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# DEVELOPING A CAUSAL MODEL FOR PRIVATE SECTOR DEVELOPMENT PROGRAMS

**IMPACT ASSESSMENT PRIMER SERIES**  
PUBLICATION # 4

**PRIVATE SECTOR DEVELOPMENT IMPACT ASSESSMENT INITIATIVE**

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## INTRODUCTION

All private sector development (PSD) programs are based on a *causal model* showing the causal (or logical) links between program activities and expected outputs, outcomes and impacts. Stated in less technical terms, a causal model is akin to a roadmap showing how the PSD program gets from Point A (program activities) to Point Z (program impact). Underlying the links in the causal model is a set of theorized causal relationships that program designers believe to be true. The impact assessment aims to prove the existence of these theorized relationships.

The importance of the causal model for program design is that it forces program designers to articulate these causal relationships and evaluate the degree to which they make sense and/or are justified. Consider, for example, a PSD program with the end objective to increase exports by small-scale vegetable farmers but which focuses its indicators and targets on the number training course offered to small-scale farmers. In this example, there is a clear disconnect between the intended impact and the indicators used to measure that impact. A causal model that articulated the logical links between program activities and desired impacts would clarify such an inconsistency.

Just as establishing a causal model is essential for program design, so is it essential for assessing program impact. Creating a clear and detailed causal model is an important early step in conducting an impact assessment. An impact assessment is not an open-ended fishing expedition. It is carefully designed research process guided by a set of plausible theoretical relationships linking program activities to intended impacts as expressed in the program's causal model.<sup>1</sup>

The remainder of this Primer Series paper addresses issues in constructing and using a causal model to aid in impact assessment design, including identification and selection of key outcome and impact indicators. As discussed, the causal models is also a useful tool in the design of performance monitoring systems.

## THE CAUSAL CHAIN

The process of getting from program activities to intended impacts involves a number of intermediate steps. These intermediate steps are in turn linked to each other through a series of cause-and-effect relationships represented by a *causal chain*. Figure 1 shows an example of a causal chain that includes program activities, outputs, outcomes, and impacts.

Program activities consist not only of actual program activities but also of the inputs (resources) used to produce those activities. Outputs are the tangible results of program activities. Examples of outputs include the number of trainings given, the number of people trained, the number of agreements signed, the number of business member organizations (BMOs) created, and the like. Such indicators can be easily quantified as well as aggregated.<sup>2</sup>

Outcomes, on the other hand, are observed changes among project clients, among other value chain actors, or in the enabling environment. Finally, impacts are the end results sought by the program. Impacts differ from outcomes in that outcomes are means to achieve specified ends, whereas impacts are the ends being sought and which are brought about as a direct or indirect result of the outcomes. Thus, for example, in a program with the objective to increase small firm profitability, increased firm productivity would be considered an outcome; that is, it is a means to achieve higher firm profitability, which is the end result being sought.

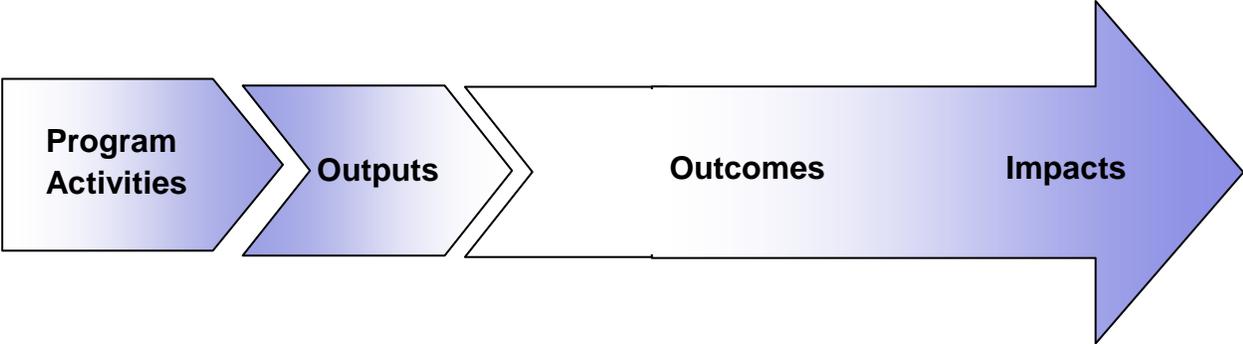
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<sup>1</sup> This is not to say that there is no room for “exploratory” research in an impact assessment. It is advisable for researchers to build methods into the assessment design that both allow the researchers to probe for unexpected results and allow respondents to define impacts from their point of view. Qualitative methodologies are particularly well-suited for this purpose.

<sup>2</sup> Unlike outcomes and impacts, outputs are typically objectively measurable, meaning they are capable of being independently observed, measured, and verified. For this reason, they are commonly used as indicators in program monitoring systems.

As seen in Figure 1, the casual chain moves from left to right. The further to the right one goes, the more difficult measurement becomes and the stronger is the causal relationship with program impacts. Notwithstanding, each link in the chain is as important as any other link: break any link in the chain, and the entire chain breaks.

Figure 1. The Causal Chain



### CAUSAL MODEL OF THE BEEF CATTLE SECTOR AT PROFIT ZAMBIA

Figure 2 gives an example of a causal model and its underlying causal chain for the beef cattle sector in Zambia that was one of three sectors included in an impact assessment of the Production, Finance, and Technology (PROFIT) project by Private Sector Development Impact Assessment Initiative (PSD IAI).<sup>3</sup> Working with PROFIT staff members, the PSD IAI research team devised a causal model for each of the three sectors to be assessed, which in addition to beef cattle, included the cotton and retail services sectors. The causal model for beef cattle is similar in design to the causal models developed for cotton and retail services.<sup>4</sup>

The causal model in Figure 2 lists planned project activities in the far left-hand column. Most of PROFIT’s activities in the beef cattle sector are facilitative and are expected to lead to the project outputs (service delivery) listed in the second column of Figure 2. The anticipated outputs are expected in turn to produce a range of outcomes, shown in the third column, and anticipated outcomes in their turn are expected to bring about the impacts shown in the last column. As seen in Figure 2, each project activity is expected to lead to a set of corresponding outputs, whereas project outcomes and impacts may be the combined result of various outputs.

<sup>3</sup> PROFIT is a PSD program aiming to improve production efficiency and returns in rural-based microenterprises through interventions targeted to different levels of the relevant value chains.

<sup>4</sup> The presentation format of the causal model is a matter of stylistic preference and the level of detail required. The important thing is that the causal model clearly identifies and differentiates between important links in the causal chain.

**Figure 2. PROFIT Project Causal Model: Beef Cattle**

Activities (Facilitation)	Outputs (Service Delivery)	Outcomes	Impacts
<p><b>Vet Services</b></p> <ul style="list-style-type: none"> <li>Organize group payment mechanism for communities</li> <li>Facilitate service delivery structure based on herd plans</li> <li>Facilitate a vet networking</li> <li>Develop business expansion model (work with vet assistants)</li> <li>Facilitate development of livestock insurance (packages with services)</li> </ul>	<ul style="list-style-type: none"> <li># of private vets providing services</li> <li># of animals receiving health care (especially preventive)</li> <li># of vets organized into networks</li> <li># of vet assistants</li> <li># of insurance policies established</li> <li># of new bulls sold</li> <li># of stud service transactions/AI</li> <li>Sales volume of drugs sold through vets &amp; retail stores</li> <li># of vets given business training</li> </ul>	<ul style="list-style-type: none"> <li>Increased # of cattle under private vet schemes</li> <li>Decreased cattle mortality &amp; morbidity</li> <li>Increased value/animal</li> <li>Increased # of vet services provided (growth of vet industry)</li> <li>Increased # of smallholders accessing financial sector (decreased risk of loss)</li> <li>Improved margins</li> <li>New entrants of vets &amp; vet assistants</li> <li>Improved animal quality</li> <li>Decreased mean age at slaughter (increased stock turnover)</li> </ul>	<p>Sub-sector level</p> <ul style="list-style-type: none"> <li>Output growth by value &amp; volume</li> <li>Growth (in volume &amp; value) of output going through formal structure</li> <li>Access to high-quality market</li> <li>Growth in smallholder output share</li> <li>Increased smallholder price relative to commercial price</li> <li>Improved ability to withstand shocks</li> </ul> <p>Firm level</p> <ul style="list-style-type: none"> <li>Increased sales</li> <li>Increased profits</li> <li>Higher productivity</li> </ul> <p>Household level</p> <ul style="list-style-type: none"> <li>Rising income</li> <li>Declining poverty</li> <li>Increasing assets</li> </ul>
<p><b>Market Transparency Activities</b></p> <ul style="list-style-type: none"> <li>Facilitate establishment of blind auctions with scales</li> <li>Facilitate grade &amp; standard pricing at abattoirs</li> <li>Link smallholders to feed lot systems</li> <li>Develop artificial insemination (AI) &amp; breeding services through vets</li> <li>Facilitate wholesale distribution of vet drugs</li> <li>Develop savings alternatives for smallholders</li> <li>Link tanneries to abattoirs</li> </ul>	<ul style="list-style-type: none"> <li># of auctions established</li> <li># of scale services available</li> <li>Grades &amp; standards pricing structure established</li> <li># of feed lot outgrower systems established</li> <li># of cattle sold at feed lots</li> <li>Use of savings instruments</li> <li># of cattle sold through more transparent mechanisms</li> </ul>	<ul style="list-style-type: none"> <li>Differential pricing by quality</li> <li>Increased awareness of market requirements among vets</li> <li>Shift from cattle as a store of value</li> <li>New entrants into beef industry (more balanced market shares)</li> </ul>	

According to market analysis done by PROFIT, smallholder beef production is hampered by two primary constraints: disease and a lack of market transparency. Rampant disease among smallholder cattle stocks results not only in high mortality rates but also in inferior product quality that makes smallholder cattle unattractive to commercial buyers. The lack of market transparency tilts the balance of economic power in the marketplace to buyers. Thus when smallholders do bring cattle to the market, they lack information necessary to secure higher prices for their products. It also distorts market signals in that smallholders do not receive clear incentives that might spur them to invest in upgrading their product. On top of all this, many smallholders regard cattle more as a source of prestige and store of value than as a commercial product.

To correct for market deficiencies and thereby induce smallholders to take a more commercial approach to cattle raising, PROFIT determined to implement activities emphasizing strengthened veterinary services and improved market transparency. As seen in Figure 2, activities falling under the former include organizing group payment mechanisms for veterinary services, including livestock insurance plans; facilitating service delivery based on herd plans; facilitating the creation of veterinary networks; and helping veterinarians developing business expansion plans. Activities falling under the latter include facilitation of blind auctions with scales and grades and standard pricing at abattoirs (slaughterhouses); linking smallholders to feedlot systems and abattoirs to tanneries; developing artificial insemination and other breeding services through veterinarians; facilitating wholesale distribution of veterinarian drugs; and developing savings alternatives for smallholders.

Linking PROFIT activities to impacts are a number of outputs resulting directly from the above activities that lead in turn to a series of outcomes. Outputs resulting from facilitation of veterinarian services include, for example, the number of private vets providing veterinary services to smallholders, the number of cattle receiving health care, the number of vets organized into networks, the number of vet assistants trained, the sales volume of veterinary drugs sold through vets and retail stores, and so forth. Outputs resulting from market transparency activities include the number of auctions, scale services, feed lot outgrower systems, and grades and standards pricing structures established; the number of cattle sold at feedlots or through other transparent market mechanisms, and the use of alternative savings instruments by smallholders.

The project outputs are expected to produce a range of outcomes considered prerequisites to achieve the intended impacts. The expected outcomes include, for example, the increased number of cattle under private vet schemes accompanied by increased growth and profitability of the private veterinarian sector; decreased rates of morbidity and mortality among smallholder cattle stocks; improved product quality with higher prices for higher quality cattle; increased market entry and sales by smallholders, and a shift from cattle raising as a store of value to a commercial venture.

The specified outcomes are finally theorized to lead to impacts at three levels: the sub-sector, the firm, and the household. Intended impacts at the sub-sector level include output growth by value and volume, increased channeling of production through formal marketing structures, increased smallholder participation, a higher producer price relative to the commercial price, and improved ability to withstand shocks on the part of the smallholders. Intended impacts at the firm level are higher productivity, increased sales, and higher profits for participating smallholders. Assuming firm-level impacts are achieved, they should produce household-level benefits, among them higher household income, asset accumulation, and the ability of poor households to climb above the poverty line.

## **USING CAUSAL MODELS TO DESIGN IMPACT ASSESSMENTS**

Once completed, the causal model drives impact assessment design; the purpose of the impact assessment is to determine whether the theorized relationships specified in the causal model actually exist. In other words, getting the causal model right is a precondition to making sure that the impact assessment is asking the right questions and is using appropriate indicators to answer them. It makes little sense to assess indicators that do not capture important linkages in the program's underlying causal chain.

The PROFIT impact assessment aptly demonstrates this point. Before conducting the baseline research, the PDS IAI research team carried out an evaluability assessment of PROFIT in November of 2005.<sup>5</sup> During the evaluability assessment, the research team and PROFIT management examined a number of program activities (or sectors) and

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<sup>5</sup> See Don Snodgrass and Gary Woller, (2006), PROFIT Zambia Evaluability Assessment," Washington, DC: USAID. The baseline research was completed in November of 2006, and the baseline report is in production.

from these selected the beef cattle, cotton, and retail services sectors for study. Each of the three sectors satisfied a number of selection criteria, including the existence of a reasonably clear and plausible logical framework.

After selecting the three sectors, the research team met over two days with key program managers and staff to create detailed causal models for each sector. Based on the causal models created during this process, the meeting participants next developed the outlines of a research plan that included indicators for each of the outcomes and impacts identified in the causal model together with sources of information for each indicator.<sup>6</sup> This research plan is shown in Figure 3.

As seen in Figure 3, some of the outcome and impact indicators lend themselves readily to quantitative measurement, while others do not. In particular, indicators at the sub-sector level tend to be qualitative in nature, depending more on the opinions of experts and other key informants, whereas indicators at the firm and household levels tend to be more quantitative. For this reason, the research plan specifies that outcome and impact indicators at the sub-sector level will be derived primarily from qualitative research (interviews and focus group discussions), as well as secondary data where available. Indicators at the firm and household levels, on the other hand, will be measured primarily with a household survey.

It will be noted that the research plan Figure 3 does not include output indicators. Impact assessments typically focus on outcomes and impacts and generally do not consider outputs. As a rule, the causal link between outputs and impacts is weak, since it tends to be mediated by a number of factors both within and outside of program control. In the case of the beef cattle sector in Zambia, for example, such factors might include poor service delivery by participating vets, administrative or political difficulties among members of veterinarian networks, poor administration of insurance policies, inappropriately designed savings instruments, corruption or inefficiencies among feedlot operators, and so forth. While outputs are less relevant for conducting impact assessments, they are, nonetheless, commonly used as performance indicators in performance monitoring systems (see footnote 3).

In contrast, the causal link between outcomes and impacts tends to be much stronger. Because outcomes are more closely linked to impacts, moreover, they can often yield particularly useful insights into the nature of causal relationships underlying impacts and how these causal relationships operate.

If, for example, the assessment of the beef cattle sector finds increased firm profitability, an understanding of project outcomes would help explain these results. Did the provision of private veterinarian services grow? Did the morbidity and mortality rate of cattle stocks fall? Did product quality and differential pricing increase? Was there an increase in transparent market transactions and if so what kinds? Did smallholders shift away from cattle as a store of value to alternative savings instruments? Answering these, and related, questions would shed important light on the causal mechanisms leading from program activities to increased firm profitability.

An assessment of outcomes is also useful for pinpointing specific design or implementation issues for reform or replication.<sup>7</sup> Notwithstanding, assessment of program outcomes alone cannot answer the central question of attribution, which is at the heart of the impact assessment.

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<sup>6</sup> For the complete PROFIT Research Plan, see Don Snodgrass and Gary Woller, (2006), "PROFIT Zambia Impact Assessment: Baseline Research Design," Washington, DC: USAID.

<sup>7</sup> Quantitative information alone is probably not sufficient to answer these types of questions. Qualitative information is particularly useful for understanding how and why outcomes and impacts occurred. See Lucy Creevey and Don Snodgrass, (2006), "Collecting and Using Data for Impact Assessment," Impact Assessment Primer Series Paper #3.

**Figure 3. Research Plan for the Beef Cattle Sector**

Level of Analysis	Outcome/Impact	Indicator of Change	Source of Information
Sub-sector	Improved animal health	Mortality & morbidity	<ul style="list-style-type: none"> <li>• Secondary data</li> <li>• Interviews</li> </ul>
	Improved quality	Value/animal or per kg.	<ul style="list-style-type: none"> <li>• Interviews</li> <li>• FGDs</li> </ul>
	Improved access to finance	# of financial providers	<ul style="list-style-type: none"> <li>• Interviews</li> </ul>
	Development of vet industry	<ul style="list-style-type: none"> <li>• # of vet services provided</li> <li>• Types of vet services provided</li> </ul>	<ul style="list-style-type: none"> <li>• Interviews</li> <li>• FGDs</li> </ul>
	Growth of beef industry	Volume of production	Secondary data
	Increased participation of smallholders	percent of output from smallholders	<ul style="list-style-type: none"> <li>• Secondary data</li> <li>• Interviews</li> </ul>
	Improved quality of smallholder beef	<ul style="list-style-type: none"> <li>• # of animals sold at feed lots</li> <li>• Mean weight at sale</li> <li>• Calving rate</li> <li>• Smallholder beef graded choice</li> </ul>	Interviews
	Improved price for smallholders	Producer price for smallholder as a percent of price received by commercial producers	Interviews
	Improved ability to withstand shocks	<ul style="list-style-type: none"> <li>• Savings (preferably monetary, but also cattle)</li> <li>• Uptake of insurance products</li> </ul>	Interviews
Smallholder MSEs	Increased sales	# of animals sold	Survey
	Increased profits	Value of sales minus cash costs	Survey
	Higher productivity	<ul style="list-style-type: none"> <li>• Herd size</li> <li>• Mortality</li> <li>• Mean weight at sale</li> <li>• Calving rate</li> <li>• Quality (do any move up from standard to choice?)</li> </ul>	Survey
MSE households	Higher income	<ul style="list-style-type: none"> <li>• Annual income from beef sales</li> <li>• Household consumption expenditure per capita</li> </ul>	Survey
	Increasing assets	Stocks of selected household assets	Survey

The extent to which the impact assessment focuses on program activities is a matter of choice. At the very least, the impact assessment should verify that the activities specified in the causal model actually took place. Researchers, however, may also want to determine how they took place, including, for example, details regarding implementation and client perceptions of service delivery quality; information that is important in understanding why or why not impacts theorized occurred. Such issues can easily be incorporated either into a survey or into qualitative assessment tools (e.g., key informant interviews or focus group discussions) in a mixed method impact assessment.

## **PRACTICAL BENEFITS OF CREATING A CAUSAL MODEL**

Creating a causal model can require an investment in time, but doing so yields significant benefits that can more than compensate for its costs. There are, at least, four principle benefits of creating a causal model. The PROFIT impact assessment offers a good example of each of them.

1. It allows researchers and program managers to determine whether the program logic and design lend themselves to an impact assessment. If, for example, the theorized causal chain has weak or missing links, there is no plausible reason to expect the intended impacts to occur, in which case an impact assessment would be inappropriate.
2. It helps researchers and program managers to match the assessment methodology to the impacts to be assessed.
3. It helps researchers and program managers identify performance indicators at each link in the causal chain. This information is useful for guiding the impact assessment design.
4. It requires program management to think through the hypothesized relationships explicit or implicit in program design. This in turn enables management to reassess program design in light of its intended impacts. Identified breaks in the causal chain point to areas where program design is weak or faulty opening up the possibility to make changes before problems become embedded in program operations, if done prior to program rollout, or to make mid-stream changes, if done after program rollout.

To the above list a fifth benefit can be added. In the process of helping managers identify performance indicators at each link in the causal chain, the causal model is also useful for guiding the design of the program's performance monitoring system. Again, the PROFIT impact assessment offers a useful case study.

The November 2005 meeting between PSD IAI researchers and PROFIT staff served as a launching point from which PROFIT embarked on a process to formally integrate causal models into its operational planning and the design of its performance monitoring system. PROFIT expanded the causal models developed in conjunction with the PSD IAI team into a series of causal models with associated performance indicators for each of its program activities. Through the process of integrating implementation and monitoring components, PROFIT identified a wider range of indicators that it now evaluates on a monthly basis through field staff reports.

PROFIT continues the process it started with the PSD IAI team by continuing to refine and adapt its causal models. The PROFIT case study will be examined in greater detail in a forthcoming Primer Series paper on performance monitoring systems.

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