

# Demonstration of Knowledge on Water Smart Agricultural Practices (WSA) in Guatemala's Dry Corridor

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## Introduction

Smallholder rural farmers in Guatemala's Dry Corridor are susceptible to shocks resulting from climate change. Such disruptions produce temporary opportunities for adequate intervention that, if used effectively, can enable individuals and communities to build long-term climate resilience. Catholic Relief Services (CRS) Guatemala, in collaboration with local partners, have implemented short-term emergency response programs (RENACER y Raíces) that hope to promote water-smart agriculture (WSA). WSA practices are generally used in long-term interventions, hence the opportunity to document which WSA practices have the most significant potential for adoption when implemented in short-term emergency response programs. The knowledge of the WSA practices has been implemented through the community Farmer Field Schools (ECA for its acronym in Spanish). In this model, a community participant is elected as the promoter of the ECA and trained by agricultural technicians on the WSA practice. Later, the ECA promoter will convey the knowledge to the participants of the ECA. The following study uses primary data collected from a Household Survey (HHS) of participants of the Farmer Field Schools who are beneficiaries of the RENACER or Raíces projects in the Departments of Chiquimula and Baja Verapaz. The study's goal is to visually illustrate the analysis per community for demonstrating knowledge of 4 of the 5 WSA practices included in the Global Partners Experience final report given to the CRS Guatemala Team: 1) Visual Soil Evaluation, 2) Nutrient Management, 3) Permanent Mulching, and 4) Integrated Armyworm Pest Management. Finally, an important finding included in the final report is that the farmers who demonstrate knowledge of the practice are applying the practice.

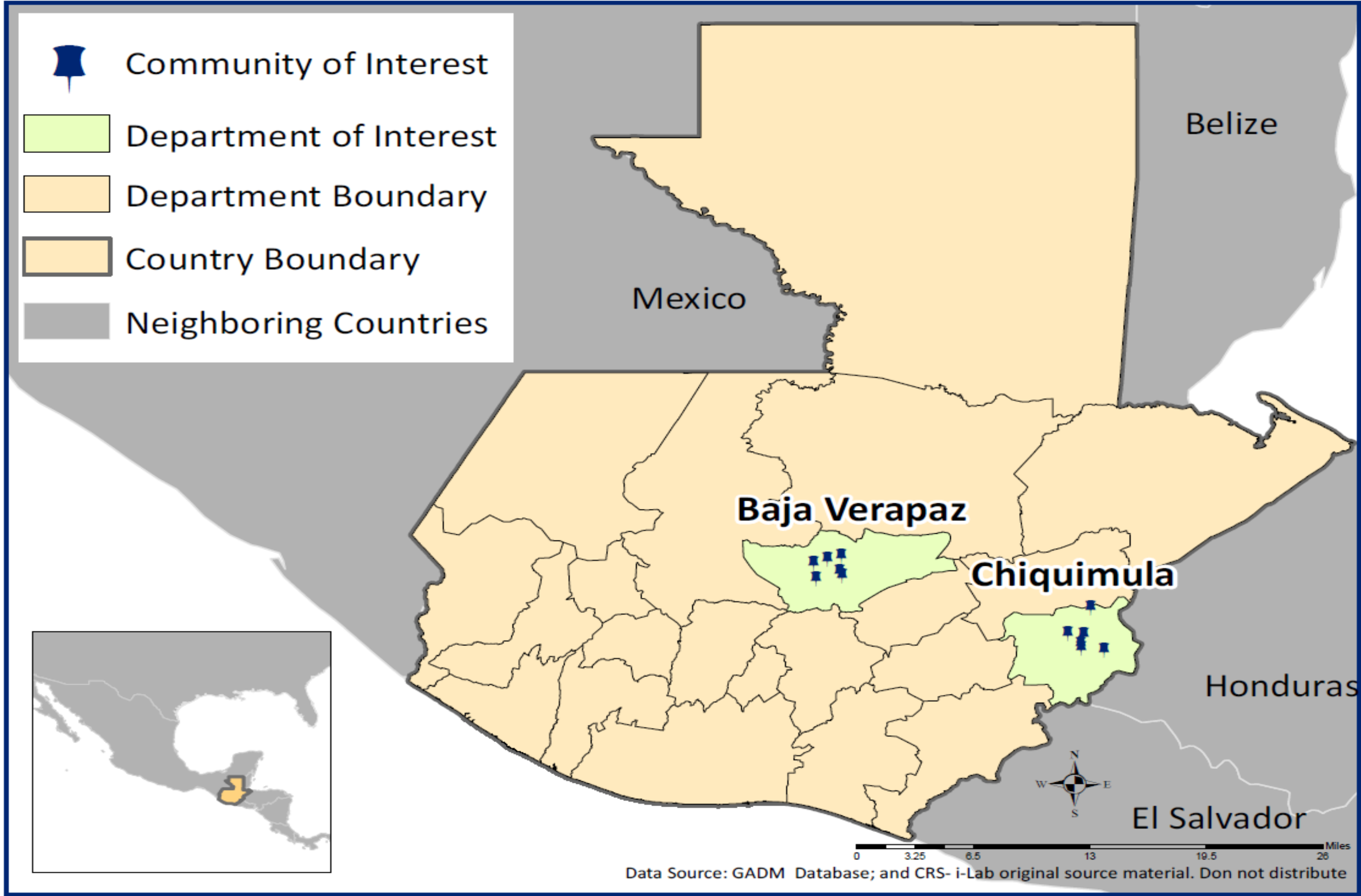


Fig. 1 Guatemala and community location by Department

## Methodology

Quantitative data were collected in the field from June 11- June 25, 2022, as part of the Global Partners Experience project with the support of Keough School of Global Affairs by the research team, four master students of the Global Affairs Program in Sustainable Development. Before the analysis began, a third party stripped all identifiable information from the Household Survey(HHS). A total of 507 HHS were collected. In Chiquimula, the total sample size was 302, and in Baja Verapaz, 205. The following maps and analyses were created using ArcMap GIS. Stata was used to produce the tables and illustrate some demographic characteristics of the surveyed sample at a community level. The final report also includes logistic Regressions.

Five types of maps were created to illustrate each community's location and demonstration of knowledge by each community. The first map (Fig. 1) shows the geographic location of the departments within Guatemala. The second (Fig. 2) and third (Fig. 3) maps show each communities' sample size in each department. The fourth and fifth maps (Fig. 4 and Fig. 5) show the descriptive statistic analysis of the demonstration of knowledge of the practice at a community level.

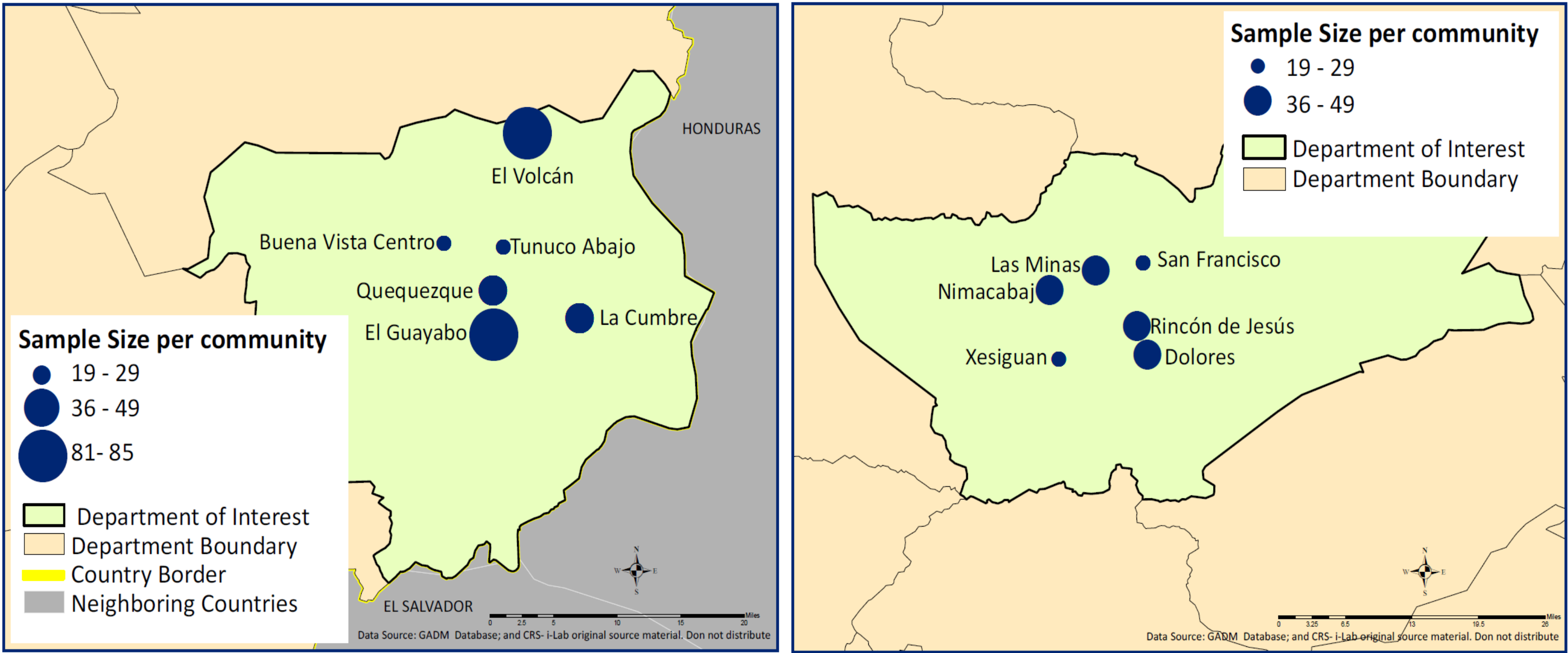


Fig. 2 Department of Chiquimula: Communities

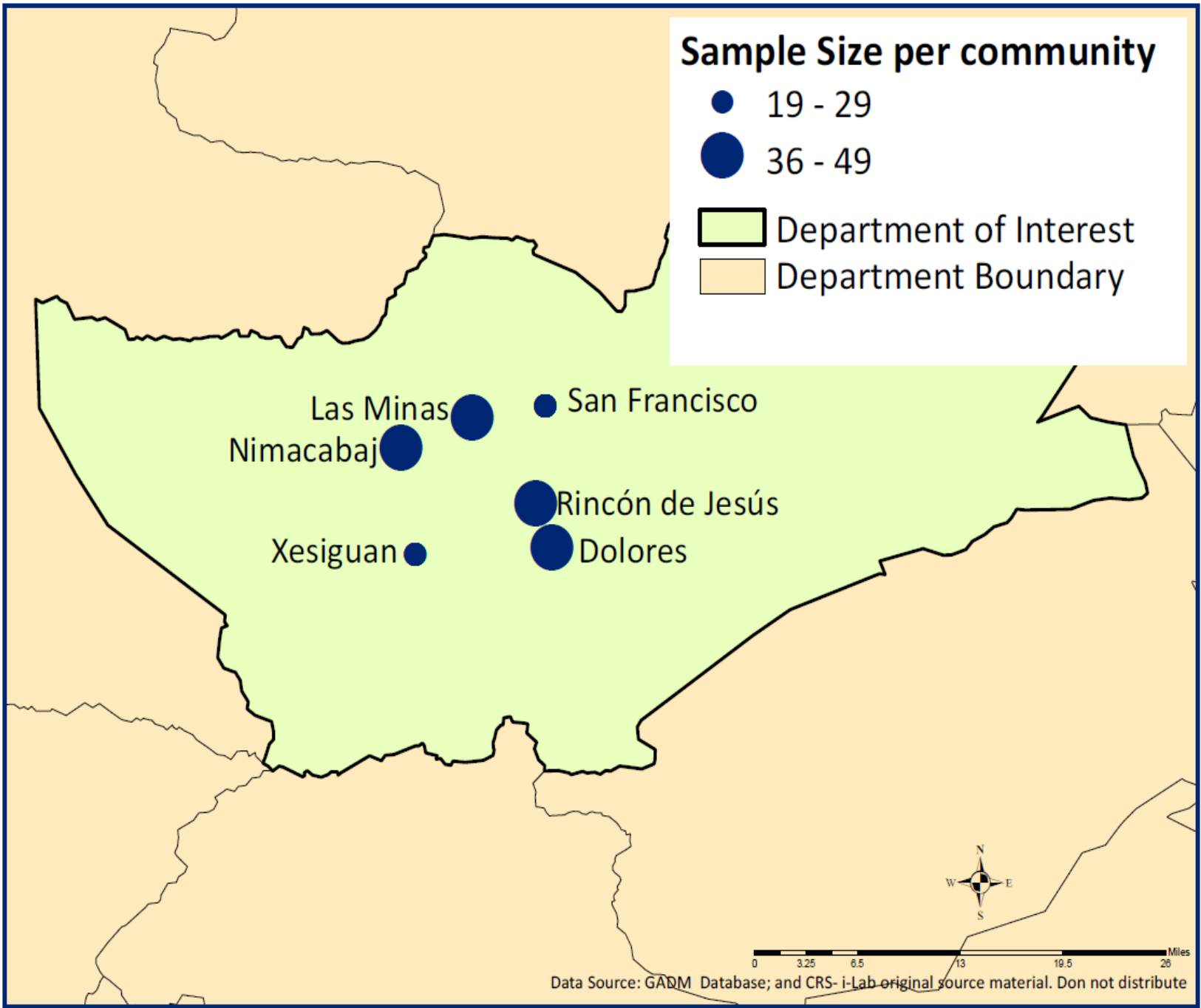


Fig. 3 Department of Baja Verapaz: Communities

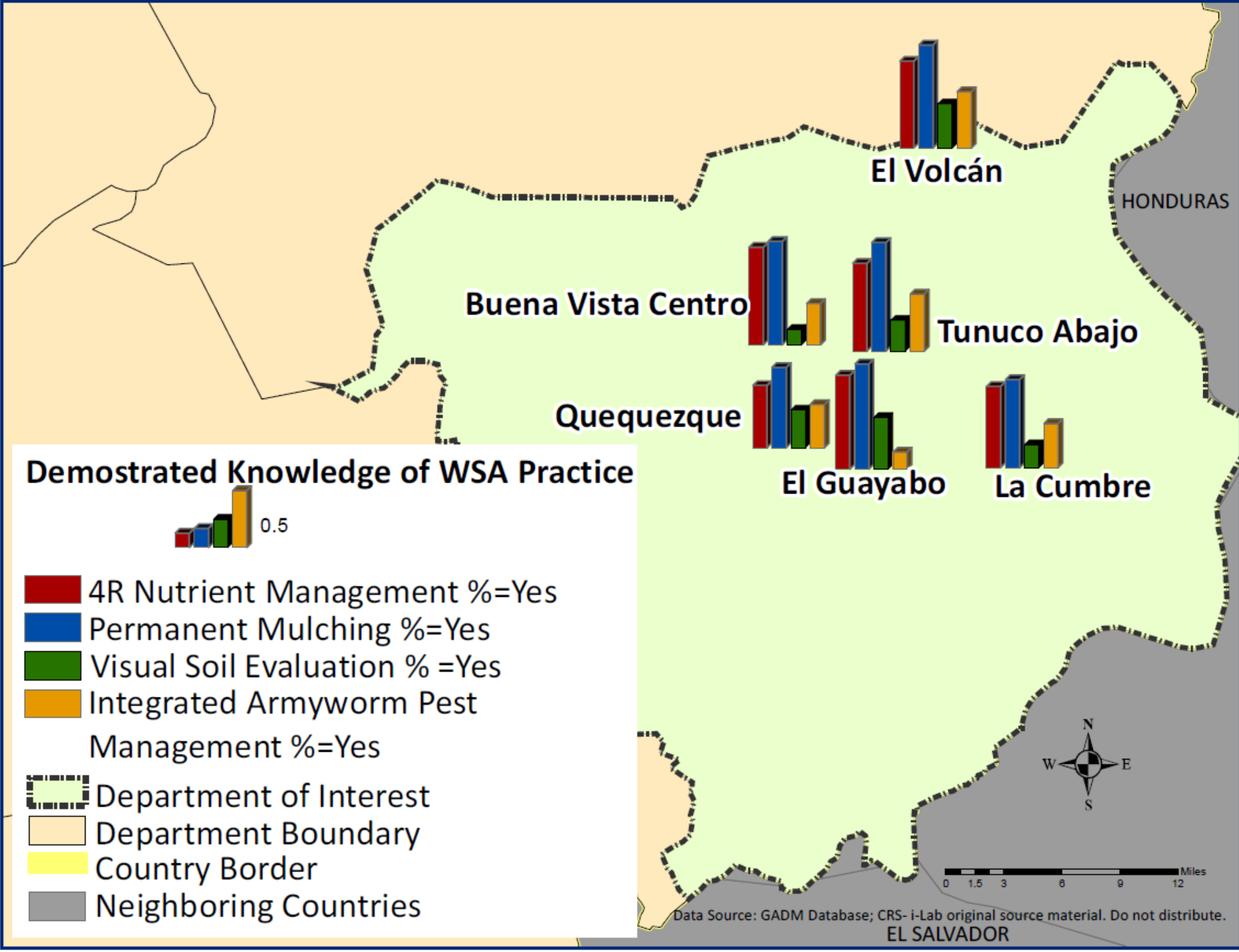


Fig. 4 Chiquimula Department: Demonstrated Knowledge of WSA Practice by community

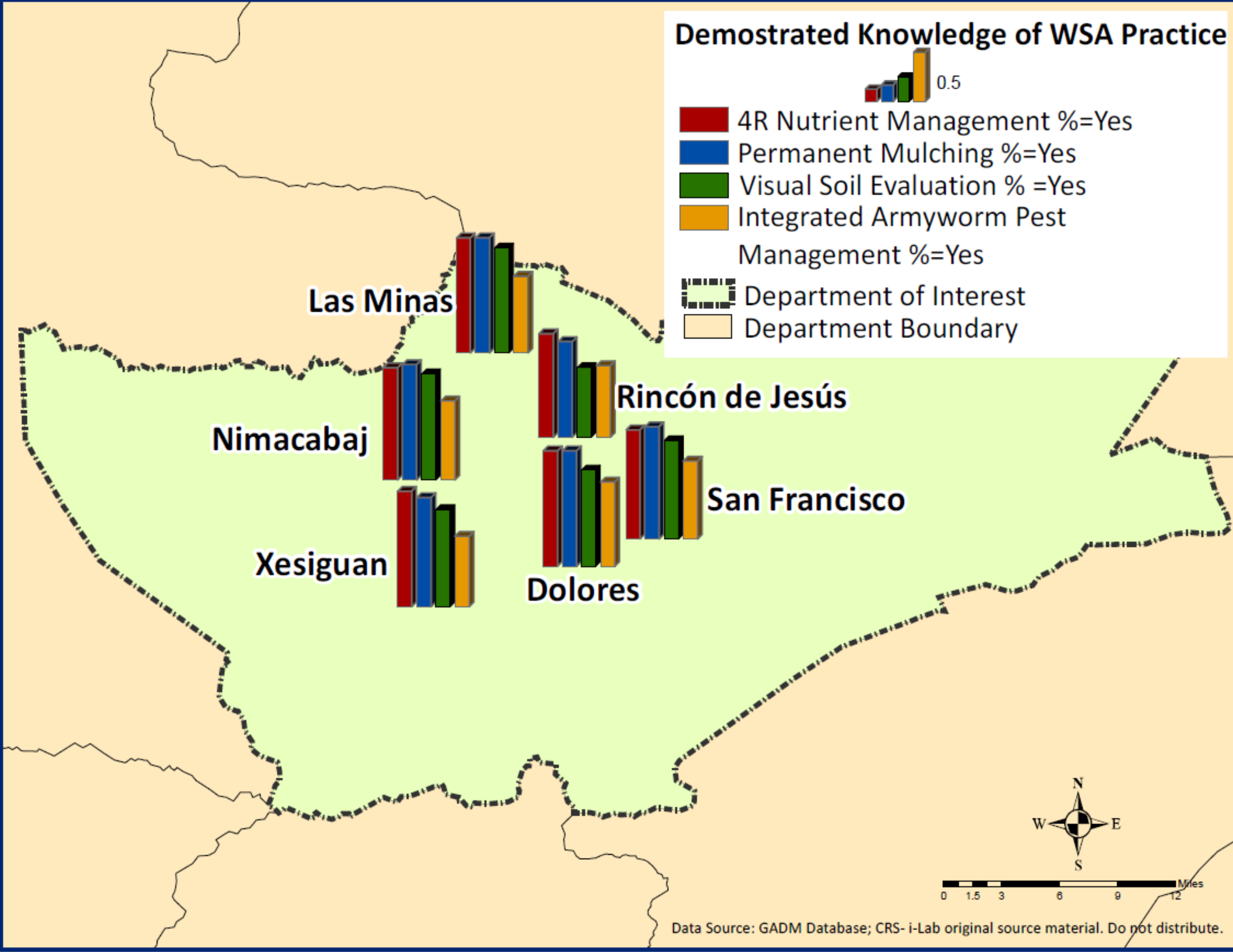


Fig. 5 Baja Verapaz Department: Demonstrated Knowledge of WSA Practice by community

## Findings

Overall, knowledge retention was stronger in Baja Verapaz across communities (Fig. 5). Permanent Mulching and 4R Nutrient Management showed the highest demonstration of knowledge across communities (Fig. 4 and Fig. 5). Visual soil evaluation and Integrated Armyworm Pest management had the lowest percentage, particularly in the communities of Chiquimula (Fig. 4 and Fig. 5).

Fig 4 shows that communities in Chiquimula had lower survey results than the communities of Baja Verapaz for demonstration of knowledge ( Fig 5). Three of the Chiquimula communities were exposed to the WSA practices (via ECAs) for less time since they were part of the project RENACER (59% of Chiquimula participants) which started a year later than the project Raíces. All the communities in Baja Verapaz were part of the Raíces project. The final report included tables to show the outputs comparing the three Raíces communities ( El Guayabo, Tunuco Abajo, Buena Vista)and the three RENACER communities (Quequezque, El Volcan, La Cumbre) in Chiquimula. Raíces communities generally had higher knowledge rates than RENACER communities (Fig 4); however, they were still not as high as Baja Verapaz (Fig 5). This suggests that exposure to less time in the ECA training might explain some, but not all, of the observed outcomes' differences.

Literature has shown that a lack of education is a barrier to knowledge. Therefore, the research team decided to examine the relationship between education and the demonstration of knowledge of WSA practices. The HH survey participants in Chiquimula have lower education rates than those in Baja Verapaz (Table 1 and Table 4).

Table 1: Chiquimula participants' Education Level

Education Level	Freq.	Percent
0 Never attended school	117	38.74
1 Started primary education	94	31.13
2 Completed primary education	66	21.85
3 Completed middle education	21	6.95
4 Completed professional technical education	4	1.32
Total	302	100.00

Table 3: Baja Verapaz participants' Education Level

Education Level	Freq.	Percent
0 Never attended school	52	25.37
1 Started primary education	50	24.39
2 Completed primary education	66	32.20
3 Completed middle education	26	12.68
4 Completed professional technical education	6	2.93
5 Completed superior Education	5	2.44
Total	205	100.00

Table 2: Chiquimula participants' Perceived Vulnerability

Which of the following best describes how well your household is managing financially?	Freq.	Percent
1 We struggle to meet our needs	250	83.06
2 We sometimes struggle to meet our needs	49	16.28
3 We can meet our needs	2	0.66
Total	301	100.00

Table 4: Baja Verapaz participants' Perceived Vulnerability

Which of the following best describes how well your household is managing financially?	Freq.	Percent
1 We struggle to meet our needs	101	49.27
2 We sometimes struggle to meet our needs	14	6.83
3 We can meet our needs	20	9.76
4 We can meet our needs and save money/ invest in improving our lives	70	34.15
Total	205	100.00

Despite these results, only the simple logistic regression analysis for Visual Soil Evaluation in Chiquimula showed that education has a positive and significant relationship with demonstrating knowledge. However, this estimation changed when other variables were included in the multivariate model. There was not enough evidence to determine whether education had a positive or negative relationship with the other three WSA practices in Chiquimula or Baja Verapaz. In addition, vulnerability measured by the financial perception of the participants showed up in some of the logistic regression analyses as an important driver and barrier variable for demonstrating knowledge. Tables 2 and 3 showed that for the variable perceived vulnerability, 83% of the participants living in the communities of the Department reported that they struggle to meet their needs (Table 4), while in the communities of Baja Verapaz, less than 50%. Vulnerability is a driver for Visual Soil and Integrated Worm Management practices and a barrier to 4R Nutrient management practice. In the final report, the logistic regression analysis also found that variables such as land amount size by the size of household, gender, presence of crop pests, type of cultivated crops, and types of livelihoods such as work for another person's farm or business in this community, work for another person's farm or business outside this community and live off the own production, were correlated either positively or negatively with the demonstration of knowledge of WSA practices.

## Recommendations

From the demonstrated knowledge maps, we can determine that the WSA practices, permanent mulching, and 4R responsible nutrients management had the highest rates of knowledge retention in both departments (Fig. 4 and Fig. 5). This finding also has implications for application. According to the maps, this also means that the other two practices, visual soil evaluation, and integrated worm management received lower rates for retention of knowledge, particularly in Chiquimula.

- If CRS would like to include the Visual Soil Evaluation and Integrated Worm Management practices for future ECAs, it should be essential to consider the barriers associated with these practices. It should also be necessary to identify the drivers that made permanent mulching and 4R-Responsible Nutrients possible to receive the highest rates.
- The tables provided in the poster suggest that the program participants living in Chiquimula have higher rates of less education and vulnerability. Perhaps adapting the material in the ECA's training and providing economic incentives to address vulnerability might nudge farmers to improve knowledge retention of the practices to lead to better application rates potentially.

## Conclusion

These visuals illustrate the differences in the demonstration of knowledge at a community level in the two departments where CRS is implementing the short-term emergency projects RENACER Y Raíces. The farmer-to-farmer approach of the ECA might explain the overall positive survey results on the demonstration of knowledge. However, demonstrating knowledge does not necessarily imply application and change in farming practices; therefore, more research on application practices might be needed.

Future research should target the understanding of drivers and barriers of the practices with the highest and lowest rates. Focus groups could help to uncover the variables and conditions in which the communities are and are not applying the practices.

## Reference

The data and research in the poster do not include the breadth of the data collected and analyzed for the Global Partners Experience Project. The final report should be consulted to understand better the study conducted in partnership with CRS Guatemala. The Database of Global Administrative Areas (GADM). Available at: <https://gadm.org/>

## Acknowledgments

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