Introduction

Diversification is a key strategy for reducing the risk of hunger associated with exposure to climate disruption and other hazards. Although evidence suggests that when low input smallholders adopt agroecology-based diversification they can improve food security (UN SDG 2, Zero Hunger), advancing climate resilience (SDG 12, Climate Action) and sustainable land management (SDG 15, Life on Land) (Altieri, Nichols et al., 2015, IPES 2016 Kerr et al., 2019), better explanations and additional empirical research are needed to identify which diversification activities are currently in use, how and why farmers are using them, and the degree to which they contribute to several desired outcomes under different circumstances. This study contributes to filling this research gap. We report on the findings of a community-based mixed methods study conducted with Nicaragua’s leading smallholder coffee cooperative union and the national agricultural university.

Objectives

In addition to documenting common farm and income diversification practices among coffee growing smallholders and assessing food insecurity challenges, we aim to start explaining how diversification relates to: 1) food security and dietary diversity, 2) climate resilience, and 3) gender relations. Finally, we critically reflect on how community-based participatory action research (CB-PAR) that integrate smallholder cooperatives and local universities can build capacity and support co-led strategies that use agroecology to advance their goals with their affiliated members.

Methods

We used a CB-PAR approach to develop this on-farm research project. In 2017, promoters conducted 171 surveys in northern Nicaragua (Fig. 1). A random sample was selected from a population stratified by past participation in co-op led diversification projects or not. In 2018, on-farm monitoring started with 50 farmers using selected diversification strategies.

Key Partner: PRODECOOP Cooperative (2300 affiliated farmers, 10,000 people, >50% certified organic, 35% female members).

Diversification strategies studied include:
1. Milpa
2. Home gardens
3. Beekeeping
4. Diversified coffee
5. Specialized coffee

Field Research, Data Collection & Analysis:
- Use established food security & household dietary diversity metrics (Bacon et al. 2017)
- Mapped 50 farm parcels using GPS & GIS
- Coffee climate resilience survey from CATIE, also see Rahn et al 2014.

Findings

What factors correlate with food security?
- Fewer Lean Months
  1. Total farm area
  2. Total income
- More HH Dietary Diversity
  1. Farm Diversity
  2. Total Income
  3. Fewer lean months

On Farm Monitoring Findings

Gender, Labor, Annual Calendars, & Training

- Family labor key, hiring external labor is common.
- Labor bottlenecks usual from Nov-Jan.
- Labor into productive activities Feb to April could reduce lean months.
- Women report a income benefit from beekeeping.
- New diversification > more burden on women’s labor.
- Analysis of extension trainings show that female participation in gender trainings > than those on diversification and beekeeping.

Table 1: Demographic, agricultural, and food insecurity information

<table>
<thead>
<tr>
<th>Variable</th>
<th>n</th>
<th>Mean</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (years)</td>
<td>169</td>
<td>52.6</td>
<td>13.3</td>
</tr>
<tr>
<td>Female respondents (binary)</td>
<td>169</td>
<td>43.4%</td>
<td></td>
</tr>
<tr>
<td>Total number in household</td>
<td>169</td>
<td>4.1</td>
<td>1.8</td>
</tr>
<tr>
<td>Farm size (Ha)</td>
<td>171</td>
<td>4.61</td>
<td>5.59</td>
</tr>
<tr>
<td>Gross income ($USD)</td>
<td>164</td>
<td>2641.64</td>
<td>3324.61</td>
</tr>
<tr>
<td>Percent farm area in coffee</td>
<td>164</td>
<td>51%</td>
<td>36%</td>
</tr>
<tr>
<td>Number of lean months</td>
<td>171</td>
<td>1.62</td>
<td>2.11</td>
</tr>
<tr>
<td>Number of lean months of those reporting food insecurity</td>
<td>85</td>
<td>3.25</td>
<td>1.91</td>
</tr>
</tbody>
</table>

Conclusions

Food insecurity - remains a persistent challenge. More than 50% of the sample report > 1 lean month (Fig. 3).Regression results: p=0.001, “suggestion correlation p-value = <0.1”

On average, households’ monthly income is closely linked to the number of lean months they report. Farmers need more investment in organic production to build adaptive capacity.

Coffee plot climate resilience - is higher in diverse shade parcels, but these remain a persistent challenge. More than 50% of the sample are addressed in the co-op’s gender program, but could improve with more women in trainings. Honey production could contribute to women’s economic empowerment. New activities risk creating double or triple labor burdens.

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