Measuring Attribution: Samarth-NMDP in Nepal using the Quasi-Experimental Design Method for an intervention in the Ginger Sector

Synopsis

Measuring impact in private sector development programs is important but also challenging. This case is part of a larger guidance paper that provides an overview of the most common attribution methods and offers guidance on how to select the most appropriate attribution method for the diversity of interventions and their context. This paper also documents how four programs selected and implemented four different attribution methods. This case explains how Samarth-NMDP selected the Quasi-Experimental Design Method and why Samarth-NMDP considers it the most appropriate method for this intervention in the ginger sector. It also explains how they carried out the measurements.

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Acknowledgements:

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This case describes how the programs have addressed a typical challenge in results measurement. The aim of the case is to provide insights that will be useful to other practitioners facing similar challenges. The authors do not represent the DCED, nor do the views expressed in the case necessarily reflect the views of the DCED and Dfid.

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[1] The HPC consortium was led by Hans Posthumus (HPC) and consisted of Aly Miehlbradt (MCL), Ben Fowler (MSA), Mihaela Balan, Nabanita Sen (OU), Phitcha Wanitphon and Wafa Hafiz (H&S)

2 Introducing SAMARTH-NMDP

Samarth – Nepal Market Development Programme (Samarth-NMDP) is a five-year UK-Aid funded rural market development implemented by Adam Smith International, The Springfield Centre and Swisscontact with a total budget of GBP 15 million. The program aims to reduce poverty in Nepal by increasing the incomes of some 300,000 smallholder farmers and small-scale entrepreneurs. The program works to improve the performance of market systems that will lead to improved growth, that will benefit poor and disadvantaged people. The programme applies the Making Markets Work for the Poor (M4P) approach.

Samarth-NMDP designs and implements a series of systemic interventions that respond to particular constraints hindering pro-poor growth in rural market systems. The program team aims to facilitate market players to carry out new tasks and activities or take on new roles which shape the way that rural, and particularly agricultural, markets are working for the poor. As a result, farmers and small-scale entrepreneurs can access and benefit from the goods and services they need for their enterprises to grow and become more competitive within markets (e.g. through improved productivity, such as increased yields). This results in increased incomes accruing to poor farmers and entrepreneurs and contributes to lifting them out of poverty.

Currently, Samarth-NMDP operates in ten sectors combined into three portfolios: Crop portfolio includes crop protection inputs, ginger, mechanization and vegetables; livestock portfolio includes dairy, fish, livestock feed and pig; and a combined tourism and media portfolio. Click here to see more information on current portfolio and geographic coverage.

3 Introducing the Ginger Disease Management Intervention

Nepal is the world's third largest producer of ginger. Ginger cultivation is concentrated in the mid-Hills region, across 24 major districts. An estimated 200,000 farmers are active in the sector, of which around one third live below the national poverty line. The poor participate in the ginger market primarily as producers and labourers, or, in some cases, as small-scale ginger collectors, traders or processors. Nepali ginger holds a competitive edge in terms of taste and smell, relatively low production costs, affordability and durability. However, productivity is stagnant, and may even be declining due to diseases.

Irregular rainfall, intense sunlight, poor drainage and soil contaminated with micro-organisms contribute to diseases, particularly soft rot, also known as rhizome rot, which decays the ginger roots which is the harvested part of the ginger plant. Rhizome rot is found in almost all ginger growing areas of Nepal and is believed to be a major problem for ginger farmers causing losses in the yield. A Samarth-NMDP survey of farmers in three major producing districts found that 95 per cent of farmers had suffered loss of the ginger crop before harvesting, mostly because of rhizome rot. While rhizome rot is common in ginger, proper mitigation measures are not practiced by Nepali farmers. Both the farmers as well as the agrovets do not have information on, and access to, proper disease management products. Depending upon the infestation, rhizome rot can be combated by proper application of a bio-fungicide and/or an anti-bacterial. One of the leading bio-fungicides to control rhizome rot is Trichoderma. Trichoderma is already in widespread use in the tea sector in Nepal, and its use for treating rhizome rot in ginger has been tested and proven in India and in Nepal but only to a limited extent.

This intervention aims to improve ginger yields and increase the incomes of poor farmers by working with market players to introduce proven disease management measures i.e. Trichoderma. Ginger farmers are not aware of Trichoderma and it is not available in the local markets. Both Trichoderma importers and agrovets do not understand the use, applicability and profitability of Trichoderma on mitigating disease in ginger due to lack of first-hand information on its effectiveness for controlling ginger rhizome rot. However, there is a large latent demand for ginger disease management solutions at the farmer level which offers a potentially large and untapped market. For this intervention, the programme works with Trichoderma importers to introduce Trichoderma through their networks of agrovets. Ginger farmers will therefore have access to Trichoderma and information on how to use it properly. The key activities are:

- brokering the linkage between importers and agrovets.
- jointly developing the promotional materials;
- developing the training curriculum with the importer to train their agrovets.
- providing technical support to the importer to set up and conduct the demonstration plots.

For more information, click here to see the video on ginger disease management intervention.

4 Selecting the attribution method

The five questions that help to select the most appropriate attribution method are answered here, and show why a Quasi Experimental Design (QED) is the most appropriate attribution method to assess the net additional income of the ginger farmers using this intervention.

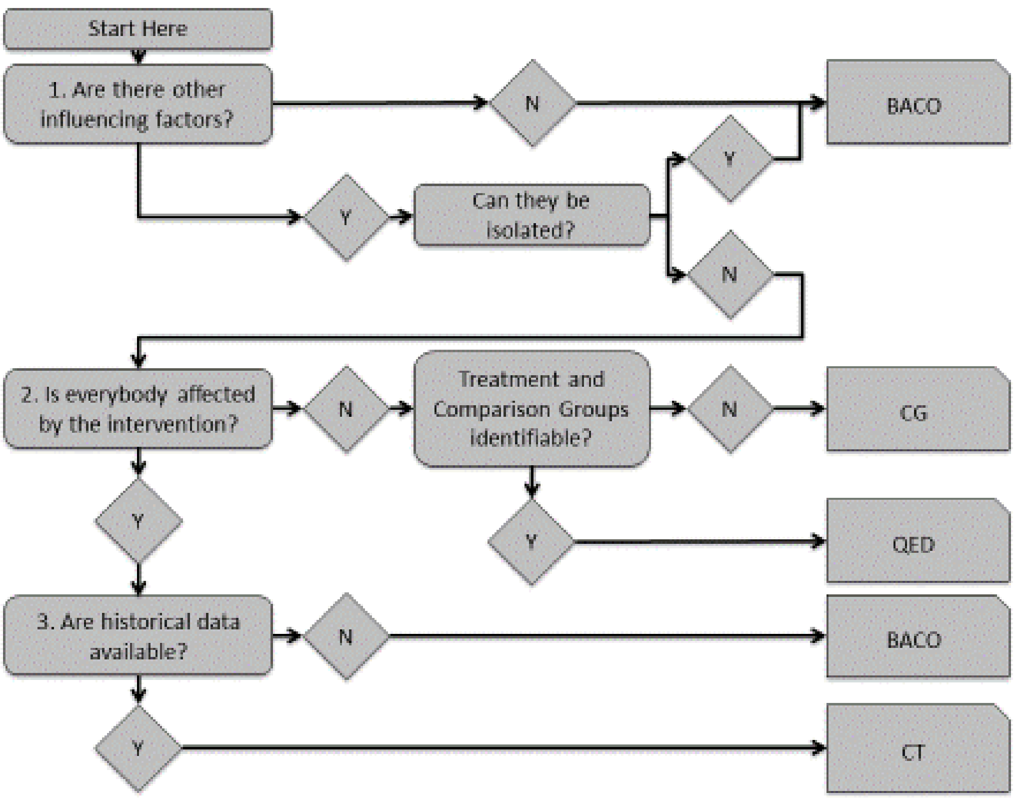

Figure 1. Attribution Selection Aid

Q1 Are there other influencing factors?

The intervention aims to improve ginger yields by reducing rhizome rot using Trichoderma. In this case, the counterfactual is the yield of ginger if the farmers do not use Trichoderma. There are several external influencing factors that affect ginger yields. For example, the amount of rainfall affects the disease occurrence and yields. Cultivation practices and quality of the planting materials also affect the yields. *Yes, there are other influencing factors.*

Can these factors be isolated?

These factors, especially the weather, cannot be isolated and kept constant between the Before and After situations. *No, these factors cannot be isolated.*

Q2 Is everybody affected by the intervention?

Currently, Trichoderma is distributed through an importers' network of selected agrovets. Not all the villages in the same districts have access to the agrovets who carry the Trichoderma. Hence, the intervention does not affect every farmer in the target areas at this stage. A comparison group can be sampled from farmers in neighbouring villages in the same districts who do not have access to these disease management products. Farmers in same districts are exposed the same weather and disease patterns and employ similar farming practices.
No, not everybody is affected by the intervention.

Are a treatment and comparison group identifiable?

As discussed above, not all the villages will be affected by the intervention. Only farmers that have access to and use the Trichoderma will be part of the treatment group. The program can sample the farmers in the neighbouring villages that do not have access to Trichoderma to construct the comparison group.
Yes, a treatment and comparison group are identifiable.

Q3 Are historical data available?[2]

There is no historical data that can be used to calculate attributable changes. Samarth cannot obtain reliable data on the changes in yields of ginger for a longer period, specifically for the districts where Trichoderma is now sold.
No, historical data are not available.

Conclusion:

As seen from the attribution selection aid (fig.1), the appropriate attribution method is Quasi-Experimental Design in this case. The program can compare changes in the yields of the treatment group (farmers who use Trichoderma) with changes in the yields of the comparison group (farmers in the neighbouring villages who do not have access to Trichoderma) by using the Difference-in-Difference (DiD) comparison. This is illustrated in

[2] In real life, it is not necessary to continue answering the questions. In this case, we have answered the other questions too to show that other attribution methods are not appropriate

Figure 2. Apart from the application of Trichoderma, both treatment (green line) and comparison (orange line) groups are exposed to similar external factors, the Difference-in-Difference in yields (A-B) is therefore due to the application of Trichoderma. By utilising this method, the program can credibly estimate the attributable impact of the intervention.

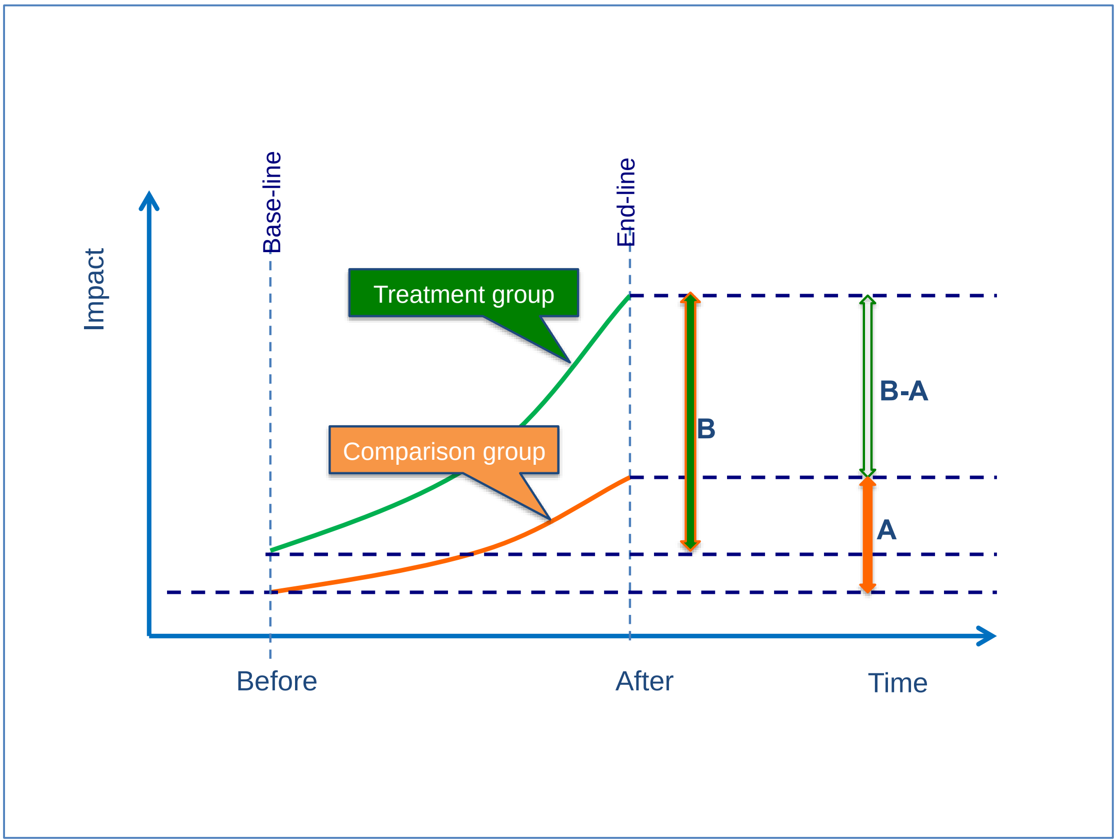

Figure 2. Difference-in-Difference Comparison

5 Quasi-Experimental Design

A Quasi-Experimental Design implies surveying both the treatment and comparison farmers before and after the intervention to capture changes in yields. The treatment group consisted of those small holder farmers who bought and used Trichoderma. The comparison group consisted of farmers from neighbouring villages who did not have access to Trichoderma. The base-line survey for both the treatment and comparison groups involved capturing the information on the 'before' situation. The end-line survey involved revisiting the sampled farmers in both the treatment and comparison groups to capture the information after the intervention. The Difference-in-Difference was then used to assess the attributable impacts of the intervention.

6 The research in practice

The base-line and end-line survey were outsourced to a research firm to collect data on ginger production and use of Trichoderma. The project team then analysed the data in-house in order to ensure the quality of the analysis. During the time of the base-line study, only around 200 farmers attended the demonstration plots set up by importers and agrovets. The list of these farmers was compiled and provided by importers. The list of 200 farmers was then used as a sampling frame for the treatment group.

Normally, the sample size is determined by the required confidence level. However, Samarth needed to determine the poverty status of the beneficiaries. Hence, the sample size was based on PPI (Progress out of Poverty Index) requirement[3], which implied that the program sampled 186 respondents from three districts. These samples were randomly selected from the list of 200 farmers. For the comparison group, the same numbers of samples were applied. The samples were also randomly selected from the neighbouring villages by interviewing every third household. The base-line survey for both treatment and comparison group was conducted to capture information of the 2012 season (April to December 2012). The base-line survey was carried out during April and September 2013 after farmers visited the demonstration plots. In that way, the list of potential beneficiaries could be compiled. The recall bias is minimal for ginger since there is only one harvest cycle per year and farmers can easily recall information for the previous season.

The end-line survey was carried out at between the end of December 2013 and January 2014 to capture the information of the 2013 season (April to December 2013). The same samples in the base-line survey were revisited and the same set of questions was asked. However, some samples could not be found and some in the treatment group did not use Trichoderma. So, the sample size was reduced to 137 samples for the treatment group and 147 samples for the comparison group. Although the sample was reduced to 137 for the treatment group, it is still considerable compared to the sampling frame of 200 farmers[4]. For 200 farmers, 137 samples still met the requirement of 95% confidence level and 5% margin of error. The Difference-in-Difference is then used to estimate the attributable changes in yields. The calculation is shown in the following table.

Average yields of ginger (kg per Ropani of land)	Base-line[5]	End-line	Difference
Comparison group	131	351	220
Treatment group	191	451	260
Difference in difference			40

The net attributable income was calculated based on net attributable changes in yields and average market price, additional costs and landholding. The calculation is reflected in Table 1 below.

Attributable changes in yields as a result of Trichoderma application	40 kg per Ropani[6]
Additional income through additional yields **(Ginger farm gate price @ Rs 90 per kg)**	40 x 90 = 3600 Rs[7]

[3] Minimum sample size was determined based on the $2.50/day/2005 PPP poverty line using the formula $n = \left(\frac{\alpha \cdot z}{c}\right)^2 \cdot \hat{p} \cdot (1-\hat{p})$ as given in the PPI calculator for Nepal where $\alpha = 0.52;\ z = 1.96;\ c = 0.05\ and\ \hat{p} = 0.82$.

[4] Please refer to the DCED sample size calculator.

[5] The ginger yields of 2012 season were severely affected by the drought.

[6] 1 Ropani = 508.72 m²

[7] Rs = Nepalese Rupee

Additional cost incurred as a result of Trichoderma application (Rs 200 per Ropani)	- Rs 200
Average net attributable income change per Ropani	Rs 3,400
Average land holding size of farmer for ginger cultivation	2.6 Ropanis
Average net attributable income change per farming household	Rs 3,400 x 2.6 = Rs 8840

Table 1: Income change calculation.

For more information, click here to see the impact assessment report.
The above findings are for the pilot phase with a small number of beneficiaries. During the scale-up phase, the program will also validate the findings to see if they are still valid and can be extrapolated to wider groups of beneficiaries.

Annexes

1. Samarth Webpage
2. Case study video on ginger disease management in Makwanpur district of Nepal
3. Intervention Results Chain
4. Impact Assessment Report

Other Case Studies on Attribution

- A practical framework to select appropriate attribution methods, introducing and explaining the attribution selection aid.
- The intervention of MDF with Acelda in Timor Leste, illustrating the use of a before and after with opinion (BACO) method.
- The Alliances Lesser Caucasus Programme (ALCP) in Georgia, illustrating how a single impact assessment could assess attribution for multiple interventions.
- Propcom Mai-Karfi (PM) intervention in the tractor market in Nigeria, illustrating the use of comparison groups (CG)