondents were selected from registered project participants, with a sampling strategy designed to capture geographic and altitudinal variation across the two departments. Within selected villages, interview participants were randomly selected from among registered project participants. Best efforts were made to locate the selected participant. When it was not possible to locate the identified participant, a replacement was selected from the same village by choosing the next participant on the list. Interviews explored participants' experience with the Feed the Future program, adoption of new technologies and crops promoted by the project, participation in markets, and perceptions of climate change. Due to language barriers, and the need for multiple levels of translation (from local language to Amharic to English), it was not possible to conduct a similar analysis in Ethiopia. Producer focus groups provided some comparable insights, but the direct experience of producers was not captured in detail.

Table 1
Interview participants. Interview participants in each country by sector.

	Honduras	Ethiopia	Total
Government	22	38	60
International Organizations	8	8	16
Donors	14	22	36
International NGOs (or Implementing Agencies)	24	44	68
Domestic NGOs/Private Sector	16	16	32
Academic	14	17	31
Farmers	100	Approx. 30 (focus groups)	130
Total	198	145	373

3.4. Analysis

Key informant interviews were thematically analyzed to explore the synergies and tensions between market systems and resilience approaches. Notes from interviews were coded to identify interventions from Feed the Future that contributed to the different theoretical pathways for resilience developed in Section 2. The interviews were also analyzed based on the three aspects identified in Fig. 2 to explore tensions between the two approaches.

Farmer interviews from Honduras were transcribed and coded using the qualitative data analysis software NVivo. Interviews were coded thematically based on experiences with market participation, including the adoption of new crops. Motivations and barriers for participation in markets and adoption were analyzed with special attention paid to vulnerable groups such as women and renters. Farmer perceptions of climate change, its impacts on production, and adaptation strategies were analyzed to identify key climate impacts of concern for farmers and the extent to which the market interventions promoted by the project addressed these concerns. Strengths and weaknesses of patterns were determined based on the consistency of farmer responses and analysis of the text of the interview responses. Based on these empirical results, implications for market participation to address vulnerability and build resilience and the limits or barriers to its success were explored. All quotes from interviews were translated by the author from Spanish into English.

4. Background

4.1. Feed the Future

The United States' Feed the Future program is a global initiative implemented in nineteen countries (twelve in Africa, four in Asia, and three in Latin American and the Caribbean) in the first phase of implementation from 2011–2016. Across its portfolio, Feed the Future funded more than 220 projects representing an investment of more than $11 billion in its first five-year phase (US Government, 2015). Feed the Future is a "whole of government" initiative of the United States, meaning that multiple agencies contribute to the initiative. In practice, however, the United States Agency for International Development (USAID) is the lead organization, and this analysis focuses on projects implemented by USAID.

Feed the Future follows a market systems approach to agricultural development, and seeks to ensure inclusive agricultural growth, emphasizing the use of markets and the private sector as drivers of economic development. The initiative uses a value chain approach to identify opportunities for the poor to engage in markets and address barriers to their participation in markets (Fig. 3). As described in the United States Global Food Security Strategy document:

> *"We will work at many levels to transform the food and agriculture system: supporting producers and other agribusinesses across value chains; boosting linkages to markets; improving the broader*

enabling environment to leverage responsible private sector investments; and encouraging the adoption of policies to support employment, entrepreneurship, and climate-smart approaches across these systems."

[US Government (2016)]

Feed the Future emphasizes "sustainable intensification," an approach focusing on increasing productivity while decreasing negative impacts of agriculture, which has received significant attention for its potential to address food security, but also criticism for being overly focused on production and not other pillars of food security (Campbell, Thornton, Zougmoré, Van Asten, & Lipper, 2014; Garnett et al., 2013; Legwegoh & Fraser, 2015; Lin, Perfecto, & Vandermeer, 2008).

Increasing the resilience of vulnerable households was one of eight intermediate results of the initiative in the first phase, along with outcomes regarding increasing agricultural productivity, expanding markets and trade, increasing investments in agriculture, and increasing employment in specific value chains, as well as a number of nutrition intermediate results (not shown) (Fig. 3). Although Feed the Future contains a nutrition component, this analysis focuses on the "inclusive agriculture sector growth" objective. This is not to suggest that nutrition interventions can't contribute to resilience, simply that such contributions are not addressed in this analysis. Climate-smart agriculture is one of three cross-cutting themes for the initiative, along with gender and nutrition.

4.2. Ethiopia

Ethiopia is a large country in eastern Africa, with a population of more than 94 million. It remains one of the poorest countries in the world, although the economy has been growing rapidly for the past several years, with reported annual growth rates of 6–11%. Agriculture dominates the economy; more than 40% of the GDP comes from agriculture, 75% of export commodities are agricultural, and more than 85% of the population is employed in agriculture (World Bank, 2014). Climate projections suggest that droughts will become increasingly common in the region, although flooding is also expected to increase, and the government projects that climate impacts could cost the economy 10% or more of GDP by 2050 (Federal Democratic Republic of Ethiopia, 2015). Much of the population lives in the central highlands, where population densities are very high and most of agricultural production is located. Large portions of the southern and eastern parts of the country are drylands, home to low-density nomadic populations primarily engaged in pastoralism (National Planning Commission, 2015). Coffee is the primary export crop, responsible for 22% of export earnings in 2013–2014, and is culturally important, as Ethiopia is the birthplace of Arabica coffee, and approximately half of production is consumed domestically, the highest consumption in Africa (Minten, Dereje, Engida, & Kuma, 2017). A wide range of cereals and pulses are produced, and Ethiopia is estimated to have the largest livestock population in Africa.

The National Growth and Transformation Plan (GTP), the five-year plan from 2010 through 2015, aimed for Ethiopia to become a middle-income country by 2025 and focused on the agricultural sector, acknowledging the important role of the agricultural sector as a driver of economic growth. One of the goals of the GTP was to decouple the historical trends between rainfall variability and GDP, a pattern that leaves the country extremely vulnerable to climate variability and change (Ministry of F Economic, 2010). Increasing productivity is a high priority for the government, and viewed as central to achieving the growth targets for the nation (Ethiopian, 2013). Ethiopia has one of the largest extension programs in the world, and government investments in agricultural extension are among the highest in the world, but productivity remains among the lowest in sub-Saharan Africa (Davis et al., 2010). Complementing the GTP, the Ministry of Agriculture's Policy Investment Framework provides a roadmap for the agricultural sector for 2010–2020 and coordinates all government and partner activities in the agricultural sector, including Feed the Future (Ministry of A Rural D, 2010). The framework organizes investments in the agricultural sector into four major programs: the Agricultural Growth Program (AGP), the Sustainable Land Management Program (SLM), the Productive Safety Net Program (PSNP), and a nascent pastoral program. The second GTP, the national plan for 2015–2020, has a stronger focus on light industry, signaling a shift in the development strategy away from agricultural-led growth, consistent with the goal of transforming the economy (National Planning Commission, 2015).

The Ethiopian Feed the Future portfolio was one of the largest globally, with an investment of more than $270 million over the five-year period from 2010–2016. The overall objective was to increase growth and resiliency of rural Ethiopia, to be accomplished by promoting a market-based value-chain approach to improving rural on-and-off farm productivity, expanding domestic and international market access, increasing the capacity of businesses, strengthening financial markets, improving the regulatory environment for trade, and increasing that ability of productive safety-net program (PSNP) beneficiaries to participate in the market. The five main projects (covering 78% of the investment) included: a) an agricultural marketing and agribusiness project (AMDe) targeting six specific value chains (wheat, maize, chickpea, coffee, sesame, and honey). AMDe was designed to complement the government's production-focused interventions in AGP by strengthening markets and market linkages, b) a livestock marketing project with similar objectives to AMDe but focusing on meat and dairy production, c) a project assisting households within the PSNP to achieve sustainable food security (GRAD), d) a project working in the pastoral region to facilitate livestock production and marketing and to help those people transitioning out of pastoralism achieve food security (PRIME), and e) a nutrition program through the Ministries of Health and Agriculture to strengthen health delivery services with a specific focus on nutrition and promote nutrition-sensitive agriculture.

4.3. Honduras

Honduras is located in Central America with a population of just over 8 million. Although Honduras is a middle-income country, approximately half the population lives below the poverty line (Presidencia de la Republica de Honduras, 2014). Honduras has one of the highest rates of inequality in Latin America, a region known for its inequality, and inequality rose throughout the 2000s (Gindling & Trejos, 2013). For the bottom 90% of the population, real incomes have fallen significantly in recent years (CEDLAS & World Bank, 2014). Honduras is one of the poorest countries in the western hemisphere, and food insecurity and nutritional outcomes are weak, particularly in the western part of the country (USAID, 2011). Honduras is considered highly vulnerable to climate change, and western Honduras is a potential climate "hotspot" (Parker et al., 2014). One prominent analysis identified Honduras as the country with the highest climate risk globally based on historical losses due to extreme events (Biggs et al., 2012). Similarly to Ethiopia, climate projections for the region suggest both increasing drought and flooding. Hurricanes and other extreme events are also projected to become more common and intense in the region (Magrin et al., 2014; Parker et al., 2014).

Honduras has a strongly divided agricultural sector. Agro-industry (including cacao, banana, pineapple, horticulture, and palm oil) dominate along the northern coast and the central val-

leys. Western Honduras is a mountainous region in what is known as the Dry Corridor of Central America, a region that experiences frequent droughts, particularly associated with the El Niño phenomenon. The government estimates that 92% of households in the region are below the national poverty line (Government of Honduras, 2013). The region is known for its coffee production, with over 100,000 coffee producers, more than 90% of whom are smallholder farmers (IHCAFE, 2015). In addition to coffee production, most households are engaged in the production of maize and beans for self-consumption, although there is some production for local markets. Yields are very low, and on average households historically produced 22.3 quintals of maize and 5.29 quintals of beans (IFPRI , 2013). Horticulture production is increasing in the region, driven by demand in urban centers and the emergence of supermarkets (Bloom, 2015; Key & Runsten, 1999). Although livestock is nationally significant, the mountainous terrain and small landholdings of most study participants limited livestock production.

USAID-ACCESO, a four-year project that ended in December 2014, was the primary investment in the first phase of Feed the Future Honduras. The goal was to help 30,000 smallholder farmers increase their incomes to above $1.25 per person per day, with a target of 12,500 households. The project was designed based on a sustainable intensification strategy and an explicit emphasis on high-value horticulture production. The main approach was technical assistance to producers to improve their productivity, diversify their production, produce higher-value crops, and link producers to markets. The project also fostered the enabling conditions for sustainable markets, including logistical support for the sale of produce, transportation to markets, and the availability of new technologies and inputs. The second phase of Feed the Future, which began in 2015, includes two projects building on the experience of USAID-ACCESO.

5. Results and discussion

5.1. Synergies between market systems and resilience

Based on the conceptual framework developed in Section 2, this section analyzes the pathways through which Feed the Future market interventions contribute to resilience and the added value that a resilience perspective offers for the market systems interventions.

5.1.1. Contributions of market systems interventions to resilience

Evidence from the case studies suggests that many of the market-based approaches in Feed the Future were helping to build resilience of smallholder farmers. As fieldwork was conducted while projects were under implementation, it is not possible to demonstrate the long-term impacts of interventions on resilience, but interviews with both project staff and project beneficiaries demonstrate ways in which various aspects of the market-based activities were designed to support resilience. These market systems interventions support agricultural livelihoods (presented using examples from Honduras) and non-agricultural livelihoods (presented using examples from Ethiopia).

In Honduras, USAID-ACCESO supported agricultural resilience by helping producers improve their yields with better agricultural practices, encouraging diversification of crops, and improving access to markets and consistent buyer relationships. The resilience benefits of diversification were most dramatic for coffee producers in Honduras. During the project period, Honduras experienced a significant outbreak of coffee leaf rust disease affecting over 25% of the coffee producing area, with local impacts on labor demand and smallholder incomes of up to 50% (Avelino et al., 2015; Fewsnet, 2013). Although many beneficiaries were highly dependent on coffee, USAID-ACCESO helped farmers diversify their incomes, particularly through the introduction of horticulture, which helped compensate for coffee losses. Among coffee producers interviewed, 66% had adopted new crops during the project period, and an additional 9% planned to adopt new crops in the near future. One farmer articulated the potentially devastating impacts of coffee rust, and the hope that horticulture production offered.

> *"We think that coffee rust is going to finish our farm by the end of the month. I believe that if we have poor faith, this is going to be true, but we have been thinking that we have to have some interchange of crops- that we plant one thing and then we plant another. We are going to be provided with different things."*

Even without these disease outbreaks, coffee is highly vulnerable to price fluctuations, making diversification an important resilience strategy (Lin, 2011). Projections of climate impacts suggest that the coffee-growing range will become more restricted and diseases will become more prevalent, so adaptive responses and potentially livelihood transitions are needed (Gay, Estrada, Conde, Eakin, & Villers, 2006; Ghini, Bettiol, & Hamada, 2011; Laderach et al., 2011).

Producers appreciated the project's efforts to connect them to markets. One farmer, speaking in regard to production of Tobasco peppers, which the project facilitated, stated:

> *"When a market is guaranteed for you, you want to cultivate because you already know that there is a market, because this is the thing that costs. To find a market is not easy. It is easy to produce, but the market is not easy."*

The more confident that farmers were that there would be a market for their product, the more likely they were to adopt new crops with higher income generation. Thus, one of the key mechanisms through which the efforts by the project to foster market linkages contributed to resilience may have been to increase farmer confidence.

In Ethiopia, apart from supporting resilience through the agricultural sector, another way that the market-oriented activities of Feed the Future supported resilience was through a commercial destocking program. Project managers for the PRIME project explained that the large number of livestock pastoralists own can quickly become a detriment rather than an asset. PRIME sought to use market mechanisms to allow pastoralists to destock *before* a shock, maintaining the value of their investments, rather than waiting until after a crisis. This component of the project built on previous experience with pastoral resilience programs. REST, an implementing agency for the GRAD project in the northern region of Tigray, was piloting an initiative to engage landless youth. They had organized landless youth to form "cut and carry" forage and beeswax businesses using common lands set aside for restoration. Although this was not part of the original design of the project, local technicians described the opportunity they had identified for this particularly vulnerable population to engage in new markets, and were excited to identify ways to scale this activity up in other regions.

In recognition of the limits of the agricultural sector for poverty reduction, several projects in the Ethiopian portfolio included a job creation component. One pilot initiative in PRIME sought to help households transitioning out of pastoralism adapt to life in an urban center and establish livelihoods less dependent on extremely variable natural resources. Although project staff were aware of the importance of these non-agricultural jobs, they expressed frustration with their efforts, acknowledging that it was more challenging to identify non-agricultural job opportunities than they

had anticipated. While there are many factors that contribute to a transition from pastoralism, including changing economic and political power in the region, the need for adaptive responses may become more common in the future due to climate-induced migration or relocation (McLeman & Smit, 2006; Rufino et al., 2013; Tacoli, 2009).

5.1.2. Contributions of a resilience perspective to market systems interventions

The conceptual framework suggests that considering resilience could improve the quality of market system interventions. One of the goals of interviews was to determine if stakeholders perceived climate resilience as relevant to their market systems interventions, and what value, if any, addressing climate resilience provided to their programs. Was climate resilience viewed as an added burden, or did stakeholders identify synergies between the two approaches?

Particularly in the context of "results-based" programming, where there is strong emphasis on numerical targets and measurable results, one of the best indications of prioritization is what gets measured. Feed the Future had a total of 53 indicators, only one of which was directly related to climate change, namely, "*Number of people implementing risk-reducing practices/actions to improve resilience to climate change as a result of USG assistance.*" Interestingly, two indicators related to climate change were dropped from earlier reporting requirements: *"Number of climate vulnerability assessments conducted as a result of USG assistance*" and *"Number of stakeholders using climate information in their decision making as a result of USG assistance.*" Many of the other indicators capture elements of programming that contribute to resilience, such as adoption of new technologies for increased productivity, access to credit, and increases in income, but do not necessitate a climate perspective. Consequently, project managers did not receive a clear message that climate resilience was of central importance.

In Honduras, project leadership explicitly decided not to discuss climate change with farmers as part of their technical assistance. They argued that environmentally-friendly production techniques such as agroforestry or conservation agriculture were fine for NGOs or others *"giving away things for free*" but were not appropriate for a market-oriented project. Staff commented *"this is a marketing project, not a climate change project.*" Staff also believed climate resilience was not a relevant concern for farmers. One respondent stated, *"We do not promote the practices and technologies to the growers as 'hey, let's help you limit the problems with climate change.' We would get no-where if we used that approach.*" These comments suggest that for these stakeholders, climate resilience and market systems priorities are in competition.

Interviews with farmers suggest, however, that climate change was salient. One of the largest concerns was the loss of predictability of initial rains during the planting season. Farmers living in valleys worried that any additional increase in temperature would be detrimental for production, and those at higher elevation were concerned that locally-adapted varieties may no longer be well-suited under warmer conditions. Coffee producers expressed concern that if temperatures increase, their higher elevation coffee might lose the premium prices it currently receives for its higher quality. They speculated that disease outbreaks like coffee rust could become more common, observing that lower elevation coffee is more susceptible to disease. This suggests that there is significant scope to link the core activities of Feed the Future to climate resilience in ways that would be appealing to farmers, and some of the tensions between the two approaches identified by staff may be resolvable.

Only two projects, GRAD and PRIME, both in Ethiopia, explicitly attempted to incorporate climate resilience into their market-based activities (with dedicated climate change funding), and both experienced challenges doing so. However, in interviews respondents argued that the experience strengthened the quality of their market interventions by helping them consider risks associated with participation in the value chains the projects were promoting.

As part of their climate resilience efforts, GRAD conducted climate vulnerability assessments for each of its value chains. In interviews, project managers commented that these assessments helped them to identify risks in the value chains that they had not previously considered. The project director reflected on the process by which the value chains had been chosen (based on market demand and feasibility of production by smallholders) and the regret that climate risks had not initially been factored into the selection process, even though the goal of the intervention was to boost smallholder resilience. In comparison to other components of the project, he believed the vulnerability assessments were a simple addition to the program design, but which gave the team a much deeper understanding of the risks associated with the planned interventions. Staff involved in implementing the project reported that the vulnerability assessments and capacity-building on climate change they received changed the conversations technicians had with farmers and the community discussions they facilitated, leading to a greater emphasis on ways to reduce or minimize these risks. Rather than identifying specific technical changes in programming, project leaders found that addressing climate change opened the door for discussions on the tradeoffs between productivity and risk, and technicians were better able to advise beneficiaries on factors that may inform their decision-making.

GRAD also attempted to address climate resilience through village economic and social associations (VESAs), which were central to the market systems approach of the project. These VESAs built on traditional village savings and loan association models, but added educational components associated with starting new businesses. Climate change was one of four cross-cutting issues addressed in these groups, along with gender, nutrition, and aspiration to graduate from the PSNP program. The groups discussed each of these themes, with a goal of integrating them into their business efforts. According to a local implementing partner, of these issues, climate change adaptation was the least successful because most of the identified adaptation options were in value chains the project struggled to promote (over 85% of project participants preferred to invest in sheep and goat rearing or fattening, and it was challenging to get participants to invest in other income-generating activities, including those identified as resilient in the climate vulnerability assessment). Interestingly, VESA participants described the groups' role as informal insurance as one of the primary benefits, suggesting that the resilience benefits, as opposed to the access to markets, may have been one of the primary motivations for participation.

PRIME also conducted climate vulnerability assessments. PRIME stakeholders commented that one of the greatest advantages of the vulnerability assessments was that it forced them to identify other livelihood opportunities for pastoralists. The vulnerability assessments also highlighted the intersections between the natural resource management components of the project and the marketing components. Project staff stated that the focus on resilience really pushed them to treat the project as an integrated whole, rather than implementing each component separately, which was very challenging, but which they believed would lead to stronger outcomes for pastoralists eventually.

After conducting vulnerability assessments, PRIME identified numerous interactions between climate vulnerability and project activities, but the team had a challenging time planning and implementing concrete adaptation measures, in part because many of

the vulnerabilities identified were not technological, but social or economic. For example, lack of access to inputs and financial services were identified as key barriers to adaptation, and thus the adaptation strategy included work on input markets and financial services. The PRIME experience demonstrates that building climate resilience cannot be approached by simply adding in stand-alone climate components.

The experience with GRAD and PRIME provides evidence even when the project design includes climate resilience, insufficient technical capacity as well as difficulties translating project objectives into concrete climate resilience measures can contribute to limited opportunities for projects to realize the potential synergies between the two approaches. Without sufficient technical understanding of climate resilience, identifying synergies between market system and climate resilience was more challenging. Some of the skepticism regarding the salience of climate resilience may have been driven by a poor or limited understanding of climate resilience. Increasing the capacity of staff could improve the ability to build climate resilience.

5.2. Tensions between market system and resilience approaches

This section explores tensions between market systems approaches and resilience and identifies key dimensions in which there may be trade-offs between the two approaches: 1) market versus subsistence priorities (differences in *what* is the goal of each approach), 2) scale versus diversification (differences in *who* are the key actors targeted by the intervention) and 3) high reward versus low risk strategies (differences in *how* success is achieved).

5.2.1. What is the objective of market systems and resilience interventions?

Market systems approaches focus on production for the market and resilience approaches focus on diverse farmer livelihoods. Differences in the goals of the two approaches led to trade-offs that were evident in both cases. A focus on production for markets can lead to trade-offs in terms of supporting resilience.

One example was the promotion of a specific variety of chickpea. In Ethiopia, a variety of chickpea was introduced for export based on international market demand. Project staff were enthusiastic about the new variety, claiming that farmers loved it and were adopting it rapidly. One respondent even claimed that he expected full adoption in the region within several years. The challenge was that chickpea has traditionally been grown by smallholders as an opportunistic crop at the end of the growing season using stored soil moisture rather than rainfall, and the native variety, while unsuitable for export markets, is particularly well-adapted to low moisture conditions (Shiferaw, Jones, Silim, Teklewold, & Gwata, 2007). Chickpea is a staple in the Ethiopian diet, and provides a dominant source of protein during Eastern Orthodox fasting periods.

Considering the important role chickpea has historically played in the resilience of smallholder farmers, if household access to this crop is lost (either due to export, or lack of drought tolerance), it would have significant implications for household resilience. As farmers are encouraged to substitute their native variety with the new variety, farmers may be losing access to an adaptation option, as well as losing agro-biodiversity, an issue that has also been identified in other contexts, such as Peru, where market opportunities have been introduced (Tobin et al., 2016). Interviews with project management suggested that they had never considered the implications of this shift for smallholder food security and resilience. At the time of fieldwork, these negative effects had not yet been experienced, as there were several years of good rainfall, so the new variety had performed well and production and sales were relatively positive. From the perspective of a market systems approach, the new variety was preferable because of its strong international market demand, while the subsistence considerations were not prioritized. This example also highlights the wider problem of promotion of single varieties of crops, which was also the case for maize and wheat in the Ethiopian case.

Similar to the chickpea example, several other market-based approaches disproportionately exposed the most vulnerable to risks and created a tension between what is desirable for the market and what is desirable for an individual household. Hybrid maize, which was promoted in both cases, provides a good example of these risk considerations. Although yields associated with hybrid maize exceed local varieties, it also requires investment in more fertilizer and other inputs to be successful. In a good year, the increased cost of seed and other inputs is a worthwhile investment, but in a poor year, low-yielding local varieties may do better, or at a minimum, losses may be smaller. Commercial farmers have sufficient access to finance to manage these risks, but smallholder producers lack sufficient access to credit, savings or safety nets. Unless complementary measures to address these gaps are incorporated into the promotion of higher-cost ventures, farmers face exposure to risks they cannot cover, and resilience priorities are sacrificed at the expense of market priorities.

5.2.2. Who is the target of market system and resilience approaches?

Stakeholders identified different target populations for marketing and resilience interventions, as evidenced by geographic distinctions between these program components. Ethiopian government policy, as well as the Feed the Future strategy, divided the country into three zones: productive, hungry, and pastoral, based on agro-climatic differences. Several respondents reflected critically on this approach, recognizing that the geographic division into productive and vulnerable areas masked the reality that all agricultural activities, particularly rain-fed agriculture, are vulnerable to climate-related shocks. In addition to being an oversimplification, as respondents identified, there are food insecure and vulnerable households in "productive Ethiopia". As well, this categorization influenced the way that climate resilience was addressed in Feed the Future interventions. The two projects that included climate change components were located in "hungry" and "pastoral" Ethiopia and neither of the major marketing projects located in the "productive" regions included climate resilience components. The marketing projects, which formed the foundation of the market systems approach for the portfolio, had not considered the potential relevance of climate resilience. Through this division, in Ethiopia, Feed the Future effectively siloed rather than integrated climate resilience.

One of the key issues that emerged due to a difference in who was the target of interventions, was a tension between a need for diversification and a need for scale. Diversification is a key resilience strategy, but production for a market requires scale, a tension that was evident particularly in the Honduran case study. Diversification contributes to resilience by increasing household income, reducing income vulnerability, and acts as an insurance mechanism, particularly for agriculture (Lin, 2011; Lunduka, Fisher, & Snapp, 2012; Neven et al., 2009; Weinberger & Lumpkin, 2007). Unlike staple crops, one of the largest challenges technicians raised was that the perishable nature of horticulture creates high logistic demands on the supply chain. They explained that volumes of production need to be high enough to justify the transport and transaction costs. Until issues of scale can be addressed, they lamented that small sales in local markets remain the only option, which is not sufficient to support poverty alleviation. Many farmers were interested in adopting horticulture at a very small scale and experimenting with a variety of crops, but USAID-ACCESO could not secure a market until enough producers committed to a new crop and produced sufficient volumes to be attractive to a buyer.

Achieving this scale with risk-averse smallholder farmers was a significant barrier to the success of the project.

In Ethiopia, the major projects were designed around specific value chains, rather than a household's total production, making it even more challenging to balance scale and diversification. As a leader in the Agribusiness and Marketing project expressed, a project focusing on commodity marketing needs to have sufficient diversity in its portfolio (she identified six value chains as approximately the right number), because inevitably some will do better than expected and others will not. While the project covered its own risk through diversification, it did not encourage the same risk-spreading among producers. Very few farmers were engaged in more than one or two of the value chains, and thus the promotion of multiple value chains by the project did little to support diversification at the household level.

These examples raise the issue of resilience *for whom*? While sufficient scale is necessary to achieve resilience for the market system, the same accomplishment may increase vulnerability at the household level. At the same time, encouraging diversification at the household may be insufficient to achieve economies of scale necessary for market systems to function.

5.2.3. How does each approach aim to achieve its goals?

Tensions also exist between high risk/high reward strategies and strategies that seek to minimize risk. While a resilience approach prioritizes risk reduction, a market systems approach prioritizes efficiency, which comes with inherent risks. Feed the Future set ambitious poverty reduction targets, and many strategies to increase household incomes require that farmers make investments quickly, or adopt higher value but riskier crops. This pressure was further exacerbated in Ethiopia by the government's ambitious growth targets for the agricultural sector. Taking on greater risks, while essential to move out of low-risk low-reward poverty traps, can increase the vulnerability of farmers with very little capacity to absorb losses (Dercon & Christiaensen, 2011; Zimmerman & Carter, 2003). A fundamental tension, therefore, exists between moving households out of poverty as quickly as possible, and ensuring that as they do so, they are not exposed to risks that they cannot absorb, or switch to maladaptive practices with high near-term profits.

In its design, Feed the Future places a strong emphasis on connecting smallholder producers to high-value markets, recognizing that subsistence agriculture is not necessarily a pathway out of poverty. In Honduras, Feed the Future relied heavily on horticulture promotion. Horticulture production has become a viable livelihood strategy because of the rapid transformation of the agricultural sector. Supermarkets have emerged as significant players and are changing patterns of procurement that create opportunities for smallholder farmers to participate in new markets (Bloom, 2015; Key & Runsten, 1999; Reardon et al., 2009). If well-designed, supporting smallholders to take advantage of these new opportunities has the potential to contribute to transformative resilience capacities of farmers. Thus, promoting high-risk/high-reward strategies is not necessarily incompatible with a climate resilience approach; it does, however, require that risks be adequately considered.

Risk was a significant barrier to the adoption of horticulture according to interviews with farmers in Honduras. While horticulture was not replacing the production of staple crops, as farmers continued to produce at least enough for home consumption, they still incurred significant risks. Horticulture crops are water-intensive, and many are sensitive to drought and pests. They also require significant investments, including the purchase of seeds (or plantings), fertilizers, and pesticides, in addition to much higher labor requirements. Higher prices and shorter growing cycles make horticulture attractive, but it also requires significantly greater investments compared to staple crops, making it challenging for the most vulnerable households to enter this value chain (Neven et al., 2009; Weinberger & Lumpkin, 2007).

There are also significant risks associated with the adoption of new agricultural strategies, including that markets, particularly supermarkets, demand a certain quality and consistency, and if farmers can't meet those demands, their investments will be in vain. This is particularly challenging in the early stages of adoption when there is a significant learning curve. The literature suggests that supermarkets are less likely to favor contracts with the most vulnerable producers because they lack assets such as irrigation that help ensure quality, and the capital to make initial investments (Michelson et al., 2012; Reardon et al., 2009). Evidence suggests that Honduran farmers had similar experiences. One group of farmers initially produced carrots for the supermarket, but over half of their produce was rejected for failure to meet quality standards. Frustrated by this experience, they chose to sell locally despite lower prices. Evidence of the benefits of participation in formal markets is mixed, but a study of smallholder USAID-supported horticulture production in Nicaragua found that while farmers did not receive higher prices from supermarkets (and sometimes lower), despite stricter quality standards and higher associated transaction costs, price volatility was lower compared to local markets and risk-averse smallholders appeared willing to make this trade-off in order to gain stability (Michelson et al., 2012). Understanding the decision-making of farmers regarding the trade-offs between efficiency and resilience, particularly in terms of risk, is key to developing interventions that overcome the potential tensions between market system and climate resilience approaches to development.

These examples demonstrate a significant concern with using market systems approaches to build climate resilience: some market systems interventions may increase the vulnerability of farmers and be maladaptive. Maladaptation can be defined as "action taken ostensibly to avoid or reduce vulnerability to climate change that impacts adversely on, or increases the vulnerability of other systems, sectors or social groups" (Barnett & O'Neill, 2010). Relatedly, some interventions may have implications (either positive or negative) in terms of climate mitigation. These implications should also be factored into decision-making, particularly as climate-smart agriculture is a cross-cutting theme for Feed the Future. In such cases, there may be more than tensions between approaches, and activities following one approach may undermine efforts to achieve goals from another perspective. While increasing farmer income and market access can help increase resilience, such strategies may become maladaptive if other factors are not simultaneously considered. Mechanisms for maladaptation include actions that disproportionately burden the most vulnerable, reduce incentives to adapt, and set paths that limit the choices available to future generations (Barnett & O'Neill, 2010; Noble et al., 2014). Even in cases where adaptation or resilience are not project objectives, avoiding maladaptation can be a minimum standard to which projects aim. Both countries emphasized a "demand-driven" approach, based on an analysis of what products and varieties the market demanded. While matching project activities to market demand is important, if this is the only criterion used to select products to promote, considerations of resilience and risk may be missed. Adding climate resilience to the criteria for selecting crops or other market opportunities would help avoid maladaptation.

6. Conclusions

This paper analyzed the contributions of market systems programs to climate resilience, and the compatibility of climate

resilience and market systems approaches, using the United States government's Feed the Future program as an empirical case study. Based on case studies in Ethiopia and Honduras, there is evidence of ways market systems interventions contribute to climate resilience. As the same time, the experience from Feed the Future suggests that there are strong barriers to addressing climate resilience in market systems programs, and significant tensions between the two approaches.

6.1. Integrating resilience in market systems development projects

Despite evidence of contributions to resilience, this analysis found that there are fundamental differences between market systems and resilience approaches, leading to tensions between the two approaches. While it is feasible, for example, for an individual to be both part of a vulnerable household and a potential emerging commercial actor, these two perspectives represent different priorities, and programs following each approach use different strategies to achieve their aims. By looking critically at when it is possible and when it isn't to combine these approaches, our understanding of both resilience and market systems approaches to agricultural development are advanced.

Integrating resilience in market systems approaches offers a potentially powerful approach to improving climate resilience, but programs and policies should be designed and implemented with a recognition of the tensions between the goals of each approach and include clear strategies for balancing the differences between them. Areas of compatibility between the two approaches, including their focus on systems thinking and feedback loops, create interesting synergies that could make market systems approaches uniquely qualified to contribute to resilience if the tensions between the two approaches can be resolved. Evidence from Feed the Future suggests that this will require some changes to current programming strategies. Even in the case of Ethiopia, which explicitly had climate resilience as a program objective, there were numerous examples where climate resilience was not considered, and some evidence of possible maladaptation arising from a failure to adequately address risk, vulnerability, and resilience. The technical opportunities for climate-smart agriculture must be combined with a broader analysis that considers the underlying causes of vulnerability, risk and resilience (Coirolo & Rahman, 2014; Eriksen, Nightingale, & Eakin, 2015; O'Brien & Selboe, 2015). Improving the technical capacity of program designers and implementers regarding climate resilience could increase the ability of projects to identify opportunities to integrate climate resilience and resolve some of the tensions between market system and resilience approaches to development. Explicitly discussing the trade-offs between the goals, target audiences, and primary mechanisms of each approach would represent an important step forward for meaningfully ensuring that market systems interventions strengthen resilience.

6.2. Program/policy recommendations

The findings also allow for the identification of program and policy recommendations of value for future programming for Feed the Future or other similar market systems agricultural development interventions. Several indications from the recent U.S. Government Global Food Security Strategy suggest that the second phase of Feed the Future may address some of these issues. The second phase of the initiative, from 2017–2021, more explicitly incorporates climate resilience. "*Strengthening resilience among people and systems*" has been added as an objective, in addition to "*inclusive agricultural sector growth*" and "*improved nutrition*," and two intermediate results: "*improved proactive risk reduction, mitigation, and management*" and "*improved adaptation to and recovery from shocks and stresses*" have been added (US Government, 2016).

- *What gets measured matters:* include performance indicators related to climate resilience in results frameworks and project/program reporting. These indicators should relate to the core market-system interventions and not be isolated climate change activities.
- *Don't create siloes:* don't separate program objectives into different projects. Climate resilience cannot be addressed in separate projects (and most certainly not in different geographic areas targeting different individuals). This effectively re-siloes programs that may be integrated at the portfolio level.
- *Stick to the core competencies:* while there are many potential climate resilience interventions, market systems projects don't need to implement all of them; other actors may be better-suited to design and implement certain climate efforts. Instead, focus on identifying *how* climate change affects the market system interventions that form the core of programming and modify these interventions as needed. Some of these core interventions already address climate change, just not explicitly, and efforts should focus on continuing to strengthen these interventions.
- *Consider risk:* analyze the risk implications of all interventions from the perspective of the most vulnerable. When promoting high risk but potentially high reward interventions, make sure to pair these with complementary interventions to reduce risk or manage it, such as strengthening safety nets or promoting insurance. Make sure farmers are fully aware of the potential risks before encouraging them to invest in high risk ventures. Climate vulnerability assessments, such as those used in Ethiopia, can be a useful tool to facilitate risk analysis.
- *Acknowledge trade-offs:* acknowledge and openly discuss the potential trade-offs between market systems and resilience approaches. Recognize that achieving the goals of both approaches may require lowering expectations or targets for some of the objectives that may be in tension. Don't assume climate resilience can be "added on top" of market systems programs. This will allow "boxes to be checked" rather than fundamentally influencing core programs. It is better to make modest progress building climate resilience rather than add side activities in an attempt to address climate change.
- *Reflect and learn:* compare what was proposed in country strategy and project design documents in terms of climate resilience to what happened to a) determine what was realistic or feasible and what may have encountered barriers, and b) identify additional areas for addressing climate resilience that programs developed over time.

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