Financial Analysis of an Agricultural Extension Initiative in a Conflict-Vulnerable Area of Mindanao

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Abstract

An economic assessment of a pilot agricultural extension initiative relating to vegetable growing in a conflict-vulnerable area of Zamboanga Sibugay, Mindanao was undertaken. There are minimal micro or macro level studies in the literature attempting to measure the economic returns to agricultural extension. Those studies have typically suffered from an attribution problem in relation to the separation of extension costs and benefits from other influencing factors. In conflict vulnerable areas such as reported here, agricultural extension is generally limited or absent. In this example, the application of the extension initiative was the only change affecting farmers' practices, so the study is somewhat unique in being able to isolate the extension effect.

The analysis indicates that the present value of benefits from the extension initiative is 1.6 million pesos while the present value of costs is 1.1 million pesos, with a net benefit of 570 thousand pesos. The benefit cost ratio is 1.54 and the internal rate of return is 34%. These various measures are all significantly positive and lend credibility to the idea that agricultural extension applied to conflict-vulnerable areas can represent an acceptable return on money invested. The research can also be seen as a component of a broader 'action research' agenda whereby initial research outcomes are evaluated before progressing to the next step of wider implementation/adaptation.

Keywords: *conflict, extension, financial analysis, Mindanao*

Introduction

An agricultural extension initiative entitled 'LIFE' – Livelihood Improvement through Facilitated Extension has been developed and is now being pilot tested for suitability in conflict-vulnerable areas in Mindanao, Philippines. The initiative (extension model) evolved from the previous experiences of the Landcare Foundation of the Philippines (ACIAR 2004). Readers are referred to the detailed descriptions of the extension model's framework, underlying principles and activities in Vock (2018). A brief overview follows. The overarching strategy involves *social capital enhancement along with two other related and concurrent strategies, improving farmer access to technical innovation* and *close collaboration with local institutional partners.* Social capital can be seen to enable the other two strategies (i.e., the three strategies are not independent of one another). Sixteen extension principles, and the corresponding on-ground activities, are linked to one or the other of the strategies. While aspects of these strategies are inherent in many community-based projects, the simultaneous attention paid to all three, and their application within a conflict situation, is unusual, if not unique. At a practical level, the rigorous and systematic adherence to all the detailed steps comprising the model is also rare.

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There is an intention to apply the model on broader geographic and institutional scales, initially focusing on conflict-vulnerable areas of Mindanao. This research can be seen as a component of an action research agenda whereby initial pilot outcomes are evaluated before progressing to the next implementation/adaptation cycle of the research (e.g., Campilan *et al*. 1999). In that sense, the evaluation of the model presented here can be viewed as 'preliminary' (Knipscheer, Menz and Verinumbe 1983), rather than definitive.

Marsh, Pannel and Lindner (2004) indicated that there were few published studies of the economic returns to agricultural extension. Reported studies are typically regional or national and are confounded by the difficulties of isolating the effects of agricultural extension from other confounding factors (Birkhaeuser, Evenson and Feder 1991). Local level studies regarding the impacts of extension on farmers are relatively common (e.g., Danso-Abbeam, Ehiakpor and Aidoo 2018; Yao, Smith and Sulaiman 2018), including in the Philippines (Yorobe Jr., Rejesus and Hammig 2011). However, these impact assessments were not matched with a cost analysis of the extension program itself. Therefore, no conclusions can be drawn regarding cost-effectiveness. Usually agricultural extension efforts are combined with other forms of development support, so that the costs (and benefits) specific to extension tend to be obscured. In this study, it is confidently held that no confounding factors can be responsible for the observed results on farmers' fields. Phyical isolation and conflict-vulnerability have prevented extension contacts from outside. This has been confirmed directly by the local extension agents who indicated that they were previously afraid to enter the area, although they are now doing so as part of the new program. In addition, the costs of extension have been carefully isolated and documented to ensure that no other costs are inadvertently included. The assessment presented here has an *ex ante* element in that the returns currently being achieved from vegetable growing are assumed to be sustainable.

The purpose of this research is to give confidence that further extension model adaptation and refinement to additional locations is warranted, by empirically estimating the benefits from extension in a pilot test site which is vulnerable to conflict.

Methodology

Data Sources

The LIFE initiative was first applied in three case study sites in Mindanao (Menz *et al.* 2014) while development, testing and refinement continued concurrently. Extension program activities at this first set of sites had a strong research/learning orientation. Therefore, the costs of the extension program implementation at those sites were likely biased upwards and therefore were not considered suitable for input into a financial assessment. For the current analysis, farm level output data were taken from one of those initial pilot sites (Barangay Magdaup, Municipality of Ipil in Zamboanga Sibugay). The Municipality of Ipil is located in the Zamboangan Penninsular in the province of Zamboanga Sibugay and is 1,113 hectares in area. This coastal area is comprised of 28 barangays including Magdaup barangay. Magdaup is an upland barangay located at about 3 kilometers from the center of Ipil.

Extension program cost data were taken to be an average of three other sites after key program parameters had been resolved, and thus can be considered to represent good estimates of likely future costs (Menz and Predo 2016). Actual expenditures were carefully recorded by research personnel during program implementation. These estimates formed the basis of the cost calculation of 864 thousand pesos for the one year of program application/implementation in Ipil with a two person facilitation team, serving 60 farmers (30 per facilitator). The core program cost components are shown in Table 1.

Table 1. Summary of the extension initiative costs for one year (pesos)

Item	Amount (PhP)	Percent (%) of Total
Management	54,026	6
Field personnel (x2)	400,000	46
Training	30,812	4
LIFE model staff training	151,267	18
Farmer cross-visits	59,947	7
Conduct meeting/discussion	38,858	4
Transportation costs	129,167	15
Total	864,077	100

Note: The source of these data is AMAEP Working Paper No. 20
(https://sites.google.com/site/improvedextensionproject/publications/working-papers)

The primary motivation for implementing an extension activity based around livelihood improvement via vegetable production was to diversify the income sources of farmers when fishing-related activities like agar-agar (the primary income generator) is in a lean period. Average farm size of the pilot test farmers is two hectares, with rice being the main land-based crop averaging approximately one hectare, followed by corn at about one-half hectare. Vegetable production allows farmers to utilize smaller areas of vacant area near their dwelling areas. Farmers grow ampalaya, eggplant, pepper, squash, and string beans. These are primarily sold in nearby barangays, house-to-house within the barangay, and also used for home consumption. Under the extension program, farmers have been provided with training on vegetable production, and some material inputs (fully costed in this analysis) that enabled them to engage in this livelihood activity. One year is regarded as being sufficient to achieve the initiation of new livelihood activities, and this has been confirmed by the actual changes in farmers' practices. At this stage, extension program costs in years subsequent to year one are unknown (and could be zero) but in the calculations below, 40 months of 'maintenance costs' have been allowed (i.e., follow up with farmers by extension personnel) calculated at a rate of 10% per annum of the initial program rollout costs as shown in Table 1.

Farmers in Magdaup undertook several different vegetable production activities as a result of the extension program. For some farmers, the economic benefits from commencing new livelihood activities have not yet been realized, so the gross margin calculations below may well be conservative. Vegetable production costs were taken from a detailed case study survey and vegetable economic returns were collected from a sample of 11 farmers for use in this current paper (Predo *et al.* 2016), leading to the gross margin (equivalent to gross revenue minus variable input costs) figures shown in Table 2. No explicit accounting for nutritional benefits from vegetable consumption has been undertaken as these are regarded as having been captured in the revenue figures which include home consumption value. An impact assessment of the program

in another location has demonstrated that additional income from vegetables coincides with enhanced food sufficiency (Menquito *et al.* 2018). For inclusion in the analysis, seven years of production with two six-month 'cycles' of production per year are assumed to represent a feasible outcome from the extension program implementation. Experience thus far in the pilot study has indicated that the program costs as shown in Table 1 can effectively service 60 farmers. To retain a conservative approach to the analysis, no 'spontaneous' adoption by non-program participants is assumed.

Table 2. Gross margins for Ipil vegetable farmers, sample of 11 farmers over 6 months

Name	Gross Revenue (PhP)	Production Cost (PhP)	Gross Margin (PhP)
Farmer A	8,054	2,824	5,229
Farmer B	6,563	2,301	4,261
Farmer C	2,985	1,047	1,938
Farmer D	1,268	444	823
Farmer E	3,510	1,231	2,279
Farmer F	6,810	2,388	4,422
Farmer G	480	168	312
Farmer H	4,920	1,725	3,195
Farmer I	9,000	3,156	5,844
Farmer J	6,448	2,261	4,187
Farmer K	13,747	4,821	8,926
Grand Total	63,783	22,368	41,416
Average per farmer	5,798	2,033	3,765

Decision Criteria Used in Financial Analysis

A meta review of studies on the impacts of agricultural extension (Evenson 2001) was updated by Anderson and Feder (2007). Rates of return were typically estimated econometrically by relating productivity changes to investment in research and extension or by applying the economic surplus method, which calculates economic benefits based on estimated productivity changes. Despite this apparent straightforwardness, few studies of systematic comparison of costs and benefits 'with and without' a project/program have been undertaken (Birkhaeuser, Evenson and Feder 1991). In the analysis that follows, the economic impact measures shown below are directly attributable to the costs incurred as shown in Table 1. This is the case because the isolation of the case study farmers due to the conflict environment, has eliminated the potential influence of other factors.

The net present value (NPV), benefit-cost ratio (BCR), and internal rate of return (IRR) from the extension initiative were estimated to determine the financial profitability of vegetable production. The NPV is computed using the following equation:

$$\mathbf{NPV} = \sum_{t=0}^{T} \frac{(B_t - C_t)}{(1+r)^t} \qquad (1)$$

where: B_t = benefit at time t

C_t = cost at time t

t = Time (years) where benefit or cost is observed

T = Life span of investment (years)

r = Discount rate (% per annum)

The BCR was computed as the ratio of discounted stream of benefits to discounted stream of costs over the time horizon considered in the analysis. Below is the formula used to compute BCR:

$$BCR = \sum_{t=0}^{T} \frac{B_t / (1+r)^t}{C_t / (1+r)^t} \quad (2)$$

One can derive the IRR by equating NPV to zero. The formula used to derive IRR is as follows:

$$\text{NPV} = 0 = \sum_{t=0}^{T} \frac{(B_t - C_t)}{(1+IRR)^t} \quad (3)$$

Results and Discussion

The intention in this paper is not to make a *definitive* assessment of the extension initiative's 'value', since this will change according to the local circumstances, and data are only currently available from one site. Rather, the objective is to seek guidance as to whether current and likely future benefits to be obtained can reasonably be expected to cover the costs of the intended rollout. To do this, a combination of past recorded cost data and expected future benefit outcomes were used. Table 3 below shows the results. There is an assumed seven-year flow of benefits (based on the annual farmer gross margins from Table 2) set against an initial year of significant extension costs, followed up by 40 months of modest 'program maintenance' costs (i.e., maintaining contact with farmers after year 1 and resolving emerging problems, among others). Future benefits are discounted at a rate of 20% in order to make legitimate comparisons across years. Twenty percent can be regarded as quite high (i.e., conservative) reflecting the riskiness of operating in a conflict-vulnerable area.

Table 3 indicates that the present value of benefits is 1.6 million pesos while the present value of costs is 1.1 million pesos, with a net benefit of 570 thousand pesos. The benefit cost ratio is 1.54 and the internal rate of return is 34%. These measures are all significantly positive and lend credibility to the idea that the program can represent a good return on money invested. A variety of previous studies referred to earlier have indicated a range of results in relation to economic returns from extension. In general, those previous results were on the positive side of the ledger, as is the case here.

Table 3. Framework and quantification of financial indicators (thousand PhP)

Item	Year							
	0	**1**	**2**	**3**	**4**	**5**	**6**	**7**
Benefits								
Vegetable production gross margins[a]	0	452	452	452	452	452	452	452
Costs								
Program rollout	864							
Maintenance cost	0	86	86	86	26	0	0	0
Total Costs	86	86	86	86	26	0	0	0
Net benefits per year	-864	366	366	366	426	452	452	452
Discounted net benefits	-864	305	254	211	205	182	151	126
Present value of total benefits	1,629							
Present value of total costs	1,059							
Net Present Value (NPV)	570							
Benefit Cost Ratio (BCR)	1.54							
Internal Rate of Return (IRR)	34%							

[a] The figure of 452 thousand pesos for annual vegetable production revenue is derived from 3,765 pesos (from last row in Table 2) x 2 periods per year x 60 farmers

Stand-alone financial analysis of an extension program at the micro level has rarely been observed in the literature, and certainly not in a conflict-vulnerable context. Interestingly, the conflict-vulnerable nature of the study area provides the advantage of isolation (and therefore quarantines what might have been confounding factors in the analysis). The calculations here have illustrated that the LIFE extension initiative is a promising investment option. Even an incomplete accounting of expected benefits indicates that the future flow of benefits exceeds the costs of implementing the extension program. Yet the extension program also ranged into areas beyond vegetable production, such as social capital enhancement (Johnson *et al.* 2018), so additional economic benefits from this source would also be expected in addition to those calculated here.

As mentioned earlier, the analysis is intended as a guide to the likely value of additional research/extension investments in relation to this agricultural extension initiative in conflict areas. In an action research framework, intermediate outcomes are assessed prior to embarking upon another round of adaptation and implementation. This paper provides an example of that process, while also being unusual, and perhaps unique, in assessing at farm level, an agricultural extension initiative.

Conclusion

Enhancing incomes of farmer beneficiaries through livelihood improvement via agricultural extension is the ultimate objective of the LIFE model in the context of conflict vulnerable areas. The benefit-cost analysis has illustrated that the extension model, exemplified here via vegetable growing, is a promising investment option from the perspective of both the extension providers and the farmers themselves. Only 'livelihood' (here interpreted as 'financial') benefits are assessed in this paper. Separate research referred to above has indicated that social capital enhancement, another outcome of the model, can itself lead to economic benefits and these benefits are not likely embodied in the measurements reported here. Further assessments of the LIFE model will be undertaken as additional data become available, geographic application is extended, and additional time is allowed for more of the economic impacts of social capital enhancement to be captured.

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