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THEMATIC BRIEF #2

Strengthening the capacity of multi-stakeholder partnerships in ARD

Systems thinking and ARD partnerships

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building trust
in value chains

Complexity and ARD partnerships

The nature of the issues around which Agricultural Research for Development (ARD) partnerships are formed requires a different way of conceptualizing and thinking to that commonly found in many agricultural professionals. In general, three types of unsatisfactory situations, which each implies different approaches, can be distinguished:

- **A "simple problem",** where there are generally few people involved, few complicating factors; and where there is general agreement about what is wrong and what constitutes a "solution". An example is a flat tyre on a car.

- **A "complicated problem",** where there is still a clear and agreed objective, but which can involve a lot of people or related actions to solve. An example is the construction of a rocket to go to the moon. Having successfully done it once, the process can usually be repeated in a similar way (albeit with continual improvements).

- **A "complex problem",** where most people agree that something is unsatisfactory in some way, but there is little agreement as to exactly what needs to be done, or even what would constitute an improvement. The coordinated actions of several different people or groups of people, often over a longer timescale, are needed to make significant and lasting improvements to the situation. Even then, there is little guarantee that the same issue tackled in the same way by a different set of actors would lead to the same outcome. An often-quoted example is bringing up a child – which is also reflected in the African proverb that "it takes a village to raise a child".

Complex thinking turned simple through short plays by women's groups in Uganda.

The management of natural resources and agriculture represents a complex human activity. In the mid-20th century, relatively simple technological solutions applied in a process which came to be called the "green revolution" were seen as the solution to food security and national development. But this proved more complex than assumed. In the 21st century, the 17 inter-related "Sustainable Development Goals" represent a far more complex array of interrelated concerns and actions.

Complexity results from different interests and perspectives of the situation by different actors involved. As ARD researchers and partners, we may think we know what the problem is, only to find out that others see the situation differently. They may see other related problems as more important or see our proposed solutions as unworkable. For example, as researchers we may think applying animal manure to the fields is a good idea to increase crop productivity and boost incomes, but the farmers may think differently if they see no assured market for their crop, or if they consider part time employment as labourers in a local town a better use of their time. Women and men may have different interests and needs, even within the same farm.

An initial stage in ARD is therefore the sorting out of the problem area and the objectives of the research. In practice, this means gathering information about how different stakeholders – people who have a stake or interest in the matter – see the problem situation.
It also means taking a wider look at the issues, the context within which our initially identified problem occurs. Gathering the diverse views of stakeholders and taking a wider look often then results in a redefinition of our "problem", opportunity, research question or area of interest. In this process, it is helpful to visualize or express this as a "system of interest".
An understanding of the concepts of systems and systems thinking can therefore help ARD partners better understand and visualize their partnership, its aims and activities, as well as their own roles within the system.

Systems

A system can be considered as:

- An arrangement of components or processes that interact in such a way that they act as a whole;
- Where the properties of the whole arise from the relationships between the component parts; and
- Something that has a purpose or is of interest to someone.

A car can be described as a system, made of lots of bits that function together. If we take out the engine, the car does not work, nor do the wheels alone get us where we want to go. A heap of spare parts is not a system, as they do not act together. Cars are of interest to us, because they can get us from place to place, and also because they can be fun to drive, or because they confer status. The purpose of a car therefore differs from person to person.

Natural systems, such as the "solar system" for example, may not have an obvious purpose. But once humans begin to modify or manage the system, it invariably becomes a "human activity system" and is given a "purpose" – even though different people might define that purpose in different ways. There are essentially no "natural systems" left on Earth: even remote areas such as the national parks of Africa or Antarctica, are now managed by humans and affected by human activity there and elsewhere in the world.

ARD partnerships are formed to improve a certain situation – which can be visualized as a system. An understanding of the concepts of systems and systems thinking can therefore help ARD partners better understand and visualize their partnership, its aims and activities, as well as their own roles within the system. A simplified representation of a "system" around a "complex" problem is shown in *Figure 1*: in this case the PAEPARD partnership formed around African Indigenous Vegetables in Uganda.

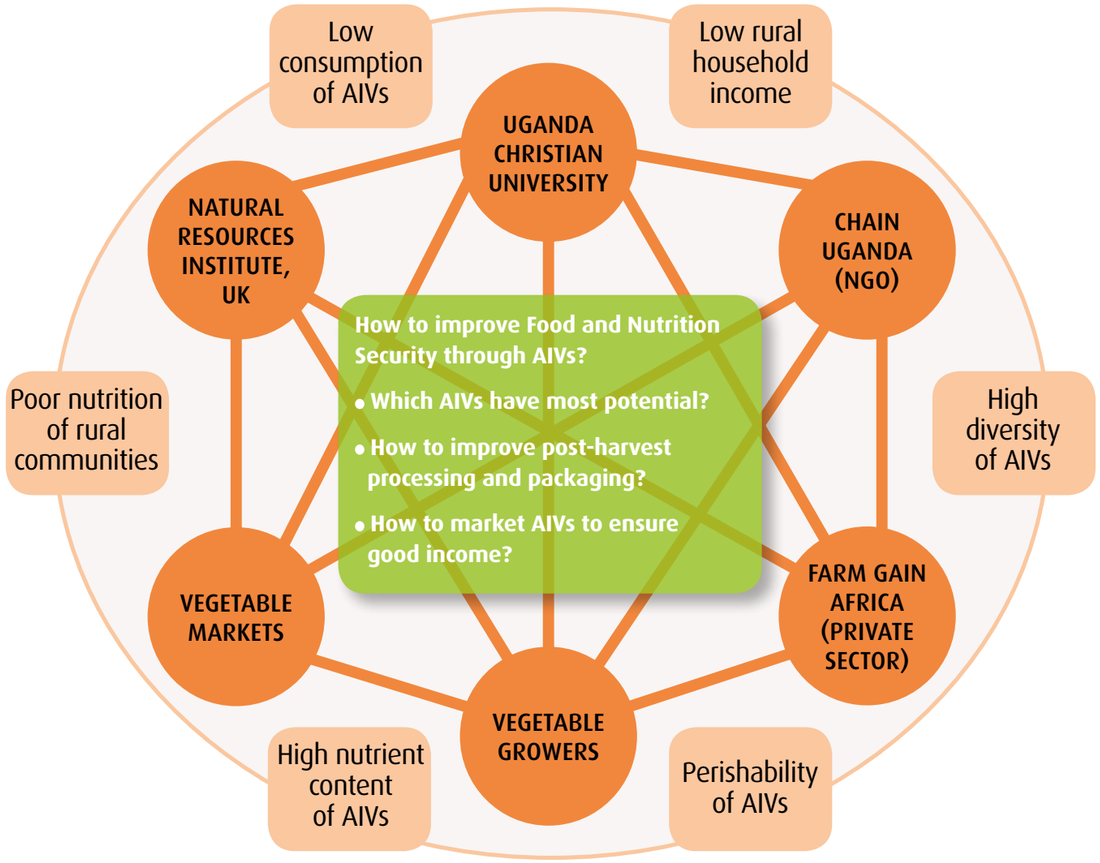

FIGURE 1. A system to improve nutrition and income through African Indigenous Vegetables (AIVs) in Uganda.

Systems properties

Properties of systems include:

- **Components and sub-systems**

The components of a system of interest to an ARD partnership consist of the actors (or stakeholders) within the system (see circles in *Figure 1,* for example), and the functions they have (which represent "sub-systems" within the larger system). The ARD partners themselves are therefore part of the system and can change the performance of the overall system (otherwise they would not be partners).

- **Purpose**

A system can only be defined by the purpose assigned to it by the stakeholders and actors within it. If different stakeholders have different interests and hence purposes, they are visualizing different systems, and their actions are likely to be uncoordinated or disjointed (in fact, a common situation). The purpose and nature of a system evolves, as new stakeholders, interests and concerns are brought on board, from a focus mainly on production to one also including marketing, for example.

- **Interaction and feedback**

The components and processes within a system interact. Changing one component causes a change in another, which may then "feed back" to affect the first. Feedback may be negative (compensatory/balancing) or positive (exaggerating/reinforcing). In complex systems, such feedback is not always predictable. Introducing insecticides to control pests can backfire if insect predators of these pests are also killed, or if the target pest develops resistance to the insecticide.

- **Boundaries/environment**

In ARD partnerships, the boundaries of what partners consider to be "the system of interest" is drawn around the factors they can change. External factors outside their immediate control, which can still affect the "system" are considered as the "environment". ARD partnerships need to consider which factors are likely to be critical to the success of their partnership, which partners are needed to achieve this, and hence where they draw the boundaries of their system. Typically, ARD partnerships increase the boundaries of their "system of interest" as they grow and evolve – progressively adding marketing or policy issues, to an initial focus on production, for example.

- **Hierarchies and scale**

Many ARD issues require linked actions at local level, national or even international level. Examples within PAEPARD partnerships include aflatoxin contamination in the groundnut and livestock value chains, the use of mango fruit by-products, and the development of Trichoderma soil amendments. In other words, the areas of action can be considered to cover a "hierarchy" of systems, consisting of interlinked "sub-systems" at these different levels.

- **Inputs and outputs**

Systems are regarded as a means of transforming inputs into outputs. Actors typically start with a focus on physical inputs (e.g. seed, fertilizer) or technical information. However, innovation often requires organizational and institutional change, to complement technical change. Farmers may not be able to source inputs or market products, if they are not organized into groups or cooperatives, or do not trust other actors in the value chain. Actions to build the functional capacity of actors in the system to trust and relate to each other, are therefore also critical inputs to the system.

- **Emergent properties**

The properties and performance of a system result from the interaction between its components

and are often difficult to predict by studying the components separately. The outcomes of an ARD partnership, may be difficult to predict from the actions of individual partners, or when planning activities at the outset of a project. ARD partnerships therefore need to be flexible and responsive to emerging outcomes, and establish procedures for reflection of ongoing experience, re-planning and reassessing expectations. More flexible and process-oriented methods such as "Theories of Change" and "Outcome Mapping" therefore offer advantages in ARD partnerships over more rigid methods such as "Logical Frameworks."

Systems thinking

Systems thinking, or "systemic" thinking, is thinking about the whole, and the relationship between the parts of the system instead of focusing on the parts themselves in isolation. It is "contextual" thinking - understanding the system within the circumstances and broader environment. This type of thinking is not easy or instinctive. The formal education and training of scientists and educators encourages "mechanistic", "reductionist" and systematic thinking, rather than systemic thinking. Smallholder farmers and business people, who balance many interrelated factors, resources and risks, are more likely to think in a systemic way.

Even within the world of systems thinking, there are significant differences. *Hard systems thinkers* assume systems exist objectively, have a clear purpose and well-defined boundaries. Their concern is mainly how to improve the efficiency of the system, by improving the components and/or the interaction between them. *Hard systems thinkers* experience biophysical but also social phenomena as constant, regular, recurring and predictable. Much of the thinking that goes into project planning follows a "hard systems" logic.

Soft systems thinkers, on the other hand, assume that systems are fuzzy: difficult to define, *dynamic,* chaotic, changing and unpredictable. They consider systems to be negotiable social constructs, only existing to the extent that people agree on their goals, boundaries, membership, and usefulness. They argue that problems occur when reductionist or hard systems thinking is applied to problem situations in which human perceptions and behaviour dominate, and where goals, objectives and even the interpretation of events are all contested by different actors in the system. Their focus is more on getting stakeholders to understand each other and agree on a joint vision of the "system" that needs improvement.

Agricultural innovation systems

The gradual change in different types of thinking from hard to soft systems described above has resulted in an evolution of research and innovation approaches. *Table 1* simplifies – and to a degree caricatures – these changes but illustrates how systems thinking has influenced the research and innovation agenda.

ARD partnerships increasingly focus on "agricultural innovation systems". These can be described as a network of actors (organizations and individuals) that interact within an environment of supporting institutions (regulations, policies, incentive mechanisms) to bring new products, processes and forms of organization into social and economic use (adapted from TAP, 2016).

TABLE 1. Approaches to agricultural research and innovation. (Source: Adapted from Tropical Agriculture Platform, 2016)

	TECHNOLOGY TRANSFER	FARMING SYSTEMS	INNOVATION SYSTEMS
Era	1960s onwards	1970s onwards	2000s onwards
Type of thinking	Reductionist	Hard systems	Soft systems
System of interest	Crop (field)	Farm	The "agricultural innovation system"
Purpose of the system of interest	Improve production technology of crops and livestock	Address farmer constraints and improve farm income	Improve capacity of system to innovate and improve value chain competitiveness
Outputs sought	Technical change	More efficient use of farm resources	Technical, organizational and institutional change
Main source of innovation	Researchers	Farmers and researchers	All actors in the value chain and related services
Role of farmer	Knowledge recipient	Knowledge source and recipient	Knowledge co-creator
Services required by system actors	Technical	Technical and organizational	Technical, financial, business, and organizational support services
Nature of capacity strengthening	Infrastructure & human resource development	Strengthening communication between research extension and farmers	Strengthening interactions between actors; institutional development and change, learning and innovation; creating an enabling environment

This means that ARD partnerships, in practice, need to follow "soft systems" type thinking, and be prepared to struggle to define their systems of interest, objectives and partners.

Systems tools for ARD partnerships

A number of tools can help ARD partnerships identify issues of concern, explore the diversity of views, converge on shared visions of desirable future situations, and hence define the focus of ARD partnerships and projects.

• Systems diagrams

Many people find images easier to understand and remember than text (they are "visualizers" rather than "verbalizers"). Diagrams show relationships or linkages between different concepts or variables more clearly and immediately than is possible with text. Among groups, drawing diagrams stimulates thinking about a situation, aids analysis and the communication of ideas, promotes a common understanding of a situation and helps "visioning" alternative futures. The process is often more important than the final drawing. Types of diagrams useful to ARD partnerships for analysing systems include:

"Concept maps" (also known as "mind maps", spray or spider diagrams), which simply link ideas and structure thoughts around a central theme.

"Stakeholder maps" or **"netmaps",** which identify stakeholders/interest groups in a certain situation, and can show their relationships (e.g. strength of collaboration);

"Rich pictures", which can depict the main actors, their perspectives, interests and concerns (such diagrams are often not very structured - the idea is to capture the "rich" diversity, rather than clarify, define, analyse).

"Systems of interest" (or "flow diagrams"), which do attempt to show structure - the actors within a system and the interactions between them (e.g. flows of information, products), the "boundaries" of the system (according to the partners), and the "external" forces which influence the system.

"Value chain diagrams", similar to flow diagrams, which show the actors in the direct commercial value chain (input dealers, producers, traders, processors, wholesale and retail markets, consumers), and the value added at each step. Value chain diagrams can also be expanded to show the services needed by these private sector actors and the main policies/regulations which affect them.

"Problem trees" or **"problem-causal diagrams",** which link problems or causes to "get to the root of the problem". Such diagrams can follow a "hierarchical" logic (with the "central problem" depicted at the top, and "contributory problems" branching out below like tree roots, or they can be less structured to show feedback loops, etc.

"Trend lines", which show on a timeline the main events (good and bad) which have led to a current situation. A variant on this idea is to "map the future backwards", by identifying the desired and undesired future situations, and then the actions needed to assure – or avoid – these situations.

"Theory of change" (ToC) diagrams, which show, and link expected changes to the actions that

Complex thinking through concepts and illustrations during a PAEPARD-NWO joint workshop in Uganda.

ARD partners (propose to) undertake. A good ToC diagram also shows key assumptions and external factors that underpin the actions proposed/undertaken.

In practice, all these diagram types can be deceptively difficult to do well, and/or take more time than expected. When done by one or two stakeholders as a tool to communicate to an external audience (e.g. in a publication), they may be detailed but convey only one perspective. When used as a tool for ARD partners to analyse and learn together, the purpose needs to be clear to all partners (e.g. through giving the diagram a precise title before beginning to draw), and the process needs careful facilitation to stay on track and avoid domination by one or few dominant actors in the partnership.

• Systems matrices

Systems matrices simply organize information in tabular or matrix form. They are useful to compare, contrast and structure in a hierarchal way, rather than explore more complex relationships between several actors or processes. Typical matrices used include:

"Stakeholder matrices", which can list the different interest groups or stakeholders, their interests or perceptions of a given issue, their influence or importance (in achieving partnership objectives), their (organizational) objectives/mandates, their actual/potential roles in the ARD partnership, their information offer or need, the benefits they expect to see from a partnership, etc.

"SWOT" analysis, which lists, in a 2 x 2 table, the strengths, weaknesses, opportunities and threats faced by an organization or partnership. Generally speaking, the strengths and weaknesses represent factors internal to the organization or partnerships - which can be exploited or changed - and the opportunities and threats represent external factors - which should be exploited or avoided/mitigated.

"Logical frameworks" or **"logframes"**, which list the hierarchy of expected objectives of a (proposed) project, in terms such as goal, outcome (or purpose), outputs (or results, "deliverables"), activities, etc. Also listed are usually the assumptions that underpin this linear logic, and the indicators that will be used to show that these objectives have been met.

Project proposal formats typically requested by donors from ARD partnerships typically include a logical framework, which represents a systematic and hierarchical mode of thinking, rather than the systemic mode of thinking described above. The "logframe" should therefore be used as a final summary of project planning, rather than an exploratory or analytical tool.

Systems tools help explore partnership issues

Problem definition in PAEPARD partnerships

The different partners in an ARD partnership usually have differing levels of power and influence within the partnership, due to status as well as access to funding. PAEPARD was established to mitigate these differences of power, particularly between research organizations and research users (e.g. farmer organizations mainly), and between African and European partners. The project provided funding for potential ARD partners to come together and explore common areas of concern/opportunity, through "partnership inception workshops", and to develop these ideas into project proposals, through "project development writeshops".

During the partnership inception workshops, tools such as rich pictures, stakeholder diagrams and matrices, systems of interest and problem-casual diagrams were used to explore their common interests and develop joint objectives. During the proposal development writeshops, these ideas were further formalized through developing logical frameworks (as requested by the funding calls targeted). During later reflection of project lessons learned, both of these activities were seen as key to forming and consolidating the partnerships.

Once PAEPARD partnerships were formed, their "system of interest" changed as new partners – with new perspectives, interests and capabilities - were brought on board. In some cases, these new partners were invited or co-opted, recognising that new activities or skills (e.g. marketing, policy advocacy) were needed to achieve the overall objectives. In other cases, new partners were incorporated to respond to new funding opportunities, which often specified the type of issue that could receive funding, and types of actor (or nationality) that needed to comprise the project consortium in order to be eligible (see *Box 1* for a specific example of this from PAEPARD).

BOX 1

An evolving system of interest to mango value chain actors

THE EUROPE-AFRICA-CARIBBEAN-PACIFIC Liaison Committee (COLEACP) is a civil society organization established by stakeholders in the international fruit and vegetable trade in ACP countries to develop sustainable and competitive agribusiness. It identified mangoes made unmarketable by fruit flies in West Africa as a problem for the value chain. PAEPARD provided seed funding to bring interested partners together, conduct a desk review of the problem and facilitate multi-stakeholder workshops to explore the problem situation in more depth, identify researchable issues and prepare project proposals. Farmers and researchers had traditionally focused on fruit fly control, but the addition of partners from the private sector extended the "system of interest" to adding value to the fruit rejected for export. This expanded ARD partnership then identified 3 research themes, which can be said to represent three different "sub-systems of interest": a) a system to extract mango butter for the cosmetics industry without using petro-chemicals; b) a system to improve compost through village level bio-digesters, and c) a system to process mango waste into livestock feed. Each of these three themes required its own set of partners from both Africa and Europe, although some partners were represented in two or all three partnerships. As these opportunities are further explored with additional researchers and stakeholders, the themes – and hence "systems of interest" are likely to continue to evolve. Having a better understanding of these evolving systems helps to manage them better.

Adapted from "COLEACP users led process" PAEPARD, 2017.

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Executive summary

An understanding of systems thinking and tools for exploring systems helps Agricultural Research for Development (ARD) partnerships to achieve their goals. ARD partnerships are usually formed to address complex problems. They are "complex" because the stakeholders involved see the problem situation differently, and/or propose different solutions to improve the situation. Exploring this diversity of viewpoints, and then converging on a joint understanding of what partners can achieve together inevitably involves conceptualizing a common "system of interest" to the partners.

This brief explores the main concepts behind systems and shows how different ways of systems thinking lead to different types of research and development activity.
It then presents a number of tools commonly used to explore, visualize, analyse and summarize information and relationships relevant to ARD partnerships.

Finally, the brief reflects on how PAEPARD partnerships used some of these tools to explore their own "systems of interest". Using these more flexible systemic tools can help ARD partnerships get a better understanding of the complexities of their problem situation, leading to more effective results. While most financing sources demand the logframe, this tool is limited by its linear logic and is more useful as a project planning summary, and less as an exploratory or analytical tool.

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