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Abstract

Food security is essential for human well-being. Intending to improve human and environmental health, increase agricultural productivity, and reduce poverty in Costa Rica, Nicaragua and Honduras, the Canadian International Development Agency's (CIDA) *Community-based pest management in Central American agriculture project* focused on developing programmes and policies that could impact local, national and regional agricultural practices regarding the handling, storage and use of pesticides. In international development initiatives, such as this one, participatory approaches to governance provide opportunities for learning through public engagement in decision-making processes. This longitudinal qualitative case study examines what processes, activities and factors enabled, and/or constrained learning from participation in this CIDA project. Findings reveal what learning-focused, meaningful participatory approaches to governance look like in practice. Results show that learning occurred through strategic-level planning and implementation of project activities and through opportunities to experiment with newly acquired knowledge and skills. Other considerations included: (a) clearly establishing learning goals, (b) understanding learners' characteristics, and (c) creating effective pedagogical approaches for learners. Policy and practical implications are explored.

Keywords: Central America agriculture, learning for sustainability, public participation, rural development, transformative learning

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1. Introduction

Food security is essential for human well-being. Major concerns exist around the environmental sustainability of agricultural production in Central America. This is due in part to widespread environmental pollution, high incidences of elevated pesticide residues in food sold at local markets, and frequent occurrences of pesticide toxicities in rural communities (Sage, 2012; Shiva, 2013). Intending to improve human and environmental health, increase agricultural productivity, and reduce poverty in Costa Rica, Nicaragua and Honduras, the Canadian International Development Agency's (CIDA) *Community-based pest management in Central American agriculture project* (2006–2013) focused on developing programmes and policies that could impact local, national and regional agricultural practices regarding the handling, storage and use of pesticides (Mulock & Herrera, 2013).

In the field of international development, participatory approaches to governance have been promoted as a way to involve communities in decision-making processes to increase the success of initiatives and to ensure sustainable outcomes of capacity building and learning (Suskevics, Hahn, Rodela, Macura, & Pahl-Wostl, 2018). Moreover, development initiatives should reflect local priorities and address local needs; often they focus on poverty reduction, resource management, human health and/or environmental problems (Green, 2010). For instance, aiming to promote food security and environmental sustainability, some international development agencies collaborate with local institutions to promote agro-ecological practices and capacity building in rural communities (Najjar, Spaling, & Sinclair, 2013; Sims, 2012, 2017; Taylor, Duveskog, & Friis-Hansen, 2012). However, for these initiatives to be successful, public participation must be meaningful. Walker, Sinclair, and Spaling (2014) describe meaningful public participation as local stakeholders being purposefully engaged in decision-making processes and activities at all levels. Indeed, planning and implementing project activities can lead to significant learning outcomes and behavioural change in a transition to more sustainable livelihoods (Diduck, Sinclair, Hostetler, & Fitzpatrick, 2012; Suskevics, Hahn, & Rodela, 2019).

Ideally, meaningful participation involves a sharing in planning and decision-making processes. Participatory approaches to governance that integrate adult learning theory have been considered the most genuine regarding: (a) co-creating local knowledge; (b) understanding local realities, values, constraints, and opportunities; and, (c) enabling local voice in decision-making (Sinclair, Sims, & Spaling, 2009). Muro and Jeffery (2008) argue that learning-focused participatory approaches to governance can contribute to solve societal problems, fostering change towards sustainability. To address complex issues, these approaches should be interdisciplinary (Diduck et al., 2012; Sims, 2017), where people can learn collaboratively and take collective decisions (Muro & Jeffery, 2008); methods used should encourage critical reflection, dialogue, and allow participants to express concerns (Walker, Sinclair, & Spaling, 2014). Percy (2005), along with Sinclair, Sims and Spaling (2009), suggest using the ideal conditions for learning to help guide development practice. However, regarding what facilitates learning outcomes, Cornwall (2006) and Suskevics et al., (2018) point out that processes that enable and constrain learning need more exploration. Taylor et al. (2012) call for further study of the pedagogy behind transformation through agro-conservation initiatives.

CIDA's *Community-based pest management in Central American agriculture project* integrated learning theory and a participatory approach when designing the project and when planning and implementing activities (Sims, 2017). In this project (2006–2013), universities collaborated to increase food security with rural communities and stakeholders through promoting 'good pest management practices' (Izquierdo, Rodriguez Fazzone, & Duran, 2007). The participating universities included the Universidad Nacional Agraria (Nicaragua), Universidad de Costa Rica, Universidad Nacional Autónoma de Honduras, and University of Manitoba (Canada). Participants from rural communities, academia, government, and local organizations were involved. As outlined by Sims (2017), this approach led to significant learning outcomes for participants, such as: "learning about: alternative farming practices, human and natural environments, and safer pesticide use. Many participants learnt how to work more effectively with rural communities. For some, this changed their perspective about life and their role in society" (p. 539).

The purpose of this paper is twofold: (a) to explore what processes, activities, and other factors enabled, and/or constrained these, and beyond-process—as found three years following the project—learning outcomes, and (b) to explore what meaningful participatory approaches to governance, especially in developing-world contexts, look like in practice. In particular, concepts from transformative learning theory and an education-for-sustainability pedagogical approach are applied to understand the processes that promoted learning and social change. The goal is to contribute to the discussion around how to design context-appropriate public engagement activities in development initiatives that actively support rural participants' capacity to create liveable, healthy communities (Diduck et al., 2012). Practical and policy implications are explored.

2. Theoretical Perspectives

International development initiatives, including community-based natural resources and environmental management (NREM) initiatives, afford opportunities for examining the learning implications of public participation (Spaling, Montes, & Sinclair, 2011; Walker, Sinclair, & Spaling, 2014). Transformative learning theory provides a theoretical entry point when seeking to understand what factors enable, and potentially constrain learning in these non-formal educational contexts (Diduck et al., 2012; Taylor et al., 2012); transformative learning provides rich concepts for understanding the nature and depth of learning outcomes and accommodates the social context where learning occurs (Mezirow, 2008). It "helps explain the process of learning, including how people apply new frames of reference in individual and social action" (Diduck et al., 2012, p. 1324). According to Sims (2017),

> transformative learning describes a process by which individuals may improve their instrumental and communicative competence [developing] more 'functional' frames of reference (i.e., ones that are more inclusive, differentiating, critically reflective and integrative of experience)….Instrumental learning refers to learning for task-related competence, [it involves] improving performance and learning effective means to reach desired ends. Communicative learning [refers] to understanding what others mean when they communicate with us and involves understanding their purposes, values and intentions (p. 540).

Walker, Sinclair, and Spaling (2014) explain: "...transformative learning occurs when critical reflection on acquired instrumental and communicative learning results in a shift in one's perceived notion of self or one's relationship with broader societal or environmental surroundings" (p. 6).

Reflecting on development initiatives and public engagement processes, the importance of how they are designed cannot be overstated as regards learning outcomes, sustainability, and creating culturally-sensitive, context-appropriate equitable decision-making forums (Muro & Jeffery, 2008; Ntseane, 2011; Walker, Sinclair, & Spaling, 2014). Evidence suggests that learning through participatory decision-making can result in collective action, contribute to building environmentally-sustainable societies and contribute to the on-going sustainability

and success of initiatives through enduring learning outcomes (Marschke & Sinclair, 2009; Sims, 2012, 2017; Suskevics et al., 2019). Diduck et al. (2012) state that public involvement processes "can have a direct effect on opportunities for individual and social action...the precise methods used to engage the public could influence critical self-reflection...shape learning processes, and...influence...opportunities for learning for sustainability" (p. 1325). Consequently, understanding what factors enable desired learning outcomes has implications when designing decision-making processes and project activities (Sinclair et al., 2009; Suskevics et al., 2018).

3. CIDA Pest Management Project

This CIDA project consisted of three main components, each having distinct responsibilities, however, the work was complementary. Throughout the project, team members collaborated to support one another. Sims (2017):

> The community-development component worked with farm families to understand how and why they farm the way they do with particular focus on their pest management practices. The technical component implemented demonstration plots and facilitated educational outreach activities. The aim through these activities was to: promote safer pesticide storage, handling and use practices, and provide alternatives to pesticide use...The *policy component* developed indicators to help understand current practices and monitor change over time. (p. 541)

Within the overarching goals of the project, university collaborators from all four countries, jointly, developed a common methodological framework where broad guidelines for objectives and activities were established. This allowed for a similar approach to be taken to address a regional problem yet permitted enough flexibility to adapt activities to specific contexts according to local needs and community characteristics. An underlying principle was that all project activities, from international planning workshops to technical outreach activities, were considered and designed as opportunities for learning. Over 2,200 participants from rural communities, academia, government and local organisations were involved. A detailed description of the project, participatory approach taken, and learning results are published in Sims (2017).

4. Approach

The data presented here were collected during my involvement in the work as project manager (2008–2011), community-development team member (2008–2013), and researcher (2008–2016). I draw from semi-annual field visits involving participant observation, discussions with participants and project collaborators (2008–2011) project reports (Mulock & Herrera, 2013); and results from a qualitative case study that aimed to understand what participants had learnt through participation in the CIDA project (Sims, 2017). This case study involved two rounds of interviews. The first round was conducted directly following project completion (December 2012–February 2013), and it involved a total of 43 participants—university collaborators, farmers, and students—from the four countries. It focused on what participants had learned through participation in the CIDA project and what factors had facilitated,

or constrained, their learning. As established by Measham (2013) as appropriate, the second round was conducted three years later (May 2016) to determine enduring beyond-project learning outcomes and what had facilitated these outcomes. The second round of interviews involved Nicaraguan and Costa Rican farmers (four participants) who had 'hosted' demonstration plots and members of the technical teams (seven participants). At that moment, the Honduran security situation was determined too unsafe for fieldwork. A purposive sampling method was used. Participants were invited to participate in interviews. Interviews lasted approximately an hour. Methods used to determine trustworthiness of data included triangulation, member checks, and peer review. As with Sims (2017): "interviews and project documents were analyzed using Atlas-ti, a qualitative data analysis software program. Atlas-ti was used to code selected data segments and build families of codes based on themes that were consistent across the data set and emerged from what participants reported" (p. 544). In the sharing of results, direct quotations from this case study highlight participant voices, bringing authenticity to the sharing of their experiences. At the participants' own request, real names have been used.

5. Results: Factors that Enabled, or Constrained, Learning Outcomes

This section outlines specific activities that facilitated learning, particularly highlighting how participants' involvement in strategic international and national-level project planning activities and talking with rural actors to understand farm-level reality and practices resulted in learning. Then, factors that facilitated learning through implementing project activities, such as through hands-on opportunities to experiment and to act on learning, are examined. These factors highlight the value of experimentation with participatory approaches and during technical outreach activities to enable learning results. Finally, other facilitating factors and considerations are explored that contributed to learning outcomes. Table 1 summarizes these factors that facilitated learning and outlines resulting learning outcomes from participation in this CIDA project (Sims 2017).

5.1 Specific Activities that Facilitated Learning: Planning, Sharing Experiences, and Implementing Project Activities

5.1.1 Strategic international and national-level project planning activities. Project implementation involved strategic-level planning, followed by adapting plans to specific contexts, implementing ideas, observing and sharing results, discussing and planning next steps. There were at least three cycles of engagement (i.e., planning, putting ideas into action, and reflection), all of which were punctuated by opportunities to discuss matters with university and community participants and stakeholders. The cycle was applied in four sets of activities: (a) three years of demonstration plots, (b) technical outreach activities, (c) student practicums, and (d) international planning meetings.

Table 1. *Contributing Factors That Facilitated Learning Through Participation in CIDA's Pest Management Project with Resulting Learning Outcomes*

Contributing Factors to Learning Outcomes	Learning Outcomes (as established in Sims 2017)
	Instrumental learning:
▪ Collaboratively planning, implementing CIDA project activities.	▪ Learnt alternative farming practices, skills and knowledge about environment, more appropriate pesticide use, participatory strategies.
▪ Experiencing participatory approach through strategic planning, coursework; applying participatory strategies with communities to understand farm-level realities.	**Communicative learning:** ▪ Developed communal and regional awareness (for example, learnt about farmers' reality, environmental conscientiousness).
▪ Planning, implementing and participating in farm demonstration plots and other technical outreach activities.	▪ Learnt how to work more effectively with, and understand, communities.
Other facilitators:	**Transformative learning:**
▪ establishing clear learning goals;	▪ Critically reflected on roles, responsibilities as stewards of community well-being and environment.
▪ understanding learners' characteristics;	
▪ providing and enabling mentors;	
▪ creating effective pedagogical approaches according to learner, context;	
▪ creating safe learning environments, building trustful relationships;	
▪ providing opportunities to experiment with newly-acquired knowledge, skills.	

The approach taken to project planning and implementation was holistic, interdisciplinary, and participatory. For all participants interviewed, planning project activities collaboratively with farm families, technicians, and stakeholders facilitated learning. As university collaborators, in collective forums, this meant reflecting on challenges, engaging in a process of inquiry, asking critical questions—that is, problem posing and problem solving to ensure many perspectives were shared; understanding one's own position—proposing solutions, assessing proposed actions, and making informed decisions. Putting ideas into action was a critical component of the iterative planning process as was, in a systematic way, reflecting upon progress and sharing results. For technical-team members (i.e., those responsible for the technical component), this cycle of planning, action and reflection included experimenting on farms; for community-team members experimenting with participatory approaches. These deliberative planning forums took many forms, international strategic planning meetings involved university-level collaborators from all countries; later, students and community participants also participated. Community-level planning involved farm families and national project team members. Planning at this level involved decision making around appropriate workshops, farm demonstration days, and demonstration plots.

Victor (technical team Nicaragua), Vanessa (community team Costa Rica) and Luis (community team Nicaragua) describe how the interdisciplinary, participatory, collaborative approach enabled learning through the international planning process. Victor, in 2013, observed: "The international workshops were very participatory...the methodology helped us share the knowledge that existed between us...we needed to know what the other teams were doing as we had to work together." Vanessa, in 2016, commented: "I learned how the political, technical and communal teams from Honduras, Nicaragua, and Costa Rica worked...seeing others' perspectives from other contexts provided me with lots of learning, there were many tutors." Luis, in 2013, reflected: "The regional workshops were a valuable tool providing feedback to analyze how we could improve and focus the work."

The final international symposium, in 2013, focused on learning from one another's experiences. For Antonio (farmer Nicaragua), this inspired action. In 2016 Antonio commented: "Our Honduran brothers taught me about their used-pesticide-container depots—how to properly triple wash and punch holes so that containers can't be reused." Following this exchange, Antonio built a pesticide container recycling depot on his land, a gesture which benefits his community and environment.

5.1.2 Talking with rural actors to understand farm-level reality and practices. In order to make informed planning decisions, participatory methods were used with community members to understand local contexts, evaluate needs, and propose ideas to guide actions. For the project baseline study, participatory action research (Spaling, Montes, & Sinclair, 2011) was used to lead discussions with rural communities so as to better understand the local environment, community concerns and current pesticide practices. This was complemented by statistical and geographical data, by information gathered by students living with farm families, and by on-going discussions by team members with community participants. This information was then shared with the international teams, especially during international planning meetings. This hands-on work in communities enabled us as an international team to learn about farm-level reality and consequently build the project around it. This information continued to guide national teams' decision making around topics and approaches for agro-extension activities. Initiatives were

proposed to participating communities and specific decisions were made together ensuring that initiatives were relevant, of interest, and responded to learners' needs. For example, in Honduras, pesticide container waste management was identified by communities and project team as a health and environmental problem. In response, the Honduran team, in close collaboration with communities, thought of possible solutions; got experience-based feedback from the larger international group; built recycling depots for used pesticide containers with the community—choosing location, building together—and planned for on-going maintenance. Participants indicated that they found this motivating.

5.1.3 Implementing project activities: Hands-on opportunities to experiment, act on learning.

5.1.3.1 Participatory approaches and methods. University collaborators and students learnt participatory approaches and methods; the former by experiencing them in international meetings, the latter through coursework and practicums. Subsequently, applying this kind of approach enabled participants to learn how to better work with, and understand, communities (Sims, 2017). In 2016, Vanessa (community team Costa Rica) explained:

> The meeting in Nicaragua was a practice, living what I'd studied...I learned
> by participating...Afterwards, we had four years to experiment with
> students, I continue to experiment! ...We did the same – we set up the project
> but from our own criteria...Initially, it seemed a risky methodology, now it
> feels normal...The project provided resources, opportunities to experiment
> (with the methodology), aside from having this supportive team to talk with.

Vanessa continues to use a participatory approach in her teaching and work with communities.

In 2013, Luis (community team Nicaragua) explained how students learnt about rural reality through applying participatory methods in their work with farming communities.

5.1.3.2 Technical Outreach Activities. Technical outreach activities were effective at facilitating shorter- and longer-term learning outcomes. Farm-level demonstration plots were productive forums for learning for farm families and technical teams. "Through experiential fieldwork in the plots, technical team members and farmers...learnt how to identify persistent challenges, diseases and pests, problem-solve together, observe results, experiment in a systematic way, and innovate" (Sims, in press). Farmers acted as peer researchers on their plots and in the community. "Farmers gained confidence, carrying these skills forward beyond the life of the project, continuing to be curious and experiment" (Sims, in press). Farm demonstration plots, demonstration days, and community-level workshops, provided authentic venues for discussion and sharing experiences. Witnessing health, financial, environmental benefits motivated farmers and technicians to being open to learning and testing other agro-conservation techniques, creating a virtuous learning circle. The horizontal transmission of ideas was seen as farmers tried, tested, and promoted beneficial agro-conservation practices to others.

Farm-level demonstration plots. Within each national context, technical teams, with participating communities, decided upon the location, process, and purpose of demonstration plots. Some national teams (e.g., Costa Rica) experimented with alternative-to-conventional-chemical-intensive practices alongside approaches considered 'good agricultural practices'; others (e.g., Nicaragua) an agro-ecological farming systems approach "testing the efficacy of intercropping, vermicomposting and producing naturally-occurring insecticides among other approaches" (Sims, in press). Farmers volunteered to 'host' a demonstration plot. Although 'host' farmers potentially benefitted by learning beneficial pest management practices, they faced risk if the alternative practices proved detrimental. The farmers responsible were main actors in deciding what interventions would be undertaken and what crops grown (Sims, in press). Technical teams visited farmers weekly/biweekly during the growing season to accompany the demonstration plot process. Farmers Antonio (Nicaragua), Ricardo, and Minor (Costa Rica) explained how hosting a demonstration plot facilitated their learning:

> The plots were like our school...there was a whole learning around pest control and using resources from your farm...On my farm I'm still applying what I learnt, I've innovated too...I wanted to experiment with a small tomato crop from seed until harvest – with conventional and non-chemical practices...I applied a certain amount of organic vermi-compost to every five plants – each having a label, application date, what I applied (Antonio, 2016).

> I learned a lot from the plots. We researched, learned to use different practices...They gave us workshops, how to use fewer inputs yet have similar results. The technicians and students supported us, and we supported them...Really, we're producing 90% more now...If I had a problem, they'd come help me identify a pest, find a better (organic) solution (Ricardo, 2013).

> In the field they showed me about soil conservation...It makes me think about my children, that if we continue with bad practices, things won't change. So, we've changed how we till the soil to protect it....A month before planting they asked what products I was applying and why. We decided that we could change certain products...I use these new practices consciously as I'm convinced it's the right thing to do. The plots were marvelous–the harvest was superior, not only because of the amount produced but because we've a clear conscience that we're lowering the chemicals that were making us and consumers sick (Minor, 2013).

Three years on, Minor and Antonio continue applying and experimenting with

beneficial agro-conservation practices. Sadly, Ricardo had to find more stable employment due to family illness. Their comments highlight the importance of being accompanied by team members in the learning process and the longer-term learning that occurred. In planning together around plots, we learnt what farmers' priorities, needs and constraints were. Technical teams learnt a great deal through demonstration plots as for many, professionally, they provided a unique opportunity to enrich their theoretical knowledge through practical experience.

Focussing on the broader transmission of information and horizontal learning, Beatriz (technical team Costa Rica) explained her perception of how farmers learn and their role as community-level promoters of beneficial practices:

> With a talk, farmers say 'how interesting'. During a farm demonstration day, he may think that it could work on his land. But if he sees another farmer doing something and continuing to do it...Minor, for example, has pheromone gallons (to control white flies) that everyone can see. Farmers stop. Minor explains what they are, where they should be located, where to get them. They call me. One strategy is putting them in strategic visible places, having someone who knows how they work. These farmers-as-trainers are important (Beatriz, 2016).

Farm demonstration days. Demonstration plots acted as educational venues during farm demonstration days. At these events, 'host' farmers and technical teams educated community members about agro-conservation practices. This sharing of knowledge and experiences along with the ability to witness practices first-hand, made these forums effective at transmitting information at a community level. In 2013 Victor (technical team Nicaragua) observed: "When we had workshops with producers, we put ideas into practice on the plots—they were the learning centres. For farmer learning this was best. As Nicaraguan producers say: 'I need to see to believe.'"

Workshops. National teams did educational workshops based upon topics prioritised by participating communities. These also enabled a broader transmission of knowledge on particular topics. In 2016, Antonio (farmer Nicaragua) explained: "We did the 'mummy' workshop. We saw how using an insecticide affects your body. We saw the key parts where one's body can be poisoned...They talked about spray-backpacks, triple washing, bathing oneself, and protective equipment". Workshops provided venues for farmers to discuss health, environmental, and economic concerns around food production with each other and technical teams.

> Workshops and plots were times when producers and project teams could share, problem solve. It was rich, sharing the little we knew and learning from everything the producers know. Their real, empirical knowledge combined with the more technical knowledge was an excellent combination (Martha [policy team Nicaragua], 2013).

All of the foregoing activities that facilitated learning, from participatory strategic planning, students living with farm families, individual discussions around demonstration plots to broader discussions at farm demonstration days and workshops, provided opportunities to: participate in educational experiences that were meaningful, evaluate needs, identify possible beneficial actions, act upon learning, and systematically reflect on experiences. These forums were experiential and deliberative.

5.2 Other Facilitating Factors and Considerations

Case study results revealed certain factors that could influence other learning-focused initiatives' design and implementation—whether they be for development or NREM contexts. These considerations include: (a) clearly establishing learning goals, (b) understanding who target learners are, (c) identifying which pedagogical approaches might prove most effective depending on learners and learning environment, (d) creating safe learning environments and building relationships, (e) recognizing all potential educational guides and mentors within learning contexts, and (f) providing opportunities to experiment with newly-acquired knowledge and skills.

5.2.1 Establishing clear learning goals. Within this CIDA project, from strategic planning to technical outreach activities, all interventions were designed to maximise opportunities for learning whilst achieving specific project goals. Depending on the activity, specific learning goals were established for different participants. For example, at international strategic-level planning meetings, learning goals for university collaborators included: (a) learning to work together as an effective interdisciplinary international team—in spite of existing regional tensions, (b) understanding regional challenges around pesticide management practices and national particularities, and (c) developing appropriate strategies to address challenges (see Sims 2017 for details). For university students doing their practicums, goals included learning about farm-life reality and how to work effectively with rural communities. For farmers they included learning safer and alternative-to-chemical-intensive pest management practices. Data revealed that learning goals responding to an identified 'need' was important. Activities were then designed to enable learning towards that goal.

5.2.2 Understanding who the learners are. Understanding who target learners were then planning the pedagogical approach accordingly was important. Livelihood and cultural characteristics, gender, and level of education were taken into consideration. In this CIDA project, understanding what potential learners found accessible, valuable, relevant, and genuine was paramount. For example, rural participants acting as peer researchers needed to see that an idea worked to believe it was beneficial—for instance, improving their quality of life, environment, food

security—before they would risk changing production strategies (Sims, in press). Openness to learning and desire to contribute were considered by participants as beneficial attitudes in the learning process.

5.2.3 Providing and enabling educational guides and mentors. Many participants identified the importance of a mentor and of being accompanied throughout the learning process. This was true when planning and implementing the CIDA project and with demonstration plots. These relationships were paramount. Farmers, like Ricardo, Minor, and Antonio, stated how important quality technical team accompaniment was with demonstration plots (Sims, in press). In all forums, participants—students, university, community, stakeholders—educated each other; this is similar to findings from other empirical studies (Marschke & Sinclair, 2009; Sinclair, Sims, & Spaling, 2009). As Beatriz explained, farmers could better promote agro-conservation practices to other farmers as their interventions were considered genuine. Rural participants identified 'neutral' actors facilitating the process as beneficial rather than ones potentially interested in financial gain. The natural environment was an important teacher. This was seen as technical teams and farmers observed changes over time, for example to soil quality as they incorporated organic fertilizer and other agro-conservation practices. Taylor, Duveskog, and Friis-Hansen (2012), in their farmer field school study, affirm the facilitators' valuable role in accompanying learning processes as do Suskevics et al. (2019). However, Armitage, Marschke, and Plummer (2008) caution that 'experts' can be problematic due to power imbalances suggesting time, humility, and trust building to overcome challenges.

5.2.4 Accommodating the approach to the learners. Using a participatory approach to project planning and implementation allowed for participants to be involved in decision-making processes around what actions were most appropriate. This approach was interdisciplinary and involved sharing responsibilities, being exposed to various perspectives, and acting locally; it was inquiry-based (Sims, 2017). Participants appreciated an approach that was intentionally tailored to respond to their needs, not one meant to respond to an exterior, imposed agenda as is sometimes the case with development or NREM projects (Cornwall, 2006). Rural participants appreciated outreach activities that were facilitated in their communities, at a time that accommodated their livelihood needs, using accessible language. Providing opportunities to learn by being and doing in the real world was essential (see Sims, in press). Students' practicums living with farm families filled an academic practical need and fit their schedules. University collaborators grew professionally through practical opportunities to apply their theoretical knowledge, learning by implementing the project and through experimenting around technical outreach activities. Providing opportunities for dialogue and sharing knowledge—farmers with farmers with students and with academics—were essential enablers, particularly with respect to communicative learning outcomes (see Sims, 2017).

5.2.5 Creating safe learning environments and building trustful relationships. Regarding the learning environment in project activities, university collaborators, students, and farmers commented that they felt safe taking risks, proposing ideas, and experimenting. They attributed this to feeling that their ideas were valued and to respectful, trusting, amicable relationships with those guiding activities—for example, project team members during technical

outreach activities. Taylor and Snyder (2012) explain that trustful relationships "allow individuals to have questioning discussions, share information openly and achieve mutual and consensual understanding" (p. 44). Percy (2005) adds that through building trusting relationships "learners develop the necessary openness and confidence to deal with learning at the affective level, which is essential for managing the...emotionally charged experience of transformation" (p. 131). Diduck et al. (2012) argue that better relationships enable deeper and broader learning. Building trustful relationships with and amongst participants opened them to the possibility of learning; critical reflection took courage; university and community participants identified the importance of being accompanied by someone they trusted. CIDA results revealed that building relationships engendered a sense of responsibility one to the other. As with Minor's example, building relationship with the land led to an ethic of environment stewardship. Certainly, when tension appeared between certain team members due to conflicting priorities or a lack of trust, like with Bull, Petts, and Evans's (2008) study, it inhibited the learning process.

5.2.6 Opportunities to continue implementing newly-acquired knowledge and skills.   The results from 2016 interviews revealed that learning that was sustained beyond the life of the project involved participants having opportunities to continue implementing, and often innovate with, newly-acquired knowledge and skills. This was true with Vanessa for participatory methods with which she continues to experiment in her teaching and community-development work. Farmers, such as Antonio, Leticia, and Ofilio (Nicaragua), and Minor (Costa Rica), continue to experiment with agro-conservation practices on their farms, including incorporating new ones. For continued implementation, these farmers had to see that what they were doing was beneficial for themselves, others, and/or the environment. Having resources accessible on their farm—for example, manure to feed composting worms—facilitated continued implementation (Sims, in press).

5.2.7 Inhibiting factors.   Participants identified factors that constrained opportunities to learn. For example, in Honduras the need to improve collaboration between different team components inhibited certain activities from being realised to their full potential consequently impacting learning opportunities for farmers and team members. Another observation was occasionally, perhaps due to existing internal (national team) power dynamics, critical dialogue was limited impacting opportunities for learning. Limited Spanish-language skills proved a barrier for sharing ideas between two Canadians and some Central American collaborators. For some farmers and university collaborators, a lack of openness to learning was considered to have negative impacts.

The interviews from 2016 revealed certain barriers to the continued application of learning outcomes. The most important were changes in circumstances due to illness, land ownership, unforeseen challenges, and climate change. These changes no longer allowed participants to continue applying what they had learnt. Other barriers included cost, uncomfortable protective gear, and perceived risk for little financial benefit.

6. Discussion

This research contributes to a growing body of literature on the cross-cultural application of transformative learning theory (Ntseane 2011; Sinclair, Sims, & Spaling 2009; Spaling, Montes, & Sinclair 2011). It elucidates what factors and activities contribute to learning processes and what meaningful participatory approaches to governance, especially in developing-world contexts, look like in practice. Scholars, like Suskevics et al. (2019) and Diduck et al. (2012), identify this area as in need of further research. These are important contributions, particularly when trying to design context-appropriate public engagement activities that actively support participants' capacity to create liveable, healthy communities.

In what follows, pedagogical considerations such as learning strategies for sustainability, contributing factors to beyond-process learning, instrumental learning acting as a conduit to other learning, and cultural context are examined.

6.1 Key Learning Strategies for Sustainability

A major focus of the CIDA project was enabling learning for sustainability (Sims, 2017; Suskevics et al., 2019). Many project activities reflected key learning strategies identified in the education for sustainability literature (Kovak & Elliot, 2011). For example, the baseline study began with an inquiry-based approach wondering about what areas needed to be understood to adequately guide project decision-making. The focus and approach used to collect data highlighted learning in community around local real-world issues; enabled different perspectives to be expressed; and allowed for a broad integration of various subjects—environment, health, impact of pesticides on family. A participatory approach enabled participants to have a voice in decision-making, construct knowledge and demonstrate their social circumstances (Ntseane, 2011; Spaling et al., 2011).

Technical outreach activities, particularly demonstration plots, exemplified environmental inquiry focussing on participants'—technical teams, farm families—needs and interests. They were highly experiential providing opportunities to learn in and from the environment. Learning was embedded in learners' contexts with opportunities to plan, experiment, act on what was learnt, and then reflect. Responsibility was shared between actors when making decisions; different perspectives were taken into consideration (Kovak & Elliot, 2011, Suskevics et al., 2019). A focus, and outcome, was on responsible environmental stewardship (Sims, 2017). This is similar to other studies focussing on agro-conservation development initiatives (Percy, 2005; Sims & Sinclair, 2008; Sinclair et al., 2009; Taylor et al., 2012) which are highly experiential, and where reflection and dialogue are key elements in a process often prompted by a need to work in new ways to find solutions. Demonstration plots promoted learning including beyond-project learning outcomes; they involved the deepest level of accompanied engagement (Sims, in press). However, demonstration plots being so intensive, requiring one-on-one accompaniment by technical teams, perhaps limited the breadth of their impact. Honduran pesticide container recycling depots were another example of environmental inquiry.

6.2   *Contributing Factors to Beyond-Process Enduring Learning Outcomes*

Bull et al. (2008) examine how public participation in NREM decision making can translate into a legacy of environmental stewardship. They, along with Diduck et al. (2012) and Measham (2013), identify the need for longitudinal studies examining longer-term learning results to add empirical depth and richness to understanding transformative outcomes and sustainability. 2016 interviews revealed learning outcomes that transcended the life of the CIDA project. Like with Bull et al.'s (2008) English study, project participants continue to experiment with, and apply, what they learnt. Minor, Antonio, Ofilio, and Leticia, to the best of their abilities, continued to use agro-conservation practices showing environmental stewardship leadership in their communities. Vanessa insists on a participatory approach when planning community projects, building them with community collaborators that respond to their needs and aspirations.

As for what facilitated beyond-project learning outcomes, 2016 interviews revealed a recurring theme among farmers and university collaborators: the ability to continue being curious, engage in a process of inquiry, experiment, and assess the effectiveness of their actions. No matter the learning outcomes (whether having learnt participatory methods or new agro-conservation practices), for participants to continue being curious and experiment—to put their learning into action—their circumstances had to enable those opportunities. Seeing the environmental, health, and financial benefit of their actions has provided on-going motivation (Sims, in press).

However, assessing the impacts of learning on longer-term behavioural change remains challenging; a conversation with Antonio (farmer Nicaragua) reveals complexities. In spite of instrumental learning clearly leading to a transformation in his farming practices and role as communal environmental steward (Sims, 2017), occasionally he struggled to implement practices congruent with his new perspective. When visiting Antonio in 2016, he proudly shared the agro-conservation practices that he continues to use—for example, making natural insecticide, mung beans as cover crop, saving seeds, and vermi-composting. Regarding chemical products, he clearly articulated how to apply them safely. Interestingly, however, when visiting his fields I noticed his helper applying pesticides wearing little protective gear. I asked Antonio about the apparent contradiction. He explained: full protective equipment was cost prohibitive and uncomfortable in the heat. Consequently, he does what he can—wears rubber boots, gloves, goggles, bandana over mouth; post application washes hands, face, changes clothes. This highlights how someone can be conscious and dedicated towards an idea, but that barriers exist to realizing actions. Bull et al. (2008) define 'beyond process' (social) learning as evidenced by a change in behaviour. However, Antonio's learning is not clearly evidenced through an obvious (observable) behavioural change. His example reminds researchers and development workers to query participants directly to understand their rationale and barriers that exist to applying new knowledge, potentially revealing what other contextual factors must be addressed to enable longer-term sustained behavioural change. The 2016 data showed farmers having learnt about the consequences of using pesticides and having adapted what they learnt according to their possibilities and limitations.

6.3 *Instrumental Learning as Entry Point to Other Kinds for Learning*

Taylor et al. (2012) argue that the role instrumental learning plays in fostering transformative learning needs to be researched further. In this CIDA project, technical outreach activities provided hands-on opportunities to acquire specific skills and information enabling instrumental learning (Sims, 2017). Like with Marschke and Sinclair (2009), instrumental learning clearly led to behaviour change and was a conduit to communicative and transformative learning. These findings concur with other similar studies focussing on promoting technical skills, like agro-conservation practices with small-scale farmers in developing countries (Sims, 2012, 2017; Sims & Sinclair, 2008; Taylor et al., 2012). These findings also exemplify intentional experimentation, a factor identified as contributing to action-oriented learning (Suskevics et al., 2019). Minor's (farmer Costa Rica) experience exemplifies how learning certain agro-conservation practices transformed his approach to soil conservation and pest management. This change in practice—instrumental learning—led to a transformation in how he sees his role as environmental steward. It changed the way he acts and thinks. Similarly, when Vanessa (community team Costa Rica) learnt how to realise a participatory approach to decision-making, her behaviour, and how she conceptualises the learning process, teaches and plans with communities have all been transformed (Sims, 2017).

Similar to farmer field schools (Taylor et al., 2012), CIDA demonstration plots were extremely effective at enabling learning. However, the Kenyan farmer field schools were conceived and facilitated as communal learning forums. In contrast, CIDA demonstration plots were an aggregate of individual initiatives with associated complementary communal activities. This potentially impacted their ability to result in collective action and social learning. Antonio (farmer, Nicaragua) building a used-pesticide container recycling depot for communal benefit shows how individual initiatives can lead to potential collective action. Certainly, as evidenced in Marschke and Sinclair (2009), Sims (2012, 2017), and Walker et al. (2014) empirical studies, instrumental learning can lead to communicative and transformative learning. Further exploring the relationship between individual transformation and collective action, as Bull et al. (2008) and others call for, would help clarify how an individual commitment to environmental stewardship could translate into societal learning.

Indeed, Bull et al. (2008) stressed the importance of understanding how social learning takes place "if processes of public participation are to translate into broader shifts in social values and behaviour" (p. 714). Certainly, these CIDA case study findings, as with Sims and Sinclair (2008), seem to suggest that if the focus is on individual engagement or the aggregate of individuals, then learning outcomes will be primarily at an individual level. A persistent challenge remains understanding what creative learning processes and other infrastructure—social or other—are needed to enable collective learning outcomes and not simply individual ones. A recent analysis by Suskevics et al. (2019) on what factors facilitate action-oriented learning in NREM initiatives provide guidance moving forward.

6.4 *Considerations for Cultural Context*

Ntseane (2011) and Taylor and Snyder (2012) identify a need to understand the influence of context on learning processes; particularly, exploring the relationship between participants' background, culture, and/or positionality. Ntseane (2011)

argues that adult education should stimulate change while being respectful of cultural values, traditions, and identity; this being critical as local identity should not be lost while transforming endemic problems. Empirical studies (Najjar et al., 2013; Sims, 2012, 2017; Sims & Sinclair, 2008) suggest that cultural context influences the effectiveness of certain pedagogical approaches. For example, Taylor et al. (2012) explain that in Kenyan farmer field schools, communal plots were important when collectively testing new practices, as, due to certain local superstitions, individual participants would not have felt safe to do so otherwise. Moreover, knowledge was shared in culturally appropriate ways (e.g., theatre, song, dance). Similarly, in this CIDA project, Honduran team members followed distinct protocols when entering predominantly Lenka Indigenous communities. Initially, to build trustful relationships, they spent the day with the local priest meeting community members. Then, they visited farm families explaining the project, inviting participation; the female team member spent time with the women, the male team member talked with the men in the fields.

The ideal conditions for learning emphasize rational discourse as central to transformative learning (Mezirow, 2008; Sims, 2012). These aforementioned empirical studies, and Suskevics et al. (2019) suggestion that proximity to practice and experimentation supports action-oriented learning, invite reflection as to how hands-on activities, for example, can support transformative learning processes, particularly facilitating rational discourse, depending on learners' cultural and livelihood characteristics as these characteristics influence what resonates with learners.

7. Concluding Reflections: Implications for Project Design, Planning, and Implementation

These results have practical and policy implications. When designing and implementing environmental management initiatives, project proponents should be mindful that engaging participants in decision-making throughout the process can bring legitimacy and make outcomes more viable over the long term.

Percy (2005) points out that participatory approaches to governance allow for projects to be designed, to a greater or lesser extent, in collaboration with end-user participants. Regarding practical implications, the participatory approach to project planning required an investment of time and resources to be able to meet in person to plan and build trustful, respectful relationships. It required those involved to trust in the process, to be flexible in order to genuinely make project decisions with collaborators that address their needs and reflect their contexts. For the project proponents, it required trusting local collaborators—and in turn devolving power to them—so that they could make decisions appropriate for them.

This exploration highlights how participation in development initiatives can and should be tailored to local contexts and participants' needs, characteristics, culture, and interests to maximise the potential for learning outcomes to occur and to respect local identity whilst transforming endemic issues. A more contextualised project can make initiatives more effective through greater learning outcomes and accommodate broader development goals (Cornwall, 2006; Green, 2010; Taylor et al., 2012).

If intending to enable learning and behavioural change, consider all interactions as potential learning forums. Be mindful of how different participants in activities

are educators and learners. Provide many opportunities to share information and learn from each other. Certainly Bull et al. (2008), along with Walker et al. (2014), found that the on-going sharing of ideas between groups of individuals developed understanding of their, and other communities', interests motivating people to work together to achieve common goals.

The following considerations could be useful as guidelines for successful learning-focused interventions. Establish clear learning goals for all interactions, from strategic interventions down to individual activities. Plan intentionally how participants interact with one another and the natural environment. Remember, time together is precious. Participation in these learning forums takes people away from basic livelihood activities. Consequently, time shared should be productive, focussed, and meaningful. Create safe learning environments guided by the ideal conditions for learning (see Sims 2012). At the outset of a project, take the time necessary to learn about the context, including about the natural environment and participants' cultural, livelihood characteristics. Take care to build trustful relationships with participants as this helps engender a sense of responsibility one to the other and helps support learning. Throughout a project, but particularly at crucial moments in a project's life, provide on-going opportunities to meet, plan, problem-pose and problem-solve, share experiences, reflect upon project implementation successes and challenges, and adapt activities to changing contextual factors. Do not underestimate the power of instrumental learning as an entry point to other kinds of learning; activities like technical outreach activities act as important forums for critical discourse, inquiry, and can lead to other kinds of learning—communicative and transformative. These considerations should be taken into account, prioritised, and accommodated for through resource—financial, time, people—allocation, when planning and implementing development and/or NREM projects.

Finally, to potentially up-ramp individual learning to collective learning as to have a more communal impact on behavioural change, in terms of implications for planning development and/or NREM projects, make sure to plan activities according to broader goals. So, for example, if a goal is to promote food security at a communal level, and if this requires collective behavioural change to occur, then think through agro-conservation practices related to individual farming practices *and* reflect upon what policies and social infrastructure must be created to support individuals and the community as a whole to sustain such actions and learning. This might include provisioning for on-going training and support once the 'project' is done. In the planning process, consideration should be given as to which communal strategies have to be in place so that community members can support one another to become knowledge sovereign, learning and adapting as they move forward.

Acknowledgements

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