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Multifaceted Assessment of Agricultural Extension in Conflict Affected Areas of Mindanao, Philippines

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Authors' contributions

This work was carried out in collaboration between both authors. Both authors read and approved the final manuscript.

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ABSTRACT

Agricultural extension in conflict affected areas has received limited research attention. Yet agricultural extension undertaken within a group–based facilitation framework can have many benefits via livelihood improvement, human and social capital development. In this paper, an extension model adapted for conflict affected areas is briefly described and then assessed from multiple viewpoints – physical, economic, lifestyle, social capital and environmental. This was done in two case study sites in conflict affected areas of Mindanao, Philippines. Major positive physical, economic and lifestyle changes were revealed at both case study sites, as were changes in knowledge, attitude, skills, and aspirations and social capital. Some positive environmental aspects

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were also noted. Income and savings were up 64 and 108 percent respectively, with those income changes being reflected in additional expenditures on basic items such as food clothing and education. Knowledge, attitudes skills and aspirations (which can be regarded as intermediate steps towards livelihood improvement) all increased substantially. Various social capital indicators were judged to have improved. From an environmental perspective, there were decreases in charcoal production and slash and burn activity. Tree planting and soil fertility increased. Most of these assessment parameters, but especially social capital with its implication for trust and human interaction, are relevant to peace building. With the passage of the Bangsamoro Organic Law, there is expected to be a strong increase within the Philippines and internationally in funding the promotion of agricultural livelihood activities in Mindanao. The multifaced assessment of benefits is somewhat unique and the resulting quantification of the benefits demonstrates that additional funding and more diverse applications could be warranted.

Keywords: Agricultural extension; conflict; Mindanao; impacts.

1. INTRODUCTION

The root of the conflict in Mindanao can be traced back in 1903, with the displacement of indigenous people and Moros upon the declaration of the Philippine Commission law which effectively rendered null and void all land grants made without the authority of the Philippines government. Disharmony and conflict have been occurring ever since at various levels of intensity. Moro groups have been seeking an independent state in Mindanao for four decades. After numerous attempts to resolve the conflicts, a final peace agreement between the Government of the Philippines and the Philippines' largest rebel group, the Moro Islamic Liberation Front (MILF), was agreed in 2014 and was signed into law during 2018. The conflict between the government and the MILF is not the only conflict affecting the Autonomous Region of Muslim Mindanao. Rather, the conflict situation in Mindanao is multi-faceted, involving numerous armed groups, as well as clans, criminal gangs and political elites. The effects of the conflict on farmers are multifarious and include lack of mobility for marketing produce and purchase of inputs, physical displacement from the farm, males being distracted from farming thus creating an even heavier burden on women. Conflict has isolated farmers from networking opportunities with other farmers, various government and non-government support services, and information providers.

Within the context of conflict affected areas, the link between development outcomes and security is accepted [1]. Insofar as agricultural extension can facilitate development, it can also boost security. Participatory research methods in the 1980s forged the view that it is important to understand and strengthen farmers' own capacity to develop new knowledge and to solve problems. In the 1990s, discussion on agricultural knowledge and information systems, and the importance of group action came to the fore. Concomitantly, the need for platforms for interaction to promote innovation was gaining recognition. In this scenario, extension can facilitate the processes of reflective action, learning, and decision making by stakeholders. Van den Ban & Hawkins [2] explicitly affirmed the role of extension to assist farmers to make better decisions.

Robertson [3] argued that decentralized, participatory, market-driven extension systems have been successful in augmenting farmer capabilities, and that a focus on this form of development is appropriate in conflict situations, where hierarchical and rigid structures cannot work. Furthermore, by offering *access* to expertise (rather than expertise itself), agents in decentralized systems can respond quickly and effectively to varied farmer needs. These same approaches can be used to connect farmers to the experts and resources they need to manage conflict in their communities. In a service model in which extension agents work as knowledge brokers, providing access to information, they can become *de facto* agents for peace building.

The above rationale formed the basis of the 'LIFE' model: Livelihood Improvement through Facilitated Extension. Sixteen principles underlie the model. These principles and the LIFE model itself have been documented elsewhere and readers seeking the full detail are referred to Vock et al. [4], plus other articles in that same volume of research. However, to give a flavour of the model and to demonstrate the linkage with Robertson's ideas, some of the core principles are listed below:

- *Partnerships.* Recognise *all* relevant agencies will be included in the discussions and invited to be involved.
- *Group-based process.* Farmer groups are a more efficient and generally more effective process for working with farmers.
- *Facilitators of change rather than leaders of change.* For farmers to take ownership of the change process, it needs to be as participatory as possible, with farmers taking the major responsibility for decision-making.
- *Capacity building for self-help.* Long-term empowerment arises from farmers and extension agencies developing the capacity to help themselves.
- *Nexus between social capital development and livelihood improvement.* Development of improved social capital is an essential part of improving economic livelihoods.
- *Understanding the context of conflict and its impacts.* Understand the impacts of conflict on men, women, farming units, community organizations, and extension agencies, with a view to developing more conflict-resilient extension processes.
- *Systematic evaluation of extension interventions.* Demonstrate the effectiveness of farmer innovations.

In the spirit of the final dot point, this paper is primarily concerned with assessing the impact of the extension model application within conflict affected areas in two Mindanao case studies. The assessment approach is multi-dimensional, being documented with respect to (a) income and expenditure on various key lifestyle items; (b) social capital; (c) knowledge, attitudes skills and aspirations as intermediate products towards further wellbeing improvements; and (d) environment.

2. METHODS

2.1 Case Study Sites and Data Collection

Two sites were chosen where the LIFE model has been in operation over a period of one to two years. Extension facilitators have now ceased significant operations at the sites - Barangays Saravia and Assumption in Koronadal City, South Cotabato, Mindanao, Philippines (Fig. 1).

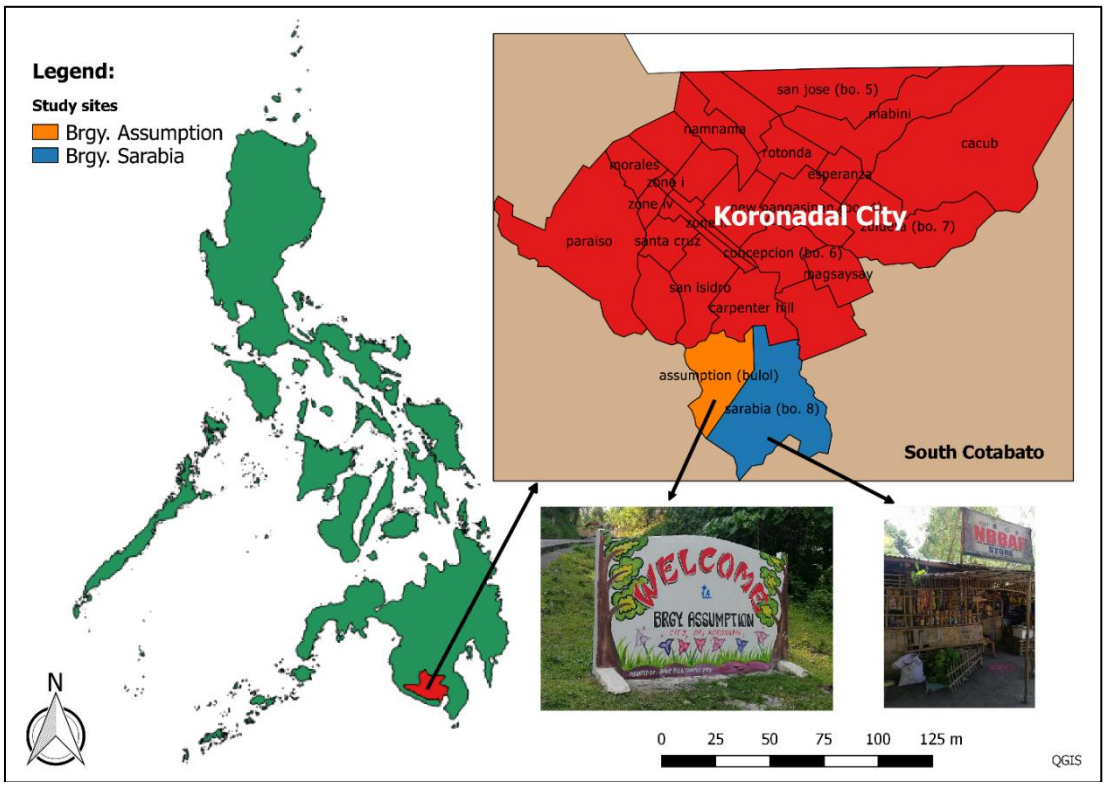

Fig. 1. Study site location

The Nga Bango B'laanAksasato Farmers (NBBAF) in Barangay Saravia has 24 active members, while the Olo-ClofeBla'an Landcare Farmers Association (OBLA) in Barangay Assumption has 24 members. Thus, a total of 48 farm group members were interviewed.

Farmers at both sites have undergone a series of priority setting exercises, trainings in different farming techniques, and have been involved in consultations and collaboration with other farmers and institutional partners.

The team conducted a one-on-one interview with all active and available members of the two farm groups lasting from 2 April 2018 to 7 April 2018. An assessment survey questionnaire was split into five sections – (a) farmer's demographic characteristics and crops grown; (b) economic and lifestyle (in terms of meeting their basic household necessities); (c) knowledge, attitude, skill, and aspiration (KASA); (d) social capital including institutional linkages; and (e) environmental aspects.

2.2 Data Analysis

The study employed descriptive statistics and frequency distribution analysis to summarize the survey data. A simple difference (before and after exposure to the LIFE extension model) analysis was used in self-assessing the changes in farmers' circumstances. A paired t-test was also conducted to determine the statistical significance of changes in the relevant variables.

3. RESULTS

3.1 Farmers' Demographic Characteristics and Crops Grown

The majority (sixty-nine percent) of farm group members are female while thirty-one percent are male. One of the reasons while majority of members are female is because most of their husbands are involved in other small businesses. Most of the beneficiaries (eighty-six percent) are married, aging from 21 to 72 years old. More than half of the population finished in elementary level while eight members did not attend school at all. Before exposure to LIFE, farmers usually planted corn and banana on most of their farmlands. However, now, they have chosen to plant other crops aside from corn and banana. These crops are vegetables, cacao, fruit tree seedlings, and forest tree seedlings.

3.2 Farmers' Economic and Lifestyle Impacts

3.2.1 Monthly income and savings

As mentioned above, most of the beneficiaries were previously involved in corn production, where income is low or sometimes none according to the farmers. One of the objectives of LIFE is to enhance incomes and savings of farmer beneficiaries partly by introducing them to other livelihood activities. To quantify the changes that the farmers experienced, farmers were asked their 'before LIFE' and 'after LIFE' monthly income and savings. On average, result showed that monthly income has increased to Php2,716 from PhP4,456. Most of the beneficiaries shyly shared that they have no monthly savings before LIFE began. Since then, they started saving money. Table 1 shows the summary of changes in farmers' monthly income and savings.

To further examine the mean difference of 'before' and 'after' the LIFE model application in terms of income and savings, a paired t-test was used in the analysis. Paired t-test is one of the most widely used statistical test to determine whether the mean differences between the two time periods are statistically significant. Since an assumption of normality and equality of variance does not apply to paired t-test, data was not transformed. Instead, paired t-test assumes that only the difference between the two pairwise is normally distributed [5,6]. Paired t-tests were used because the desired comparison is between the same respondents (or subjects) for two periods (before and after). To determine whether the change in income and savings before and after the LIFE program is statistically significant, the appropriate statistical test is paired t-test. Results showed that mean difference in income and savings has significantly increased after LIFE (paired t-test: $P = < 0.001$) at 95 percent confidence interval with t value of 6.6 and 5.7, respectively. Table 2 shows the paired t-tests results for income and savings.

3.2.2 Lifestyle changes after engagement with the LIFE model

Meeting basic household necessities such as food, clothes, health, transportation, communication, and children's education is difficult for families earning an average monthly income of PhP2,700 only (before LIFE). Most of

Table 1. Mean monthly income and savings of all farm group members

Variable	Obs	Mean	Std. Dev.	Min	Max	Mean Change (%)
Before LIFE income	48	2717	2578	200	15000	↑ 64%
After LIFE income	48	4456	4085	400	20000	
Before LIFE savings	48	652	939	0	4000	↑ 108%
After LIFE savings	48	1362	1484	0	6000	

Table 2. Paired t-test for income and savings changes

Variable	Mean	Std Err.	Std. Dev.	95% Conf. Interval	
After LIFE Income	4456	589	4085	3270	5642
Before LIFE Income	2717	372	2578	1968	3465
Difference	1739	262	1821	1210	2268
t-value	**6.6**				
Pr(|T| > |t|)	**0.0000**				
After LIFE Savings	1362	214	1484	931	1793
Before LIFE Savings	652	135	939	380	925
Difference	710	125	863	459	960
t-value	**5.7**				
Pr(|T| > |t|)	**0.0000**				

the time, farmers' income is just enough to buy food. Additional budget for agricultural expenses (seeds, fertilizers, etc), house construction and improvement, start-up for business, and contingency in case of extreme events usually came from loans or credits.

Table 3 shows that beneficiaries had higher expenditure in all items notably in food, children's education, and agricultural inputs since their LIFE involvement. To examine farmers' wellbeing in more detail, farmers were asked to assess their insufficiency and sufficiency levels in meeting their basic household needs, before and after their involvement with the LIFE model. All items are strikingly positive. The translation of improved income into a broad range of lifestyle and livelihood improvements is broad ranging. Perhaps most notable are the areas of food availability, clothing purchases, healthcare, education and transportation. Transport is worthy of particular mention because Barangays Saravia and Assumption are relatively inaccessible and far from the national road. Many farmers said that their ability to access agricultural inputs had increased.

3.3 Knowledge, Attitude, Skills and Aspirations (KASA) Impacts

One of the strategies adopted in implementing the LIFE model is to improve farmer access to livelihood innovations. Some of these innovations have already been adopted. Additionally, there is a question of other changes that have not yet translated into livelihood outcomes. To gain some insight into this possibility, four variables were self assessed - knowledge (K) change, attitude (A) or perspective change, improved skills (S), and their aspiration (A) or ambition for their current and/or future farm, community, and their family.

Table 3. Expenditure change by farmers from LIFE involvement

Item	Expenditure (% change)
Food	44
Cloth	21
Healthcare	17
Transportation	21
Communication	5
Children's Education	36
Purchase of Land	10
Purchase of Asset	17
House Construction	24
House Improvement	14
Start-up Business	16
Purchase of agricultural Inputs	32
Ability to deal with extreme Events	11
Improved marketing of farm produce	21

To undertake the assessment, a standard KASA grading system was created for the study, with a

maximum rating of 10, with the results shown in Table 4.

Table 4. Summary of average change level of farmer's KASA

Change item	Average Change Level (out of 10 maximum)	Implication
Knowledge	8.1	Very High
Attitude	7.5	High
Skills	7.6	Very High
Aspiration	8.4	Very High

3.3.1 Knowledge

As mentioned earlier, each community was associated with a LIFE facilitator who gave advice on agricultural production to help with farm management. According to **all** farmers that were interviewed, they have learned from their interactions with the facilitators. They have learned planting of new crops, proper plotting, application of fertilizer, contouring, pruning and trimming, planting distance, and grafting. According to them, this knowledge was acquired from lectures, trainings, seminars and hands-on activities.

Aside from this acquired knowledge related to farming, they also acquired non-farming knowledge and/or skill. These are saving money, investment in small business-like mini store or motorcycle service, time management, and cooking banana and camote chips for additional income. Also, ninety percent of the interviewed farmers believed that they understand the economic performance of their farm such as their expenses, income and savings to sustain their farms.

Lastly, farmers were asked to rate the overall change in knowledge that they have experienced. An average improvement rating of8.1was obtained which means they acquired very high knowledge on agricultural production following participation. Note that forty-three percent of the interviewed farmers gave a perfect score of 10 because they said that before LIFE, they have zero to minimal knowledge on certain kinds of agricultural practices.

3.3.2 Attitudes

Improving farmer access to technical innovations is one of the LIFE strategies. A key principle is to build self-help capacity and self-sufficiency of farmers, rather than just providing technical solutions and farm input materials. Attitude is referred to a set of emotions, beliefs, perspective, and behaviours that a person has towards a particular a particular object, person, thing, or event [7].

Before LIFE, most farmers were not comfortable talking and working with each other or with other people. This was changed after exposure to LIFE. Sixty-nine percent believed that after exposure to LIFE, they became more comfortable speaking in front of other people. Seventy-nine percent said that working with other people is now comfortable. Fifty-eight percent feel more confident when deciding as a group. While 46 out of 48 farmers said that they became more open in receiving advice and information from others, both related to farming and non-farming information.

Overall, an average rate change of 7.5 was observed meaning that farmers' attitude/perspective/beliefs have highly changed (positively).

3.3.3 Skills

As discussed above, farmers were able to learn different technical farming and non-farming skills. Farming practices such as planting, proper plotting, application of fertilizer, contouring, pruning and trimming, planting distance, and grafting were identified as new skills that farmers have acquired. Non-farming skills include speaking in front of others, financial management, and linkages outside groups and other institutions. Results showed that ninety-six percent of the farmers believed that their skills on farming practices have improved - specifically, land contouring, diversified farming, plotting, and fertilizer application. On the other hand, eighty-eight percent believed that speaking in front of other people has improved too. This is because most of them were really shy before. However, they learned to speak confidently with other people. In terms of financial management, ninety percent of the farmers believed that they have improved because they learned how to properly budget their income in terms of their expenses and savings.

Collaborating closely with local institutions is another key LIFE strategy aimed at improving

farmers' linkage outside the farm group. According to majority of the farmers (88%), before LIFE, they were shy and not too familiar with local institutions. However, things improved when they started attending seminars, trainings, farm visit, and selling their produce wherein collaborating with LGUs is necessary.

Overall, an average of 7.6rate change has observed which means that farmer's abilities and skills have improved very highly in terms of farm practices, speaking in groups, financial management, and linking to outside groups and authorities.

3.3.4 Aspirations

Aspiration is a desire to achieve something high or great. Analysing farmer's ambition on their farm, community, and family is an important aspect to look at to assess if they would be self-sufficient even after the facilitation has concluded. Results showed that farmers are very optimistic on their farm, on their community, and family. This level of optimism has changed after they have been exposed to the LIFE model. Most farmers wanted to have a diversified farm, a peaceful and united community, and prosperous family where children would be able to finish college.

Overall, an average rate change of 8.4 was observed which means that farmers have very high ambitions/aspirations on their farm, community, and family. It could also be assumed that higher aspirations could lead to higher chance of being self-sufficient.

3.4 Social Capital Impacts

Social capital has varying definitions from different authors focusing on trust, networks and relationships [8]. According to Farr [9] social capital is defined as a "complexly conceptualized network of associations, activities, or relations that bind people together as a community through certain norms and psychological dimensions, particularly trust". From this context, the team measured social capital by ranking farmer's active interaction between their group and other group or local or regional institutions (better, worse, or about the same), effectiveness of their group (better, worse, or about the same), their level of trust within and outside their community (more, less, or about the same), and their level of engagement to local institutions (more, level, or about the same).

Results showed that most farmers believed that all indicators relating to social capital (relationship, trust, and networks) have changed them positively (Table 5). The highest percentage change in relation to social capital was in relation to the effectiveness of their group activities in assisting their farm business. This shows that the larger groups, NBBAF and OBLA, are effective in giving assistance for all members who needed help with their farm business.

3.5 Environmental Impacts

Previously, ninety-two percent of farmers were involved in charcoal production while ninety-six percent said that they were involved in slash and burn activity. However, these activities both have a negative impact on the environment, including land degradation and loss of soil fertility. According to Scoones [10] sustainable rural livelihood is increasingly central to the debate about rural development, poverty reduction, and environmental management.

For charcoal production, 44 out of 48 farmers said that they obtained the wood from their own land while one farmer said that he obtained the wood from public land. Their involvement in charcoal production has significantly reduced. Farmers now realize the negative impact of charcoal production in the environment. Hence, about one half of the farmers said that they completely stopped making charcoal and solely focused on alternative livelihoods. On average, charcoal production at the sites **decreased** by fifty-nine percent. This clearly shows that LIFE has positive impact to the beneficiaries.

Similarly, about half the farmers said they were no longer engaging in slash and burn practices. However, slash and burn **decreased** by twenty-six percent on average. Ninety percent of the farmers observed that the fertility level of their farm soil has increased since LIFE. Fifty-four percent of the farmers believed that since LIFE began, their involvement in tree planting activity has increased substantially. Sometimes, they do tree planting activities to celebrate their farm group's anniversary, and when they are being invited by other local institutions. Overall, it can be observed that all indicators related to environment have changed positively during/after participating in LIFE.

Table 5. Indicators of social capital change

Indicators	Change (%)		
	Better/ More	Worse/ Less	About the same
Interaction between their group and other groups	88	4	8
Interaction between their group and local or regional institutions	81	6	13
Effectiveness of their group in assisting their farm business	94	2	4
Trust within local community	71	10	19
Trust between their local community and other communities	59	21	20
Engagement between their community and local institutions	73	13	14

4. DISCUSSION AND CONCLUSIONS

Longley et al. [11] reported on how development assistance can best be used to support rural livelihoods in conflict situations. Specifically, that report was concerned with how international actors might best support the agricultural component of rural livelihoods. In their view, disaster relief is not enough in situations of conflict; there is also a need for sustained support for livelihoods. This is particularly true in the agricultural sector, where the typical disaster response is to provide seeds and tools.

In the example presented in this paper, the focus was on self-help from facilitated agricultural extension targeting four categories of impact as: (a) economic wellbeing (which also embodies productivity change); (b) KASA (knowledge, attitude, skills, and aspirations); (c) social capital; and (d) environmental. All measures were found to be strongly positive.

For income and savings, statistically significant increases were observed. This positive impact has helped farmers increase their ability to meet basic household needs such as food, cloth, health, transportation, communication, business, and agricultural inputs among others. Further questioning verified that these documented changes were specifically attributed to participation with the LIFE model in most cases.

Likewise, through guidance from the facilitators, farmers have acquired a high to very high change in each category of knowledge, attitude, skills, and aspirations for their farm, family, and community after participation with the LIFE model. These positive changes can be expected to lead to additional livelihood improvements in the longer term. As for the important social capital parameter, which could be regarded as being related to both livelihood improvement and KASA (and ultimately peace building), each of six defined social capital indicators showed large changes, with an overall average improvement level judged by the respondents to be 77%.

For the environmental aspect, there were substantial decreases in charcoal production and slash and burn activity, respectively. Tree planting and soil fertility have increased. Overall, farmers believed that their participation with the LIFE model has taught them to have a bigger dream for their farm (diversified farm), family (quality of life, education), and community (peace and with unity).

Few studies of systematic evaluations of an extension project/program have been conducted [12]. This is largely because the impact of new extension programs is usually confounded by other related interventions. The current case is unique in the only intervention was the extension program and the costs and benefits were explicitly quantified. Furthermore, this assessment is unusual in its multidimensional nature, including several sociological parameters. While the economic cost of applying the LIFE model is not trivial, they can be feasibly be recouped via the commensurate benefits that accrue [13]. Self-assessment of interventions and teaching has some theoretical limitations [14], but also some practical pluses. Specifically, the self-assessment aspect of the model outcomes, as undertaken here, is very low cost. Furthermore, several of the assessment parameters are not amenable to empirical measurement, due to their inherently subjective nature. Finally self-assessment is fully compatible with the interactive nature of the LIFE model as elucidated in principle number 4 of the model (see Introduction): ‘for farmers to take ownership of the change process, it needs to be as participatory as possible, with farmers taking the major responsibility for decision-making’.

With the passage of the Bangsamoro Organic Law, there is expected to be a strong increase in the Philippines and internationally in funding agricultural livelihood activities in Mindanao. The multifaceted assessment of results presented here suggests that the LIFE model represents a possible mechanism for such funding to be deployed.

DISCLAIMER (ARTIFICIAL INTELLIGENCE)

Authors hereby declare that NO generative AI technologies such as Large Language Models (ChatGPT, COPILOT, etc.) and text-to-image generators have been used during the writing or editing of this manuscript.

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COMPETING INTERESTS

Authors have declared that no competing interests exist.

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