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RESEARCH PROGRAM ON Dryland Systems

CGIAR

Methodology note: Influence diagrams

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Contents

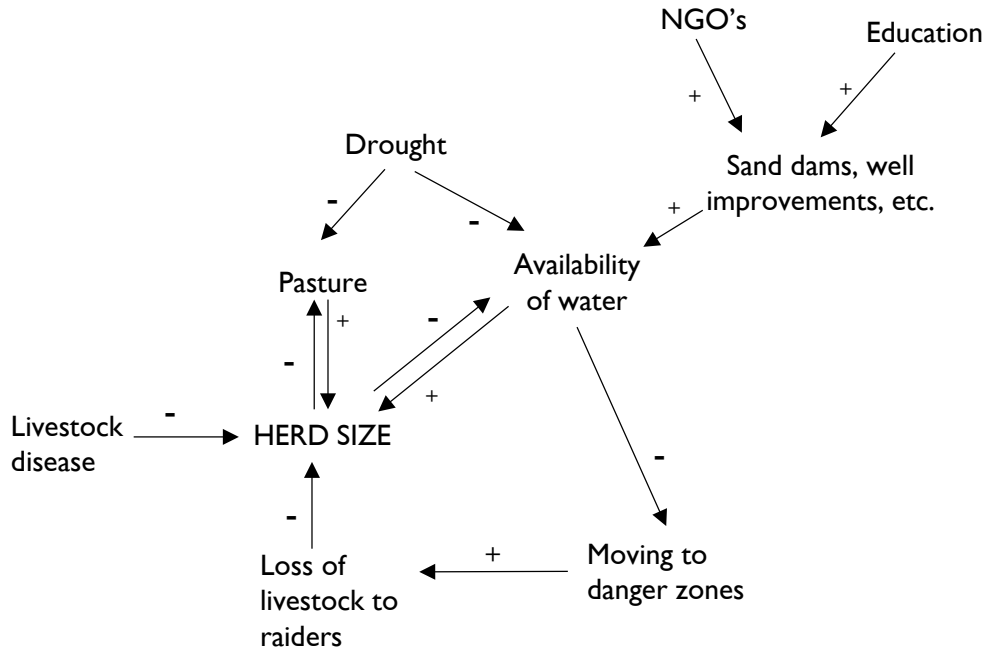
Aim

The influence diagram is a qualitative tool used for systems analysis and synthesis (Bodily 1985; Waltner-Toews et al. 2003; Gitau 2004; Robinson and Berkes 2010). It is particularly useful for synthesizing diverse knowledge into a cross-cutting, synthetic, shared understanding, including:

- Synthesising knowledge from across disciplines and sectors
- Synthesising knowledge from different sources—scientific, experiential, and traditional.

When done in a participatory or collaborative research mode—that is, in situations where stakeholders other than researchers, especially 'beneficiaries', have meaningful input into research design and share in making decisions about that research—then influence diagrams can also help to validate findings and create a shared understanding about the research project and the systems and people who are the subjects of the research. One or more influence diagrams can serve as a 'boundary object', revisited and updated throughout the project as an aid to ongoing communication and planning.

Figure.1: Influence diagram produced by a focus group of pastoralist elders, northern Kenya.



Source: Robinson and Berkes (2010)

Influence diagrams do these things through a visual representation of specific causal relationships in a system. As such they are useful for highlighting:

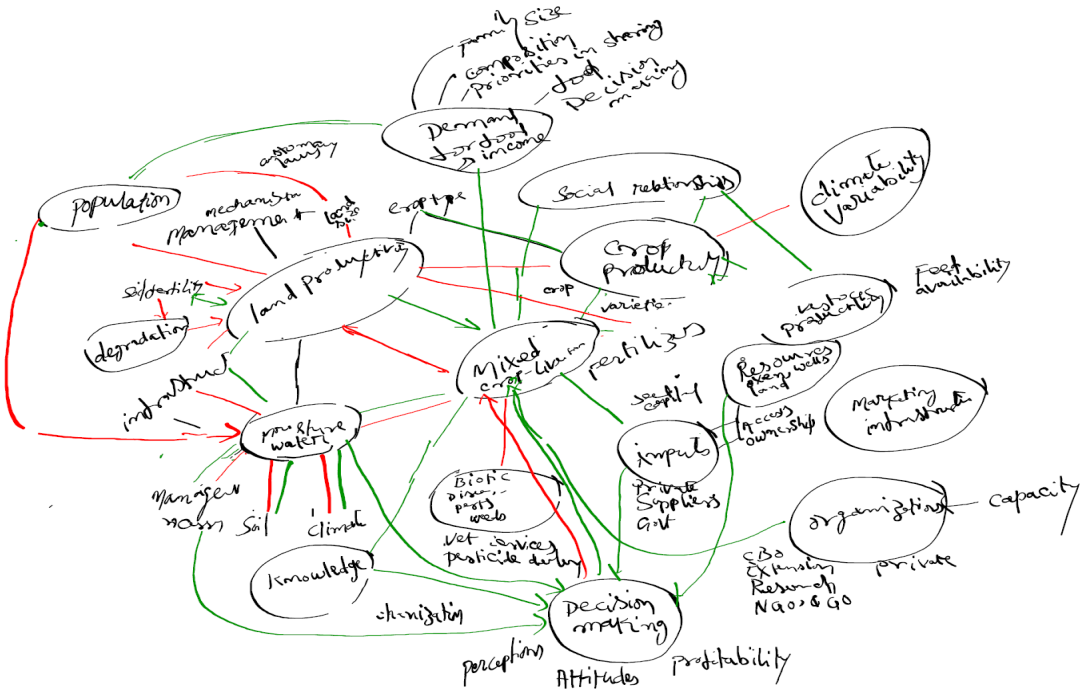
- positive and negative feedbacks
- vicious and virtuous circles
- key bottlenecks and leverage points
- Areas of uncertainty around causal relationships.

Procedure

Overview

An influence diagram is diagram made up of nodes and links, where the nodes are phenomena and the links are causal relationships. Typically the links are differentiated as contributory ('A' helps to cause 'B') or inhibitory ('A' helps to inhibit 'B'). While an individual researcher might want to create an influence diagram, the procedure described here assumes that it is being done by a group of people typically involving both researchers and other stakeholders.

Figure 2: Influence diagram produced by a group of scientists and other stakeholder in Ethiopia.



Source: Dryland System IRT meeting notes 2015

Medium

The influence diagram can be produced on flipchart paper (usually with two or more 'A0' flip chart pages taped together). Alternatively, it can be drawn on the ground in the style of participatory rural appraisal by scratching lines and symbols into the dirt and by using physical objects as symbols. Electronic whiteboards ('smartboards') can be used if the facilitator is very conversant with the software being used. There are also software programs that can make the job easier, whether using a smartboard or just a computer with large conventional monitor[1]. However, a large conventional whiteboard (or a chalkboard) is ideal, as it allows for easily making changes as the activity progresses.

Before the exercise: Establish the focus

Although influence diagrams aim at contributing to a broad, synthetic understanding that extends beyond typical silos of sectors, disciplines and levels, it is nevertheless helpful to set a specific initial focus for this kind of systems analysis. Typically, you will have some idea of what you intend to research and work on, and this helps to determine the initial focus for the analysis. Usually, this is decided by the researcher/facilitator before the activity.

This initial focus becomes the phenomenon that is placed at the centre of the diagram. 'Poverty', for instance is much too broad. 'Rural livelihoods' is better but may still be too broad. Better may be something like 'income from agricultural production'. In a pastoralist setting, for example, 'herd size' might sometimes be an appropriate starting point.

The initial focus should also be bounded by a geographic space, and often also by a particular population within that space: e.g., 'smallholder households in rural parts of district X'. It is not necessary to write the entire description of the scoping for the first node in the diagram, as long as all participants are clear on the focus. For instance, if the focus is 'income from agricultural production', then all participants should be clear that this refers to 'income from agricultural production for smallholder households in rural parts of district X'.

This initial focus does not prevent the analysis from identifying causal factors beyond the geographic space, beyond the target population, and beyond the initial sector implied by the focal node. As the analysis proceeds, participants may identify causal factors originating in other places, from other livelihood groups or other stakeholders, etc. This, in fact, is the purpose of the influence diagram—it helps to identify and visualize the complex web of causality that we need to be aware of.

Write the focus phenomenon at the centre of the diagram.

Step one: Explain the exercise

This can include giving a summary of the process and showing to participants some examples of influence diagrams.

Step two: Brainstorm casual influences (start the diagram)

The facilitator should ask questions such as the following:

- What factors influence this? What causes it to increase/improve? What causes it to decrease/decline?
- Are there factors that we don't see now which could influence it?

1 E.g., yEd Graph Editor is a program that is available for free download: www.yWorks.com

Often, initial answers to such questions contain a number of hidden assumptions, or identify causal influences that are two, three or more steps removed from the effect. In such cases, the facilitator should ask questions such as:

- *How* does B cause A?
- Does B *always* cause A?
- Are there *other* factors that help B to cause A?
- X is at a very low level in the system. Why is that?
- Y is very prominent/abundant in the system. What causes that?

Rather than immediately starting to draw the diagram, have participants brainstorm a few causal influences within the system and try to tease out details with questions such as these before starting the diagram. Then, once there are ideas about a few elements to include, proceed from the centre outwards. Each cause is linked to its effect with an arrow pointing to the effect. Please note: While it can be helpful to brainstorm a few of the causal influences before starting to add them to the diagram, what tends to *not* work very well is first coming up with a long, exhaustive list of causal factors before starting to make the diagram—this approach usually steers the participants away from using a systems perspective.

Step three: Identify the causes of the causes (*expand the diagram*)

Continue by 'stepping further out' in the diagram. Having identified, for example, that A is caused by B, C, and D, then ask similar questions about what causes each of these. Ask participants to add these second order causes to the diagram.

Step four: Identify lateral causes and feedbacks (*add complexity to the diagram*)

At this point, the analysis is probably still quite linear. Participants may have identified a few causal chains leading to the focal phenomenon; now they need to identify causal links between the different chains. There may also be feedback loops.

This is also the time to 'move forward' from the focal phenomenon. In other words, participants have identified causes of the focal phenomenon; now they need to also consider its effects. By the end, the diagram will typically be very messy and complex—this is not a problem but is to be expected (see the example in Figure. 2 above).

Ask questions such as:

- We seem to have two or three clusters/chains of causal relationships. Are there other causal linkages between these different clusters/chains?
- We identified X as a cause of Y. But does X have any other impacts?
- We have identified various factors affecting X. But when X increases, what are the effects of that?

Identify lateral causes and feedbacks

Move from this *to this*

Step five: Interrogating the diagram

The power of using influence diagrams comes from how it is used to inform planning and research. There are many possible questions which participants might be asked to consider:

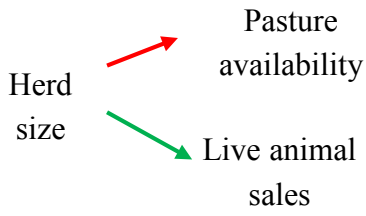
- Are there any vicious circles in this system?
- Are there any virtuous circles?
- What nodes seem to be the most influential (have the largest and most important arrows going into them and coming out of them)?
- Does this analysis suggest any key leverage points?
- What interventions—social, technological, economic, etc.—could influence this system? What factors might limit or undermine the positive impact of intervention X?
- Are there some causal relationships which we are not very sure about? Causal relationships that are just hypotheses?
- We have been considering a project that will influence this part of the system (indicating some particular part of the diagram). What factors are important for enabling this? What are other factors that might contribute to the goal? Are we addressing those other factors?
- Are there any key bottlenecks or constraints in the system—factors that if we could change them, we could change almost everything about the system?
- What might be done to improve the livelihood situation described by this diagram?
- What might be done to break the vicious circle(s) that we identified? To enhance the virtuous circles?

Discussion of these kinds of questions may also lead to identifying additional elements that need to be added to the diagram.

Guidelines

Optional: Differentiate contributory and inhibitory relationships

For a deeper understanding of the complexity of the system, it can be helpful to distinguish contributory and inhibitory causal relationships. Classically, this is done using a plus or minus symbol (+ or -) beside the arrow. However, using two different colour arrows tends to be more easily understood by participants: green or blue for contributory relationships, red for inhibitory relationships.



Contributory and inhibitory relationships
Causal factors can be contributory or inhibitory. For instance an overall increase in people's herd sizes can result in an overall decline in the availability of pasture resources (inhibitory) and an increase in live animals sales (contributory). Differentiate the two types of causal relationships with two different color arrows.

Other guidelines:

- Encourage participants to make the nodes (the phenomena) in the diagram as specific as possible.
- Start adding nodes and links to the diagram early in the process. Avoid using an approach in which first participates make a long list of causal factors, and only after doing this start adding them to the diagram.
- External drivers (factors, such as climate change, that will receive little to no influence from the local system) can be placed near the outer edge of the diagram.
- Encourage participants to not oversimplify causal relationships. If D causes A by causing C which causes B which causes A, then don't indicate D→A, but rather D→C→B→A.
- Avoid including phenomena which actually represent a lack of something. For instance, rather than have a node for 'lack of cash income', instead the node should be 'cash income'. If lack of cash income leads to low investment in farm inputs, then this would be shown in the diagram as a contributory relationship like this:

In this example, even if cash income and investment in farm inputs are both at a very low state in the system, the diagram shows how an increase in cash income could contribute to an increase in investments in inputs. Further analysis would help to identify what factors in the system are keeping cash income low.

Documentation

Both the influence diagram itself and the discussions that go on during the activity should be documented. This may involve producing a 'leaned up' version of the diagram using some computer software[2]. In doing so, the physical placing of different nodes within the diagram can be moved in order to make it easier to understand especially by reducing the number of instances of arrows crossing over other arrows.

However, if there are subsequent workshops or other meetings with the same participants, a cleaned up version of the diagram may not be easily recognizable to them. Instead, it may be better to work with the version of the diagram that they actually helped to create. If the original diagram was done on flip chart paper or an electronic whiteboard, therefore, the original version should be kept.

2 This can be done for example in Microsoft Word using the Insert→Shapes function. However, certain computer programs can make the task much easier. One example is yEd Graph Editor.

How to use influence diagrams

Influence diagrams are useful for producing, visualizing and documenting a shared mental model of a system. For researchers, they can help to guide research, highlight hypotheses that need investigation, and identify knowledge gaps. Although the influence diagram is a qualitative tool, it can feed into quantitative analyses and modelling by making explicit the causal relationships in a system.

For other stakeholders, it can help to clarify points of uncertainty; to identify potential impacts, both direct and indirect, of different interventions; provide a preview of challenges that might be faced by different development strategies; and otherwise aid in a more analytical approach to planning.

Influence diagrams, it must also be noted, are one way, and only way, of mapping a complex system. They become more powerful when combined with other methods.

When a variety of different kinds of stakeholders are collaborating, the ideal approach would be to have different stakeholder groups each produce their own influence diagrams, and to then meet to compare and contrast the different analyses and perhaps then produce a common, synthesised version of the influence diagram. This approach will help ensure that different perspectives and different knowledge from different stakeholders are not lost, while still allowing for the deeper understanding that comes from combining different knowledge and perspectives.

When engagement with a variety of stakeholders is to be ongoing over a long time period, it can be helpful to return to the influence diagram from time to time, re-confirming its analysis and assumptions, and revising and updating it as new knowledge is gained.

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