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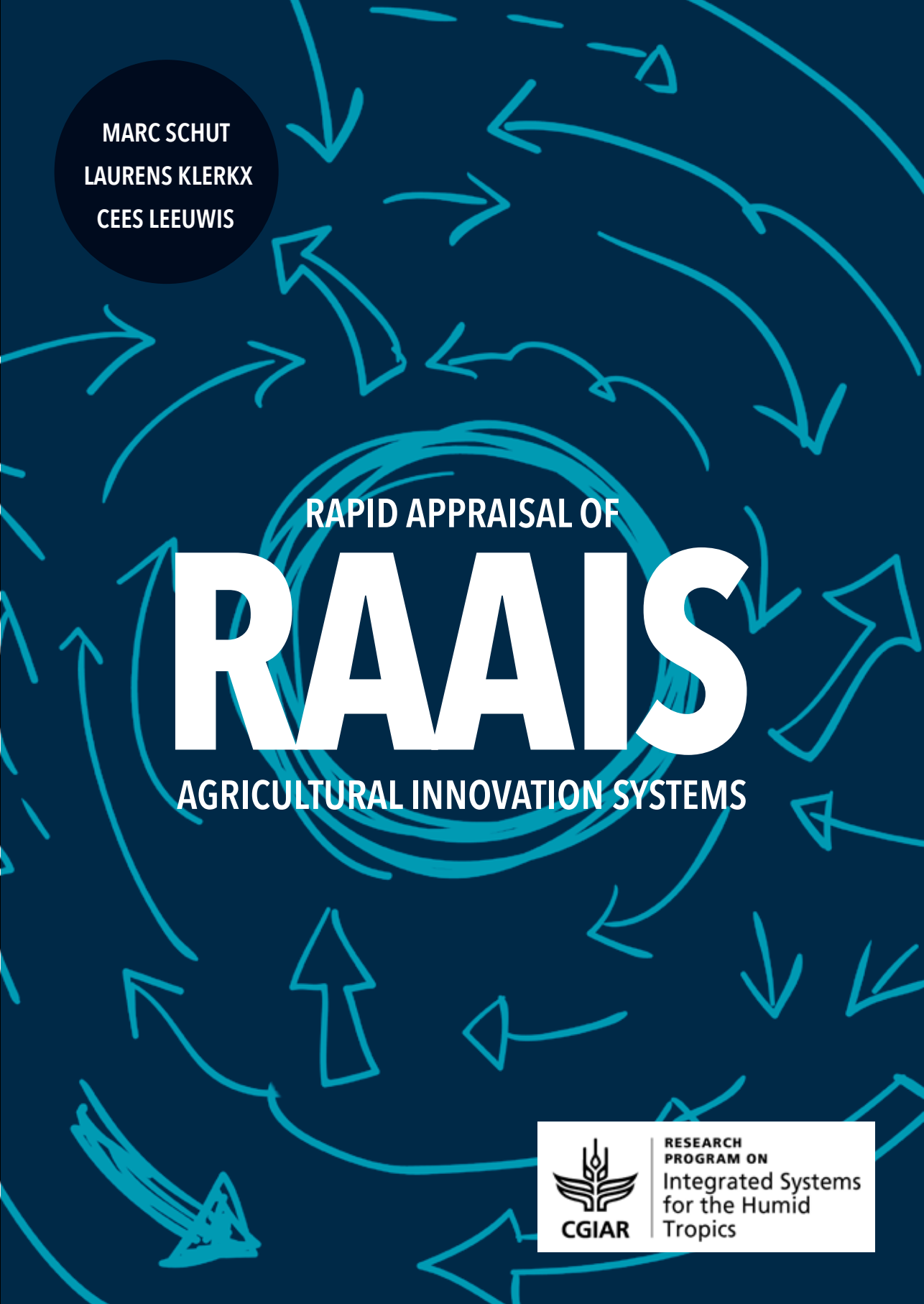
RAPID APPRAISAL OF RAIS

AGRICULTURAL INNOVATION SYSTEMS



CGIAR
RESEARCH PROGRAM ON
Integrated Systems for the Humid Tropics

RAAIS

Rapid Appraisal of Agricultural Innovation Systems

A toolkit for integrated analysis of complex agricultural problems and innovation capacity in agrifood systems

Marc Schut, Laurens Klerkx and Cees Leeuwis

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Foreword

While farm-level change remains an important dimension of agricultural innovation and development, it is widely acknowledged that farmers cannot change if others do not simultaneously change. Sustainable intensification may, for example, require innovation in the sphere of land-tenure contracts, pricing systems, credit arrangements, food processing, extension policy and/or the organization of trade. Thus, agricultural innovation is a multi-stakeholder affair, and requires a degree of concerted action in a network of interdependent actors, based on mutual expectations and some level of agreement on how to move forward. This has been recognized in the now increasingly used 'Agricultural Innovation Systems' framework.

Making Agricultural Innovation Systems work is easier said than done! In fact, it is far from easy to make stakeholders interact with each other in a productive way, and arrive at a common agenda for further investigation and action. Building on a large experience in innovation support methodologies, this 'toolkit' has been developed to help foster conducive interaction. Rapid Appraisal of Agricultural Innovation Systems (RAAIS) provides methods and frameworks for collaborative analysis of complex innovation challenges. It helps stakeholders and researchers to understand interdependencies, to take into account different levels and spheres of action, to balance technological and institutional innovation, and to identify concrete entry points for collaborative action and further research.

Many of the methods and tools make use of visual diagramming to help focus attention and to capture and store information. Most importantly, such tools are known to be a powerful way of getting stakeholders to talk about their perspectives and realities, and to evoke discussions and dialogues among them. Such exchanges are invaluable for any attempt to foster mutual understanding, creativity and agreement on ways to move forward.

We hope that researchers, development practitioner and other stakeholders in the agricultural research for development landscape will find it in-

spiring and useful to draw upon the frameworks and methods provided in this toolkit. We encourage them not to use the various building blocks as a blueprint, but rather to adapt them to the specific context at hand. We hope to learn along with you, so please share your amendments and experiences with us!

Cees Leeuwis

Professor of Knowledge, Technology and Innovation, Wageningen University

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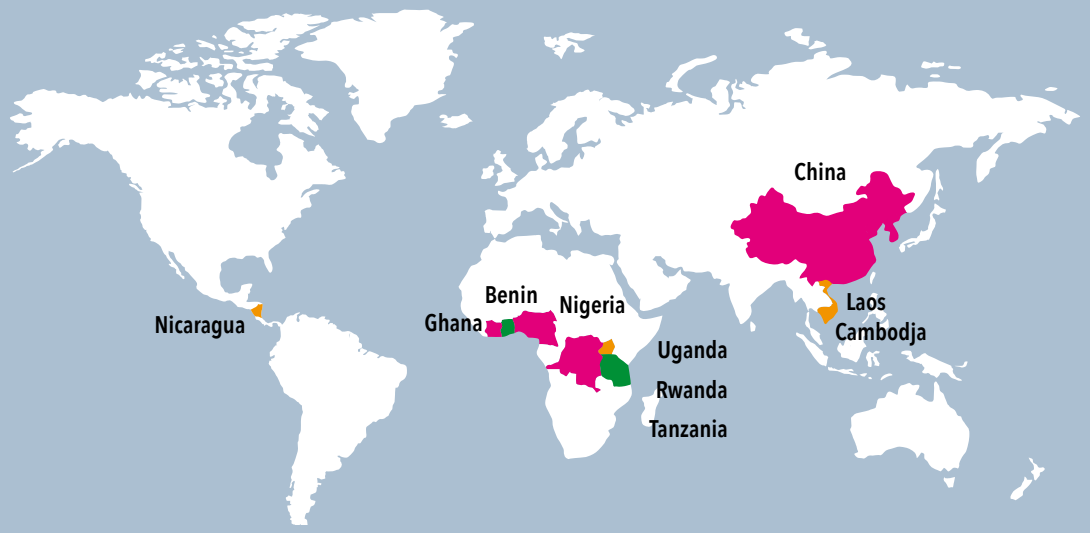
1

Introduction

FIGURE 1 World map with countries where RAAIS has been used.



- PARASITE program (Tanzania and Benin)
- Humidtropics (Ghana, Nigeria, Cameroon, DR Congo, Burundi, Rwanda and China)
- Other projects (Nicaragua, Uganda, Burundi, DR Congo, Laos, Cambodia and Vietnam)

'RAAIS is an easy way to make people do a difficult job'

This was how a RAAIS (Rapid Appraisal of Agricultural Innovation Systems) workshop participant in Nigeria described his experience. It reflects the objective that we had in mind when developing RAAIS. We wanted to develop a simple, participatory, diagnostic tool for integrated systems analysis of agricultural problems.

RAAIS facilitates the analysis of (1) interactions between different dimensions, levels and stakeholder dynamics of complex agricultural problems, (2) innovation capacity in agrifood systems and (3) the existence and performance of the agricultural innovation system. RAAIS can thereby provide specific Entry Points for innovation to address concrete problems experienced by farmers and other agripreneurs in a specific locality, but it can also provide more generic Entry Points for innovation to address constraints faced by policymakers and other scaling actors at higher levels. RAAIS is a tool that can facilitate going from a broad Entry Theme (see Table 1 and Section 4.3) towards more specific Entry Points for productivity, natural resource management (NRM) and institutional innovation (see Photo 1).

PHOTO 1 RAAIS workshop participants in Burundi identify relations between constraints and challenges for crop-livestock integration faced by different stakeholder groups. PHOTO: M. SCHUT

1.1 What is RAAIS?

RAAIS is a multi-method tool that combines qualitative and quantitative data collection and analysis techniques. This allows for critical triangulation and validation of data with different groups of stakeholders (e.g. farmers, NGOs/civil society, the private sector, government and researchers). RAAIS facilitates interaction between stakeholders in collecting and analysing data. This provides a basis for increasing awareness that addressing these problems requires collective action.

1.2 Where has RAAIS been used?

RAAIS was developed and tested under the PARASITE program to identify and analyse opportunities for dealing with parasitic weeds in rain-fed rice production in Tanzania and Benin. RAAIS was further developed and modified for usage in the CGIAR Research Program on Integrated Systems for the Humid Topics (Humidtropics). Workshops for identification of Entry Themes for innovation to support sustainable intensification of agrifood systems were implemented across study sites in Burundi, Rwanda, Democratic Republic of Congo, Nigeria, Cameroun, Ghana and China. Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) and the International Institute of Tropical Agriculture (IITA) used RAAIS to identify bottlenecks for improved banana systems in Burundi and for fertiliser use in Uganda. Wageningen University in collaboration with the International Center for Tropical Agriculture (CIAT), Bioversity International and the World Agroforestry Centre (ICRAF) have used elements of the RAAIS workshops in their work on responsible scaling of innovation in Nicaragua (scaling up agroecology in mixed crop-livestock systems), Central Africa (adoption of Banana Xanthomonas Wilt (BXW) control methods), China (sustainable rubber production) and the Central Mekong (responsible scaling of improved forage systems among smallholders) (Table 1 and Figure 1)

1.3 What can the reader find in this toolkit?

Section 2 provides a light theoretical background on agricultural innovation systems and reflects on the added value of RAAIS as compared to existing innovation systems tools and methods. Section 3 defines three of RAAIS' conceptual pillars and their interactions: (1) complex agricultural problems, (2) innovation capacity in the agrifood system and (3) the agricultural innovation system. Section 4 provides the methodological framework for RAAIS, including data collection methods and a short introduction to the proposed methods: interviews, surveys, workshops and secondary data analysis. The analytical framework for RAAIS is provided in Section 5. Section 6 provides the RAAIS workshop materials and facilitation protocol, the guide for note-taking, the RAAIS workshop analysis templates and an example of a RAAIS post-workshop questionnaire. How RAAIS can be used as a baseline for reflective monitoring and evaluation (M&E) is described in Section 7. In Section 8, we reflect on the initial testing of RAAIS and how lessons learned were incorporated to further strengthen it. Section 9 provides reference materials, including scientific papers, reports, and blog-posts and media. Where possible, we have used photographs and video clips to give the reader a better idea of how RAAIS is implemented.

1.4 More information?

Much of the information provided in this toolkit originates from a research paper by Schut et al. (2015a) entitled 'RAAIS: Rapid Appraisal of Agricultural Innovation Systems (Part I). A diagnostic tool for integrated analysis of complex problems and innovation capacity.' The paper was published in Agricultural Systems (Vol. 132, 1-11) and is accessible through open access: www.sciencedirect.com/science/article/pii/S0308521X14001115

TABLE 1 Countries where RAAIS or elements of RAAIS have been used under different projects and programs.

Country	Project/program	Entry Theme
Nicaragua	Humidtropics	Scaling up agro-ecology in mixed crop-livestock systems
Ghana	Humidtropics	Sustainable intensification and diversification of cocoa-based farming systems in Ashanti Region
Benin	PARASITE program	Parasitic weeds in rain-fed rice production
Nigeria	Humidtropics	Improvement (intensification and diversification) of integrated tree crop systems
Cameroon	Humidtropics	Improvement (intensification and diversification) of integrated tree crop systems
Uganda	PASIC	Identification of value-chain constraints for fertiliser adoption among Irish potato farmers
Tanzania	PARASITE program	Parasitic weeds in rain-fed rice production
Rwanda	Humidtropics	• Crop (potato)-tree-livestock integration (highlands) • Maize/banana-legume-livestock integration (lowland)
DR Congo	Humidtropics	• Improvement of banana-beans systems through livestock integration • Improvement of cassava-legume systems through livestock integration
Uganda and DR Congo	Humidtropics	Adoption of BXW control methods
China	Humidtropics	• What are the key challenges in relation to having a more diversified rubber sector? • Responsible scaling of sustainable ('green') rubber production systems
Laos, Cambodia and Vietnam	Humidtropics	Responsible scaling of improved forage systems among smallholders
Burundi	Humidtropics	• Introduction, evaluation and dissemination of improved varieties (e.g. high yield, nutritious, pest and disease resistant) adapted to farmer production systems and improving market value • Integration of agroforestry and livestock into farming systems for sustainable intensification and improving agro-ecological integrity • Improvement of natural resource management and soil fertility through the introduction, evaluation and dissemination of innovative technologies • Provision of innovative solutions for farmers' access to financial services and credits to intensify production and increase market opportunities
Burundi	GIZ-IITA project	Sustainable intensification of banana systems in rural Bujumbura, Burundi

2

Agricultural innovation systems

The agricultural innovation system (AIS) approach has become increasingly popular as a framework to analyse, and to deal with, complex agricultural problems (e.g. Hall et al., 2003; World Bank, 2006). The AIS approach evolved from a transition from technology-oriented approaches to agricultural innovation, to more systems-oriented approaches to agricultural innovation (e.g. Klerkx et al., 2012a). Within the AIS approach, innovation is perceived as a process of combined technological (e.g. cultivars, fertiliser, agronomic practices) and non-technological (e.g. social practices such as labour organisation or institutional settings such as land-tenure arrangements) changes (Hounkonnou et al., 2012; Leeuwis, 2004). Such changes occur across different levels (e.g. field, farm, region) and are shaped by interactions between stakeholders and organisations inside and outside the agricultural sector (Kilelu et al., 2013; Klerkx et al., 2010).

Despite the recent development and application of a variety of methods that can support AIS analyses (e.g. World Bank, 2012), the potential of the AIS approach to structurally address complex agricultural problems remains underutilised in many fields of study (e.g. Schut et al., 2014a). Four main reasons for this have been identified.

Methods used for the analysis of complex agricultural problems generally have a narrow, rather than a holistic, focus. They support the analysis of a specific dimension (e.g. the economic dimension in Beintema et al., 2012), level (e.g. the national level in Temel et al., 2003) or stakeholder group (e.g. farmers in Amankwah et al., 2012; Totin et al., 2012).

Studies that do include analysis of multiple dimensions of problems (e.g. Singh et al., 2009), interactions across different levels (e.g. Douthwaite et al., 2003) or multi-stakeholder dynamics (e.g. Hermans et al., 2013) often give limited attention to the integrated analysis of these features of complex agricultural problems.

Approaches that integrate the analysis of multiple dimensions of problems, interactions across different levels and multi-stakeholder dynamics (e.g. Lundy et al., 2005; van Ittersum et al., 2008) give limited attention to understanding innovation capacity in the agrifood system and the functioning of the agricultural innovation system.

PHOTO 2 Humidtropics Burundi Facilitator Cyrille Hicintuka inspecting piglets in Gitega.
PHOTO: D. LAMERS

The majority of AIS studies are conducted ex-post (e.g. Basu and Leeuwis, 2012), lack a clear structure to delineate systems' boundaries (Klerkx et al., 2012b), or are based on comprehensive studies which take considerable time (e.g. Jiggins, 2012). Although such studies provide a better understanding of the drivers of innovation in agrifood systems, their diagnostic ability to identify Entry Points for innovation is limited.

On the basis of the above review of the availability, scope and use of methods for AIS analyses, we have developed and tested a diagnostic tool that can support the Rapid Appraisal of Agricultural Innovation Systems (RAAIS). RAAIS fits within a tradition of rapid appraisal approaches used in the field of agriculture, including the Rapid Appraisal of Agricultural Knowledge Systems (RAAKS: Engel, 1995). RAAIS integrates and builds upon existing (agricultural) innovation system concepts and combines multiple methods of data collection.

The objective of RAAIS is to provide a coherent set of (1) specific Entry Points for innovation to address complex agricultural problems and (2) generic Entry Points that can enhance innovation capacity in agrifood system and the performance of the agricultural innovation system. Identifying both specific and generic Entry Points for innovation enhances the likelihood of complex agricultural problems being addressed in an effective and durable manner.

Photo 2 shows the Burundi Humidtropics Action Site Facilitator inspecting piglets in Gitega. Introduction of the piglets was identified during RAAIS as a specific Entry Point for innovation to address problems relating to declining soil fertility. Such interventions need to be complemented by more generic innovations that, for instance, enhance access to high quality inputs for farmers, and improve knowledge and education on integrated soil fertility management.

3

Conceptual underpinnings

3.1 Complex agricultural problems

Complex agricultural problems are defined as problems (1) that have multiple dimensions (Schut et al., 2014b), (2) that are embedded in interactions across different levels (Giller et al., 2008) and (3) where a multiplicity of actors and stakeholders are involved (Funtowicz and Ravetz, 1993).

Regarding the first, complex agricultural problems arise from an interplay of biophysical, technological, socio-cultural, economic, institutional and political dimensions. To exemplify this, we use a case by Sims et al. (2012), who analyse constraints for the upscaling of conservation agriculture in sub-Saharan Africa. They demonstrate how import taxes on steel, but not on imported agricultural machinery (institutional dimension), disadvantage manufacturers in the development of locally adapted agricultural equipment such as no-till planters (technological dimension) for effective soil conservation for sustainable crop management (biophysical dimension).

Concerning the second, the dimensions of complex agricultural problems often have different implications across different levels. Mitigating the impact of agro-industrial biofuel production on food security, for instance, will require different strategies when approached at the national level (e.g. policies avoiding agro-industrial biofuel production in regions where pressure on agricultural land is high) than when approached at the farm household level (e.g. balancing the allocation of household labour to on-farm crop production and off-farm biofuel plantation work) (Schut and Florin, 2015). Nevertheless, the different levels are interrelated, and, consequently, coherent multi-level strategies are required.

Regarding the third, complex agricultural problems are characterised by the involvement of a variety of actors, stakeholders and the organisations they represent (Hounkonnou et al., 2012; Ortiz et al., 2013). Actors include anyone who is related directly or indirectly to a problem, or to the potential solution to a problem. Stakeholders are those actors or actor groups with a vested interest in addressing the problem (McNie, 2007) and whose participation in exploring solutions is perceived as a critical success factor (e.g. Giller et al., 2011). Stakeholder participation can provide insights into the different dimensions of the problem and the types of solutions that are both technically feasible and socio-culturally and economically acceptable (Faysse, 2006).

PHOTO 3 Example of a banana palm suffering from Banana Xanthomonas Wilt (BXW).

PHOTO: B. VAN SCHAGEN

For example, Banana Xanthomonas Wilt (BXW) is a complex agricultural problem that is threatening the livelihoods of many farm households in East and Central Africa (see Photo 3). Elements from RAAIS were used to explore pathways towards responsible scaling of BXW control methods.

3.2 Innovation capacity in the agrifood system

The agrifood system is defined as the operational unit of agriculture including all actors and organisations at local, regional and national level involved in the production, processing and commercialisation of agricultural commodities (Spedding, 1988). Consequently, innovation capacity in the agrifood system is defined as the ability of these actors and organisations to develop new, and mobilise existing, competences (including knowledge, skills and experiences) to continuously identify and prioritise constraints and opportunities for innovation in a dynamic systems context (Leeuwis et al., 2014).

Following the typical system boundaries used in generic (i.e. non-agricultural) studies of innovation systems (Carlsson et al., 2002; Papaioannou et al., 2009; Wieczorek and Hekkert, 2012), we conceptualise the agrifood system as a combination of interrelated institutional, sectoral and technological subsystems. The institutional subsystem comprises different types of institutions, which are the formal and informal rules and structures that shape perspectives and practices (Leeuwis, 2004). We examine six types of institutions: policy, research, education and training, extension, markets and/or politics across different aggregation levels (e.g. national, regional or district) (e.g. Cooke et al., 1997; Freeman, 1988, 1995). The sectoral subsystem is defined around a commodity or segments of a value chain (e.g. rice or cocoa) (e.g. Blay-Palmer, 2005; Gildemacher et al., 2009). The analysis of the sectoral subsystem seeks to understand interactions between, for instance, access to credit, inputs and services, agricultural production, post-harvest activities, trade, marketing and consumption relating to the functioning of that value chain (e.g. Thitinunsomboon et al., 2008). Technological subsystems are defined around an existing or novel technology (e.g. irrigation, mechanised weeding) or field of knowledge (e.g. integrated pest management) to address a particular problem that may well cut across different sectoral subsystems (Carlsson and Stankiewicz, 1991; Chung, 2012; Hekkert et al., 2007).

3.3 The agricultural innovation system

The agricultural innovation system provides the structural conditions that can enable (when present) or constrain (when absent or malfunctioning) innovation within the agrifood system and its subsystems (Klein Woolthuis et al., 2005; van Mierlo et al., 2010; Wieczorek and Hekkert, 2012) (Table 2). Whether effective strategies to deal with complex agricultural problems will be identified depends to a large extent on the functioning of the agricultural innovation system.

Structural conditions include (1) adequate knowledge infrastructure in the form of research, education and extension, physical infrastructure and assets such as roads and vehicles, and functional communication and finance structures, (2) institutions comprising clear regulatory frameworks and their proper implementation and enforcement, (3) interaction and collaboration between multiple stakeholders in the agrifood system and (4) stakeholder capacities and adequate human and financial resources.

TABLE 2 Structural conditions that enable or constrain the functioning of innovation systems [a]

Structural conditions for innovation	Description
Infrastructure and assets	Knowledge, research and development infrastructure; physical infrastructure including roads, irrigation schemes and agricultural inputs distribution; communication and financial infrastructure
Institutions	Formal institutions including agricultural policies; laws; regulations; (food) quality standards; agricultural subsidies; monitoring and evaluation (M&E) structures; organisational mandates; market (access) and trade agreements; informal institutions such as socio-cultural norms and values
Interaction and collaboration	Multi-stakeholder interaction for learning and problem solving; development and sharing of knowledge and information; public-private partnerships; networks; representative bodies (e.g. farmers' association); power dynamics
Capabilities and resources	Agricultural entrepreneurship; labour qualifications; human resources (quality and quantity); education and literacy rates; financial resources (e.g. number of extension officers and funds to backstop farmers)

[a] Based on: (Klein Woolthuis et al., 2005; van Mierlo et al., 2010; Wieczorek and Hekkert, 2012)

Under Humidtropics, interaction and collaboration between local stakeholders were supported through the establishment of so-called innovation platforms (Photo 4).

3.4 Interactions between complex agricultural problems, innovation capacity in the agrifood system and the agricultural innovation system

The integrated analysis of complex agricultural problems, the innovation capacity of the agrifood system and the performance of the agricultural innovation system can provide a coherent set of specific and generic Entry Points for innovation.

- **Specific Entry Points** for innovations relate to those innovations that directly contribute to addressing the complex agricultural problem under study.
- **Generic Entry Points** for innovation relate to strengthening the innovation capacity of the agrifood system and the functioning of the agricultural innovation system.

For example, to reduce fruit waste in developing countries, existing technologies for conserving fruits can be adapted to fit the local context (specific Entry Point for innovation in the technological subsystem). This may trigger access to export markets (specific Entry Point for innovation in the sectoral subsystem) and require certification policies to supply such fruit export markets (specific Entry Point for innovation in the institutional subsystem). To support the development, implementation and enforcement of certification policies, the establishment of a national agricultural certification bureau may be required (generic Entry Point for innovation). The existence of such a bureau can provide an incentive for investing in the export of other agricultural produce, for instance, vegetables; this, in turn, can trigger the development or adaptation of conservation technologies to reduce vegetable waste.

The above example shows how structural adaptations of the agricultural innovation system can enhance innovation capacity to address the complex agricultural problem under review (fruit waste), but can also have a spill-over effect on addressing other complex agricultural problems (vegetable waste).

PHOTO 4 Innovation platform meeting in Nigeria to foster continuous interaction and collaboration between farmers, extension officers and researchers. PHOTO: LATIFOU IDRISSOU

4

Methodological framework

4.1 Selection criteria for methods

RAAIS is a diagnostic tool that combines multiple methods of data collection, building on existing experiences with rapid appraisal approaches and (participatory) innovation systems analysis. Five criteria have been identified for the selection of methods.

1. **Methods should be diverse, rigorous and able to generate both qualitative and quantitative data**
   This enhances the credibility and strength of the analysis (Spielman, 2005). Qualitative data provide the basis for the identification and analysis of the different dimensions of complex agricultural problems and structural conditions enabling or constraining innovation capacity. Such data may also provide narratives regarding the underlying causes and historical evolution of constraints and challenges. Quantitative data analysis can build on this by providing (descriptive) statistics and trends on, for instance, the distribution of constraints and challenges across different levels, stakeholder groups or study sites.

2. **Methods should facilitate both 'insider' and 'outsider' analysis**
   Insider analysis implies data analysis by stakeholders who can provide highly detailed explanations of specific phenomena based on their knowledge and experiences. However, insiders such as farmers or policymakers often have an incomplete or insufficient critical view of the broader agrifood system or the agricultural innovation system. Consequently, it is important to complement insider analysis with outsider analysis of data by researchers. Combined, the insider and outsider perspectives provide a thorough analysis of the issue under review (van Mierlo et al., 2010).

3. **Methods should be able to target different stakeholder groups across different levels**
   When complex agricultural problems are being studied, it is essential to include different groups of stakeholders, their perceptions on what constitutes the problem and what are perceived feasible or desirable solutions (Faysse, 2006; Ortiz et al., 2013).

4. **Methods should be able to target stakeholders individually, in homogeneous groups and in heterogeneous groups so as to capture individual, group and multi-stakeholder perceptions on problems and solutions.**
   Discussion and debate in both homogeneous and heterogeneous stakeholder groups generally provide a rich analysis of complex problems and potential solutions. Furthermore, multi-stakeholder interaction may reveal asymmetric power relationships that are key to understanding innovation capacity in the agrifood system. On the other hand, power relationships, group pressure or mutual dependencies between stakeholders may result in situations where sensitive questions are avoided, or receive socially desirable responses. Methods that target stakeholders individually are more likely to provide insights into such questions (International Institute for Sustainable Development, 2014).

5. **The methods together should provide sufficient detail on the complex agricultural problem under review, the innovation capacity in the agrifood system and the functioning of the agricultural innovation system** (World Bank, 2012).

Combining different types of methods and data collection techniques provides an opportunity to triangulate and validate data. Depending on the nature of the agricultural problem under review and the available resources and time, different types of data collection methods can be used for RAAIS, taking into account the criteria for method selection.

Based on the five criteria, four complementary data collection methods were selected to be part of RAAIS (Table 3).

4.2 RAAIS interviews

RAAIS interviews with representatives of farmers, the private sector, NGO/civil society organisations, government and researchers can provide insight into the problem under review (its dimensions, levels and stakeholder dynamics). Furthermore, interviewees can provide insight into the functioning of innovation systems, including collaboration between stakeholder groups, effectiveness of policies and other institutions, and what constrains or enables innovation capacity in the agrifood system (see Photo 5).

TABLE 3 Methodological framework indicating how different data collection methods correspond to the selection criteria for methods.

	Selection criteria for methods																
	Type of data		Insider/ outsider		Stakeholder group					Stakeholder participation				Focus of the analysis			
Methods for data collection	Qualitative	Quantitative	Insider	Outsider	Farmers	NGO/ civil society	Private sector	Government	Research and training	Individual	Homogeneous groups	Heterogeneous groups	Complex agricultural problems	Innovation capacity in the agrifood system	Agricultural innovation system
Semi-structured in-depth interviews	x	x		x		x	x	x	x	x			x	x	x
Multi-stakeholder workshops	x	x	x		x	x	x	x	x	x	x	x		x	x
Questionnaires		x		x	x			x		x	x		x		
Secondary data analysis	x			x			N/a				N/a		x	x	x

PHOTO 5 RAAIS interview with District Agricultural Officers in Kyela, Tanzania, in November 2012. PHOTO: M. SCHUT

To guide the semi-structured interviews, a topic list is prepared and fine-tuned for each interview. Using a topic list provides a degree of flexibility to identify and to anticipate interesting storylines relating to the problem under review, and allows validation of data gathered during previous interviews or during the workshops. Interviews should take a maximum of one hour, ensuring a high level of attentiveness of both the respondent and the interviewer.

Sampling of interview respondents should follow a stratified approach to ensure that stakeholders representing different study sites, different stakeholder groups and different administrative levels are included. Within those strata, respondents can be selected purposively or on the basis of snowball sampling, where interview respondents make suggestions about who else should be included in the sample (Russell Bernard, 2006). The sample size can be based on the concept of *saturation*, or the point at which no new information or themes are observed in the interview data (Guest et al., 2006). Interviews can be recorded and transcribed electronically. From an ethical point of view, interviewees should give permission for interviews to be recorded, and researchers should ensure the confidentiality of all interview data. Recording may not always be desirable, as the voice recorder

PHOTO 6 A female participant presenting constraints prioritised by women during RAAIS workshop in Ghana, April 2015. PHOTO: M. SCHUT

can create a barrier between the researcher and the respondent, especially when it comes to discussing politically sensitive issues. Instead of recording, detailed notes can be taken and transcribed electronically. The transcribed interviews can be coded. Ideally, interviews should be conducted and coded by two researchers, as this will enhance the quality of the analysis.

4.3 RAAIS multi-stakeholder workshops

Multi-stakeholder workshops focus mainly on insider analyses of innovation capacity in the agrifood system and the structural conditions provided by the agricultural innovation system. A participatory workshop methodology facilitates different groups of stakeholders – individually and in homogeneous and in heterogeneous groups – to identify, categorise and analyse constraints and challenges for innovation in the agrifood system. Depending on the type of problem, workshops can be organised with stakeholders representing national, regional and/or district levels or, for instance, across different study sites that share a specific problem. To keep the workshops manageable, and to stimulate interaction and

debate, the participation of a maximum of 25 participants per workshop is proposed – for instance consisting of five representatives from each of the following: farmer organisations, NGOs/civil society, the private sector, government and research. As far as possible, each group should be a representative sample with respect to, for instance, gender, age, income, ethnic groups.

The workshops should be held in a language spoken by all participants and be facilitated by someone who is familiar with the relevant cultural norms, has affinity with the problem and understands the realities of the different stakeholder groups. The proposed workshop methodology consists of different sessions subdivided into three categories, each with their own objective:

1. identifying constraints and challenges,
2. categorising constraints and challenges, and
3. exploring specific and generic Entry Points for innovation.

The starting point for the workshop is a broad Entry Theme. An Entry Theme can relate to a specific commodity (e.g. sustainable intensification of banana production in Burundi) or be more generic (e.g. improved access to market information for farmers in Kenya). The Entry Theme is usually closely related to project/program objectives, but should be validated with representatives of different stakeholder groups before the RAAIS workshop. Figure 2 and Table 4 provide an overview of the 14 sessions, their sequence and relations, and their specific objective in RAAIS.

Workshops are designed to take two days. Depending on the specific objective of the workshop, sessions can be included or excluded, or new sessions can be added. Many complex agricultural problems have gender dimensions. Men and women often experience different constraints and have different objectives that need to be captured when strategies for agricultural innovation are being explored. RAAIS provides tools to capture these different constraints and opportunities and can facilitate their gender-disaggregated analysis (see Photo 6). Table 5 gives an overview of the essential and optional sessions, and which are suitable for conducting gender-disaggregated analysis.

Alongside the facilitator, a note-taker documents the outcome of the different sessions and captures discussions among participants. Workshop facilitation and note-taking protocols ensure that the workshop organisation, facilitation and

documentation are standardised; this is essential for comparing or aggregating the outcomes, for instance across different study sites. The protocols for workshop facilitation and guide for note-taking can be found in Section 6 of this toolkit.

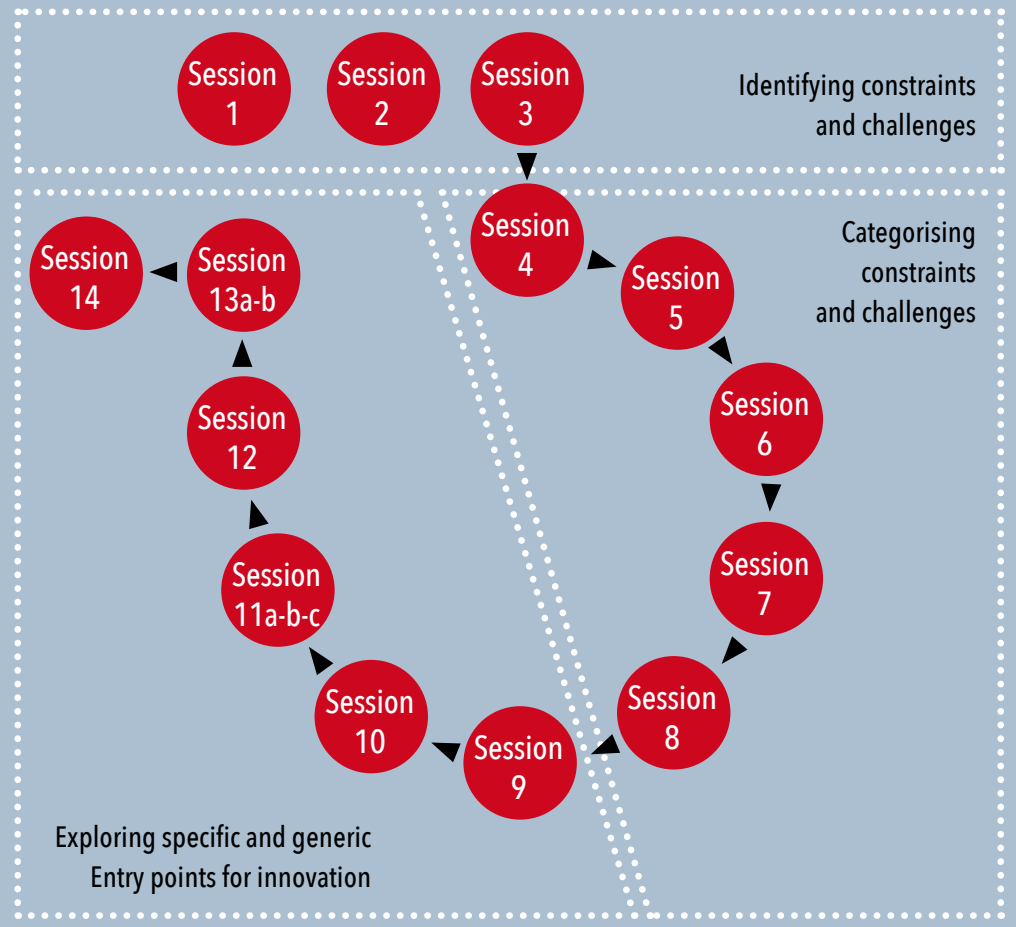
A crucial element in the workshops is the use of coloured cards. At the start of the workshop (Session 1), each of the stakeholder groups is assigned a different colour. During Session 2, the participants individually list five constraints or challenges they face in their work and write them down on their coloured cards. If five stakeholder groups are equally represented, this results in 125 cards. Session 3 facilitates discussion within stakeholder groups. In homogeneous stakeholder groups, participants discuss the listed constraints and challenges, explore overlapping issues and jointly develop a stakeholder group Top 5. If necessary, constraints and challenges can be reformulated based on discussions within the group. Each stakeholder group uses its Top 5 throughout the rest of the workshop sessions; hence, 25 cards (five cards per stakeholder group) (Photos 7-10).

The use of the coloured cards facilitates the analysis of different sessions during and after the workshops. As the cards are coded and recycled throughout the successive sessions, photographs can be taken to capture the results (for example, Photos 7 and 10). Such photographs can be analysed after the workshop and can also be used to validate the note-taker's data. Furthermore, the cards provide insight into the relations between constraints and challenges identified by different stakeholder groups (Photos 8 and 9). Combining the results from different sessions can stimulate integrative analyses. For instance, combining data resulting from Sessions 5 and 6 provides insight into the drivers of innovation across different levels. Similarly, the outcome of Sessions 7 and 13 can be compared to triangulate the data, as both seek to identify key constraints for innovation in the agrifood system.

4.4 RAAIS questionnaires

Some of the constraints derived from the workshops and the interviews may be eligible for broader study among specific groups of stakeholders through the use of surveys. Such surveys may provide more insights into, for example, the socio-economic impacts of climate change on smallholder agriculture in specific regions, the quality of agricultural extension received by farmers in addressing complex agricultural problems, or access to agricultural inputs for male- or female-headed households.

FIGURE 2 The relation between the workshop sessions and their sequence, subdivided over the three categories. Depending on the specific objective of the workshop, specific sessions can be added or left out.



Surveys are not necessarily limited to farmers; they can also be conducted with any of the other stakeholder groups involved. For the data to be complementary, surveys should be completed in the same study sites as where the workshops were organised and among a representative sample of the targeted stakeholder group. To achieve this, a stratified random sampling strategy can be used to identify respondents across different study sites, levels or stakeholder groups. An efficient sampling method that allows for optimal allocation of resources should be used to determine the sample size (e.g. Whitley and Ball, 2002).

4.5 RAAIS secondary data analysis

Secondary data are written data with relevance for the analysis of the complex agricultural problem, the innovation capacity of the agrifood system or the functioning of the agricultural innovation system. Examples are policy documents, project proposals and reports, laws or legal procedures, project evaluations, curricula for agricultural education and training, (agricultural) census and organisational records such as charts and budgets over a period of time.

During the analysis of secondary data on parasitic weed problems in Tanzania for instance, we discovered *Striga* Rules under the Tanzania Crop Protection Act of 1997 (see Photo 11). Interviews showed that the majority of crop protection officers – responsible for coordinating crop protection measures – were not aware of these *Striga* rules. This forms a good example of how data can be triangulated by using different methods.

The sampling of secondary data is not clear-cut. Key agricultural documents such as agricultural policies or agricultural research priorities should be included. These documents often refer to other relevant data. Furthermore, secondary data are often provided during or following interviews. Insights from secondary data can be verified in subsequent interviews with stakeholders (e.g. the extent to which policy is implemented and enforced).

PHOTO 7 (TOP LEFT) Top 5 constraints of NGO/civil society representatives and their categorisation under the different components of the institutional subsystem (Session 4).

PHOTO 8 (TOP RIGHT) The categorisation of the Top 5 identified by the different stakeholder groups along different structural conditions that can enable or constrain innovation (Session 5).

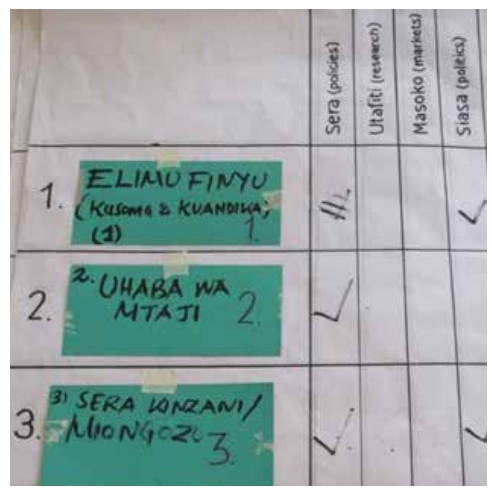
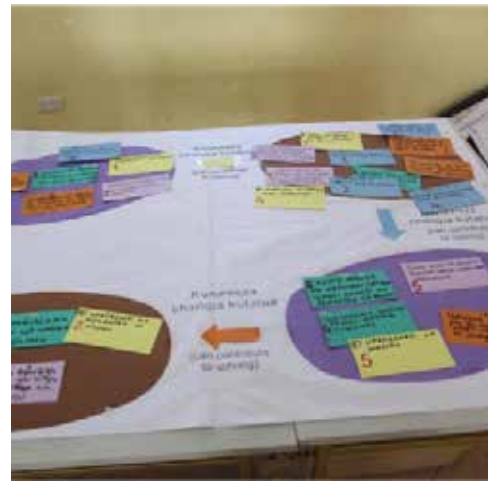


PHOTO 9 (BOTTOM LEFT) The identification of relationships between different constraints (arrows) and key problem (circled cards) (Session 7).

PHOTO 10 (BOTTOM RIGHT) The subdivision between stakeholder constraints that are easy or difficult to address (Session 11b)



PHOTOS: M. SCHUT of multi-stakeholder workshops in Tanzania held in October 2012

TABLE 4 Workshop sessions and their specific objectives and importance in RAAIS.

	Sessions	Activities	Objective(s) in RAAIS
IDENTIFYING CONSTRAINTS AND CHALLENGES			
1	Opening and participant introduction	Participants (1) introduce themselves and receive information about the workshop methodology and (2) are subdivided over different stakeholder groups, identified by coloured cards	• To ensure an equal representation of participants over the different stakeholder groups
2	Individual brainstorming about constraints and challenges	Participants individually identify five constraints and challenges they face in their work. On the back of their coloured cards, participants write their gender (male/female) and age	• To make an inventory of general constraints and challenges in the agrifood system faced by stakeholders • To capture constraints and challenges of gender and age groups
3	Developing a Top 5 of constraints and challenges in stakeholder groups	Participants (1) discuss constraints and challenges within respective stakeholder group, (2) develop a stakeholder group Top 5 of constraints and challenges, (3) present the Top 5 to other stakeholder groups and (4) have discussions within and between stakeholder group(s)	• To gain insights into the key constraints and challenges experienced by different stakeholder groups • To create awareness and stimulate learning among stakeholders
4	Identifying the type of constraints and challenges	Participants (1) categorise Top 5 constraints and challenges as relating to policy, research, education and training, extension, markets and/or politics, (2) present results to the other groups and (3) have discussions within and between the stakeholder group(s)	• To gain insights into types of constraints and challenges • To create awareness and stimulate learning between stakeholders
CATEGORISING CONSTRAINTS AND CHALLENGES			
5	Categorising constraints and challenges along structural conditions that can enable or constrain innovation	Participants (1) categorise Top 5 constraints and challenges along the structural conditions driving innovation (Table 2) and (2) discuss them within and between the stakeholder group(s)	• To gain insights into how the stakeholder constraints and challenges relate to structural conditions provided by the agricultural innovation system and whether these enable or constrain innovation capacity • To create awareness and stimulate learning between stakeholders
6	Categorising constraints and challenges across different (administrative) levels	Participants (1) categorise Top 5 constraints and challenges across different administrative levels (e.g. national, regional, district), (2) discuss results with other stakeholder groups and (3) have discussions within and between the stakeholder group(s)	• To gain insights into how key constraints and challenges relate to different institutional (administrative) levels • To identify and analyse interactions between different levels • To create awareness and stimulate learning between stakeholders
7	Identifying relationships between constraints and challenges, and identifying key constraints	Participants (1) jointly discuss and identify relations between the different constraints and challenges, (2) identify constraints or challenges that are central in the analysis and (3) have discussions within and between the stakeholder group(s)	• To analyse relationships between different constraints and challenges • To identify key constraints and challenges • To create awareness of the interconnectedness of stakeholder constraints and stimulate learning between stakeholders
8	Categorising constraints and challenges along segments of the value chain	Participants (1) categorise stakeholder group Top 5 constraints and challenges along the value chain and (2) have discussions within and between the stakeholder group(s)	• To analyse constraints and challenges along the agrifood value chain • To create awareness and stimulate learning between stakeholders

TABLE 4 Workshop sessions and their specific objectives and importance in RAAIS (continued).

Sessions	Activities	Objective(s) in RAAIS
EXPLORING SPECIFIC AND GENERIC ENTRY POINTS FOR INNOVATION		
9 Categorising constraints and challenges along project/ program objectives	Participants (1) reflect on how addressing constraints would contribute to achieving project/program objectives and (2) have discussions within and between the stakeholder group(s)	• To categorise constraints along project/program objectives • To stimulate participants to relate constraints to project/program objectives
10 Categorising constraints that are Entry Theme specific or more generic constraints in the agrifood system and agricultural innovation system	Participants (1) subdivide between (a) constraints that are Entry Theme specific or more generic in the (b) agrifood system and (c) agricultural innovation system and (2) have discussions within and between the stakeholder group(s)	• To distinguish between constraints that: (1) are specifically related to the Entry Theme, (2) are more broadly related to innovation capacity in the agrifood system, (3) are related to the agricultural innovation system
11a Subdividing between constraints that stakeholder groups can solve themselves versus problems solved with or by other stakeholder groups	Participants (1) categorise Top 5 constraints and challenges as: 'can be solved within the stakeholder group' or 'can only be solved in collaboration with other stakeholder groups' and (2) have discussions within and between the stakeholder group(s)	• To identify constraints and challenges that require collaboration between stakeholder groups • To create awareness and stimulate learning between stakeholders • To identify Entry Points for innovation in the agrifood system
11b Subdividing between constraints and challenges that are easy/difficult to solve	Participants: (1) categorise Top 5 constraints and challenges as relatively 'easy' or 'difficult' to address and (2) have discussions within and between the stakeholder group(s)	• To explore which constraints and challenges require system optimisation (easy to address) and those that require system transformation (difficult to address) • To create awareness and stimulate learning between stakeholders • To identify Entry Points for enhancing the innovation capacity in the agrifood system
11c Identifying time path for addressing stakeholder constraints and challenges	Participants categorise what constraints require short-term (< 1 year), medium-term (1-5 years) or long-term (>5 years) actions	• To subdivide between constraints and challenges that can be addressed within a relatively short term and those that require more medium- and long-term efforts
12 Identifying different types of research for development (R4D) domains that can support addressing the constraints	Participants collectively subdivide constraints under four R4D categories: (1) Productivity innovation, (2) Natural resource management innovation, (3) Institutional innovation and (4) Gender, nutrition and other innovation	• To subdivide constraints and challenges over the four R4D categories
13a Prioritising constraints under different R4D domains by different gender groups	Females and males separately prioritise constraints under four R4D categories (covered in Session 12)	• To gain insight into men's and women's prioritisation of constraints under the different R4D categories • To become aware of differences and similarities between men's and women's priorities
13b Prioritising the Top 3 constraints under different R4D domains by women and men together	Participants jointly discuss and develop an overall Top 3 constraints and challenges under the four R4D categories	• To explore opportunities for addressing system constraints and challenges through multi-stakeholder collaboration • To identify key Entry Points for innovation
14 Developing action plans	Participants develop action plans to address prioritised constraints under the four R4D categories: (1) Productivity innovation, (2) Natural resource management innovation, (3) Institutional innovation and (4) Gender, nutrition and other innovation	• To develop a set of coherent action plans for (1) Productivity innovation, (2) Natural resource management innovation, (3) Institutional innovation and (4) Gender, nutrition and other innovation related to the Entry Theme • To prepare implementation of R4D activities to address prioritised constraints identified by participants in relation to Entry Points

TABLE 5 Essential and optional workshop sessions and indication of suitability of workshop sessions for gender-disaggregated analysis.

Session	Objective	Essential	Optional	Suitable for gender analysis?
1	Opening and participant introduction	x		
2	Individual brainstorming about constraints and challenges	x		x
3	Developing a Top 5 of constraints and challenges in stakeholder groups	x		x
4	Identifying the type of constraints and challenges	x		
5	Categorising constraints and challenges along structural conditions that can enable or constrain innovation	x		
6	Categorising constraints and challenges across different (administrative) levels	x		
7	Identifying relationships between constraints and challenges, and identifying key constraints	x		
8	Categorising constraints and challenges along segments of the value chain		x	
9	Categorising constraints and challenges along project/program objectives	x		
10	Categorising constraints that are Entry Theme specific or more generic in the agrifood system and in the agricultural innovation system	x		
11a	Subdividing between constraints that stakeholder groups can solve themselves versus problems solved with or by other stakeholder groups		x	
11b	Subdividing between constraints and challenges that are easy/difficult to solve		x	
11c	Identifying time path for addressing stakeholder constraints and challenges		x	
12	Identifying different types of R4D domains that can support addressing the constraints	x		
13a	Prioritising constraints under different R4D domains by different gender groups		x	x
13b	Prioritising Top 3 constraints under different R4D domains by women and men together		x	x
14	Developing action plans	x		

PHOTO 11 Example of a legal document (secondary data source) relating directly to a parasitic weed problem in Tanzania.

GOVERNMENT NOTICE NO ..... published on .....

THE. PLANT PROTECTION ACT
(CAP.133)
RULES

Made under section 3

THE PLANT PROTECTION (DECLARATION AND CONTROL OF STRIGA) RULES

Citation — 1. These Rules may be cited as the Plant Protection (Declaration and Control of *Striga*) Rule, 2010.

Interpretation Capt. 133 — 2. In these Rules unless the context requires otherwise-
"Act" means the Plant Protection Act;
"authorized officer" means agricultural officer, agricultural extension officer or any Other administrative officer at the Local Government Authority;
"inspector" means a Plant Protection Inspector appointed under section 33 of the Act;
"*striga*" means a plant of the family *scrophulariaceae* that is parasitic on the roots of the plants.

Declaration of striga — 3. *Striga* commonly called "witchweed" or "kiduha" is hereby declared to be a pest for the purposes of the Act.

Declaration of striga infested area — 4.-(1) Areas listed in the Schedule to these Rules are hereby declared to be *striga* infested areas.
(2) The Minister May by notice published in the *Gazette* amend the Schedule.

Duties of Inspector and authorized Officers in respect to the *striga* management — 5. Where an inspector or an authorized officer has established that any land or plant is infested with *striga*, he may issue a notice that traditional measures be undertaken by the occupier or, in the absence of the occupier, the owner or a person having the charge or management of the land as he may deem fit.

5

Analytical framework

RAAIS follows an analytical framework composed of five dimensions (Table 6) to analyse the workshop and interview data: (A) we subdivide between six institutional subcategories and (B) analyse how different constraints and opportunities experienced by stakeholders are embedded in three nested systems. Subsequently, (C) causes for stakeholder constraints are analysed using structural conditions for innovation as identified by Klein Woolthuis et al. (2005). Moreover, we analyse how (D) constraints and opportunities are related to different segments of agricultural value chains, following Thitinunsomboon et al. (2008) and (E) to different integration levels following Douthwaite et al. (2003). Depending on the specific objective of the workshop, other sessions and analytical dimensions can be added, for example (F) dimensions of complex agricultural problems (Schut et al., 2013).

Quantitative workshop data can be analysed for constraints and opportunities across countries, study sites and stakeholder groups. Microsoft Excel®, SPSS or similar software packages can support descriptive statistical analysis guided by the analytical dimensions in Table 6. A similar approach can be used to analyse the questionnaires, although the focus here can also be on identifying similarities and differences across different study sites.

Qualitative interview data can be transcribed and analysed electronically in Adobe Acrobat™ using keywords (e.g. climate change, extension, policy). The analysis can focus on identifying root causes and explanations of constraints identified in the workshops. Furthermore, the analysis of these data can provide insight into sensitive political issues that are more freely discussed in individual interviews than in the multi-stakeholder workshop setting. Secondary data can be analysed for their relevance to the problem under review, the innovation capacity in the agrifood system or the functioning of the agricultural innovation system more generally.

Examples of the potential analyses are visualised in Figures 3 and 4.

TABLE 6 Example of analytical framework.

Analytical dimensions		Categories
A	Institutional and political constraints	Policy (e.g. crop protection policies); research (e.g. natural and social science relating to weeds and rice); education and training (e.g. of extension officers or at universities); extension (e.g. how service delivery is organised); markets (e.g. rice prices, input prices); politics (e.g. multi-stakeholder power play)
B	Embedding of constraints in different systems	Specific complex agricultural problem under review; agrifood value chain; agricultural innovation system
C	Structural conditions that can cause constraints to innovation	Physical and knowledge infrastructure and assets; institutions such as policies and regulatory frameworks; interaction and collaboration between stakeholders; capabilities and access to resources
D	Value chain segments	Credit; inputs and services; production; post-harvest; trade; transport; marketing; retail; consumption; export
E	Integration levels	International; national; regional; district; ward; village; household
F	Dimensions of complex agricultural problems	Biophysical; technological; socio-cultural; economic; institutional; political

FIGURE 3 An example of spider web analysis of analytical dimension A (types of institutional and political constraints) across different study sites in Tanzania.

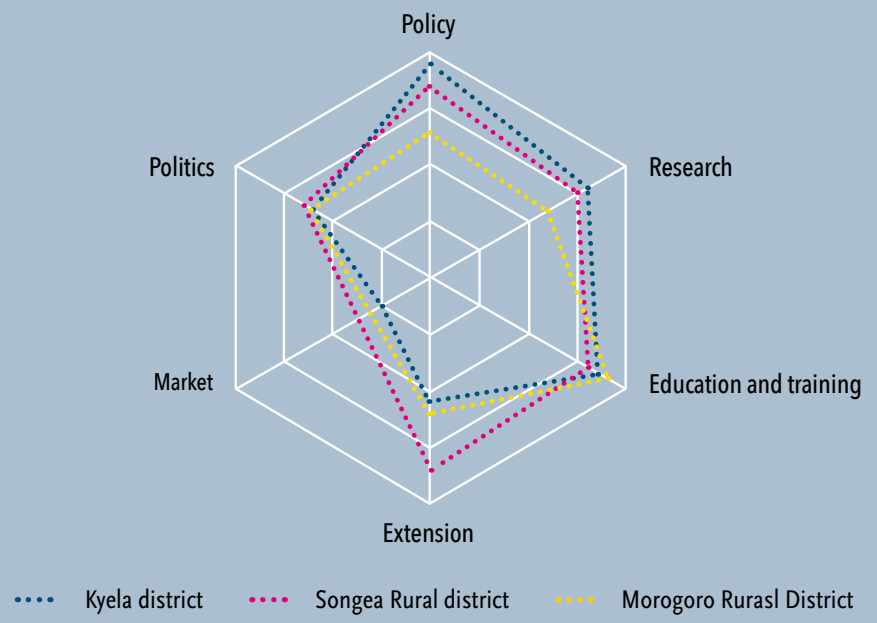
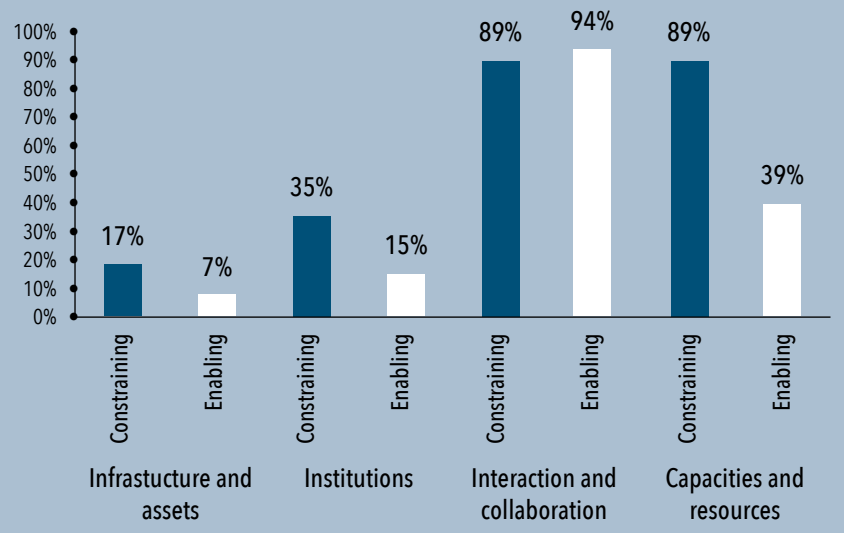


FIGURE 4 Analysis of interview data on analytical dimension C (structural conditions provided by the agricultural innovation system that can enable or constrain innovations).



6

RAAIS materials

Opening and participant introduction

SESSION 1

PHOTO 12 Group photo taken during the RAAIS workshop in Kumasi, Ghana in April 2015. PHOTO: IITA GHANA

For a detailed discussion of workshop size, composition and structure, please see RAAIS multi-stakeholder workshops on page 26.

Time	15 minutes
Activity	To become familiar with workshop objectives, program, get to know one another (see Photo 12).
Objectives	Briefly introduce project/program and its objectives. Discuss workshop agenda and objectives. Facilitate a round during which participants introduce themselves. Introduction of Entry Theme by workshop facilitator. Introduction should be kept general not to bias participants.
Role of facilitator	Into what group do you fit best? Participants are asked to raise their hand. Participants are given five coloured cards. Colour depends on the stakeholder group: • Farmer/producer: yellow cards • Civil society/NGO/farmers' association/development projects: green cards • Private sector (agri-shops/miller/trader/processor: blue cards • Government representative (extensionist, policymaker, plant health, extension liaison office): purple cards • Research and training institutes (NARS, universities, international research): orange cards
Materials needed	• Name tags • Marker pens • List of participants • 30 booklets to write notes + 30 pens • Printed workshop programme • Coloured cards (5 cards per participant) • Flipchart with overview of group colours
Potential challenges	Delay in the start of the workshop.
Session materials	Download: www.wageningenur.nl/raais-toolkit (see also page 112).

Individual brainstorming about constraints and challenges

SESSION 2

PHOTO 13 RAAIS workshop participants in Benin identifying their individual constraints and challenges relating to the Entry Theme of the workshop (parasitic weeds in rice). PHOTO: M. SCHUT

Time	15 minutes
Activity	Individual brainstorming by participants. Each individual participant writes on their coloured cards the five main challenges and constraints relating to the Entry Theme. Challenges and constraints should relate as much as possible to their direct activities on the specific Entry Theme, but more general challenges and constraints can also be included (relating to production, harvest, storage, trade, marketing, policy, research, training, or more general and so on). On the back of the coloured cards, participants write their gender (male/female) and age. The session is performed individually to avoid group pressure in defining challenges and constraints (see Photo 13).
Objectives	To identify main constraints and challenges as experienced by individual stakeholders.
Role of facilitator	Explain the session, walk around and assist participants who have questions or need support. Facilitator urges participants to identify the five main Entry Theme-related challenges and constraints that they face in their work. These can be specific, or more general. Ensure that participants write gender and age on the back of each card.
Materials needed	• 5 coloured cards per participant. Each participant group uses a different colour. • 30 markers (one for each participant)
Potential challenges	• Participants who cannot read or write (selection procedure should try to ensure against this). • Participants need support in formulating constraints and challenges. • Participants forget to write gender and age group on back of each of the cards.
Session materials	Download: www.wageningenur.nl/raais-toolkit (see also page 112).

Developing a Top 5 of constraints and challenges in homogeneous stakeholder groups

SESSION 3

PHOTO 14 RAAIS workshop participants representing Congolese NGO/civil society organisations debate about their stakeholder group Top 5 constraints and challenges.
PHOTO: M. SCHUT

Time	45 minutes
Activity	Participants sit together in homogeneous groups (so farmer representatives together, government representatives together and so on) and explore similarities and differences between constraints identified by members of the stakeholder group (see Photo 14). Next, they rank the identified challenges and constraints from major constraints to minor constraints. Each group discusses and reaches consensus on the Top 5 constraints and challenges. If necessary, new cards can be distributed if participants want to rephrase constraints and challenges. The cards are numbered 1 to 5 based on their position in the Top 5. Workshop facilitator collects the cards that did not make the Top 5.
Objectives	To identify and rank main constraints and challenges as experienced by each stakeholder group.
Role of facilitator	Explain the session, walk around and assist stakeholder groups who have questions or need support. The facilitator urges participants to write clearly, as these cards will be used throughout the workshop. Cards will be put on flipchart with tape to allow for presentation. Photos will be taken of each flipchart.
Materials needed	• Prepared flipcharts for each of the stakeholder groups with numbers 1-2-3-4-5 (see session materials) • Markers • Tape • Camera
Potential challenges	Only one or no representative of stakeholder group: if there is only one representative of a stakeholder group, his/her Top 5 are used.
Session materials	Download: www.wageningenur.nl/raais-toolkit (see also page 113). Video Clip: www.youtube.com/watch?v=QJtN1OFHBjg

Identifying the type of constraints and challenges

SESSION 4

PHOTO 15 Farmer participants in the GIZ-IITA banana project in Burundi identify the constraints and challenges for their Top 5. PHOTO: M. SCHUT

Time	45 minutes
Activity	Stakeholders have to categorise the constraints and challenges according to different dimensions of complex agricultural problems (see Photo 15): • Biophysical (e.g. climate change, soil fertility) • Technological (e.g. machinery, improved varieties) • Socio-cultural (e.g. norms, values, perceptions) • Economic (e.g. market, access to credit) • Institutional (e.g. rules, regulations, policy, land tenure) • Political (e.g. stakeholder collaboration, politics) Two important issues: • More than one dimension may be selected • Participants circle the dimension they think is most appropriate to the constraint The different stakeholder groups can discuss and at the same time put their Top 5 cards on the pre-printed flipchart. When this is finalised, each group gives a short plenary presentation (max 5 minutes per group).
Objectives	To categorise the constraints and challenges according to different dimensions of complex agricultural problems.
Role of facilitator	The facilitator supports, but also challenges, the participants when they position their cards on the flipchart (see session materials). The facilitator supports the presentation by each of the groups, keeps time and allows different participants to pose questions.
Materials needed	• Pre-printed flipchart of specific dimensions (see session materials) • Cards, Tape, Markers, Camera
Potential challenges	• Participants find it difficult to categorise the cards: in that case, other workshop participants and the facilitator support the group during the plenary. • Stakeholder groups have not selected the most appropriate dimension.
Session materials	Download: www.wageningenur.nl/raais-toolkit (see also page 113).

Categorising constraints and challenges along structural conditions that can enable or constrain innovation

SESSION 5

PHOTO 16 RAAIS workshop participants in Ghana categorising their constraints and challenges across the four categories of structural conditions that can enable or constrain innovation. PHOTO: M. SCHUT

Time	45 minutes
Activity	Stakeholders categorise their Top 5 constraints and challenges according to structural conditions that can enable or constrain innovation (see Photo 16): • Infrastructure and assets • Institutions • Interaction and collaboration • Capabilities and resources • Other
Objectives	To categorise stakeholders' constraints and challenges along categories of structural conditions that can enable or constrain innovation.
Role of facilitator	Explain the session, which is about understanding what is causing the constraints and challenges, encourage stakeholders to think critically when categorising their constraints and challenges, and facilitate discussion between different stakeholder groups.
Materials needed	• Cards • Pre-printed flipchart (see session materials) • Markers • Camera
Potential challenges	• Some constraints and challenges may relate to more than one category: participants should position the card in the category that forms the main cause of the constraint or challenge. • Some constraints/challenges may be difficult to categorise: these can be classified as other.
Session materials	Download: www.wageningenur.nl/raais-toolkit (see also page 114). Video clip: www.youtube.com/watch?v=Cr7qnTdN-CQ

Categorising constraints and challenges across different (administrative) levels

SESSION 6

PHOTO 17 RAAIS workshop participants in Tanzania dividing their constraints across different administrative levels. PHOTO: M. SCHUT

Time	45 minutes
Activity	Categorise constraints and challenges across different administrative levels (see Photo 17). Each group separately puts its Top 5 cards on the pre-printed flipchart. The session is followed by a short discussion on multi-level dynamics. Leading questions for the discussion can be: • How are dynamics at one level influenced by dynamics at other levels? • Are these dynamics constraining or enabling? Before the workshop, the flipchart should be adapted to the administrative levels of the country where the workshop is organised.
Objectives	To get insight into the multi-level dynamics of stakeholder constraints and challenges.
Role of facilitator	Support the stakeholder groups in positioning the constraints and challenges on the flipchart, encourage stakeholders to think critically when categorising their constraints and challenges, and ensure that different stakeholder groups provide equal input to the discussion.
Materials needed	• Pre-printed flipchart with levels (see session materials) • Cards and tape • Different coloured markers
Potential challenges	Constraints or challenges are applicable at more than one level: position the card at most relevant level as perceived by the stakeholder group.
Session materials	Download: www.wageningenur.nl/raais-toolkit (see also page 116). Video clip: www.youtube.com/watch?v=N3nrrUsMyvM

Identifying relationships between constraints and challenges, and identifying key constraints

SESSION 7

PHOTO 18 RAAIS workshop participants in Xishuangbanna, China identifying relations between constraints and challenges. PHOTO: M. SCHUT

Time	45 minutes
Activity	Building on Session 6, stakeholders jointly identify relations between constraints and challenges (see Photo 18). What is the relation between different constraints and challenges, what feedback mechanisms are at play? Arrows are drawn between the cards and can be one or two way. Once the participants have finished identifying relations between the constraints and challenges, they select the three constraints that are central (i.e. that are connected to many other constraints or challenges).
Objectives	To identify relations between constraints and challenges and 'central' constraints.
Role of facilitator	Coordinate and facilitate the discussion between stakeholders, encourage stakeholders to think critically when identifying relations between constraints and challenges, make sure that different stakeholder groups provide equal input to the discussion. If possible, indicate direction between different challenges and constraints by using arrows and identify three constraints with most arrows.
Materials needed	• Pre-printed flipchart with levels (see session materials) • Markers • Camera • Guide for note-taking
Potential challenges	Participants are not consistent in the use of arrows.
Session materials	Download: www.wageningenur.nl/raais-toolkit (see also page 116). Video Clip: www.youtube.com/watch?v=mOA9mV2NNzs

Categorising constraints and challenges along segments of the value chain

SESSION 8

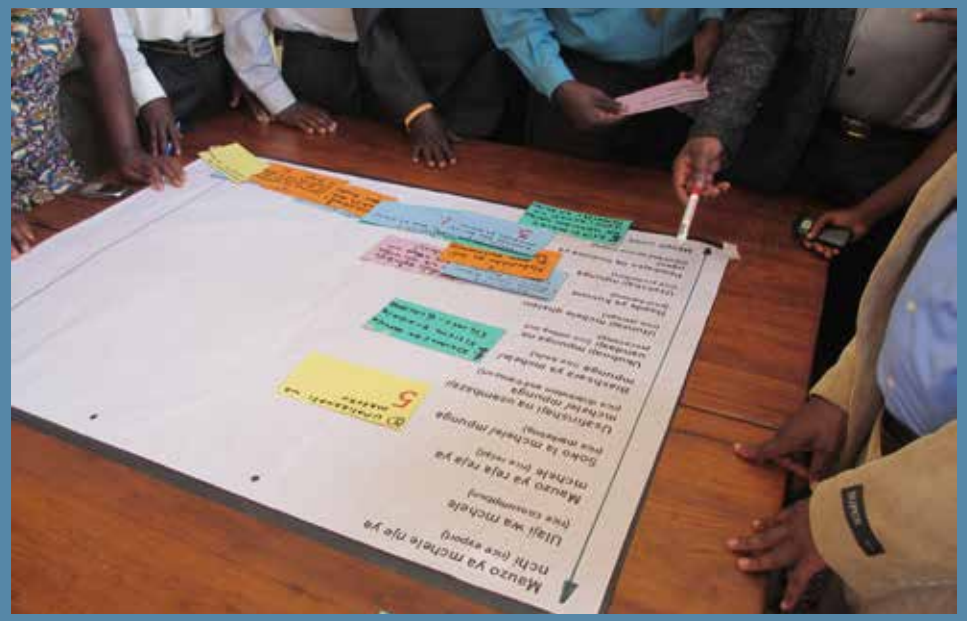


PHOTO 19 RAAIS workshop participants in Tanzania categorising their constraints and challenges across different segments of the value chain. PHOTO: M. SCHUT

Time	45 minutes
Activity	Stakeholder groups position their Top 5 constraints and challenges along the segments of the (standardised) value chain (see Photo 19). The exercise is followed by a short discussion (max 20 minutes).
Objectives	To categorise constraints along segments of the value chain.
Role of facilitator	Support each of the groups to position their Top 5 cards along the value chain, encourage stakeholders to think critically when categorising their constraints and challenges, make sure that the different stakeholder groups provide equal input to the discussion.
Materials needed	• Pre-printed flipchart (see session materials) • Cards • Tape • Markers • Camera
Potential challenges	• Certain constraints cannot be categorised along the value chain: these constraints and challenges are caused by non-market constraints and challenges and are to be noted separately or in the category. • Other constraints/challenges will not specifically focus on one segment of the supply chain, but on multiple: this is to be indicated with arrows.
Session materials	Download: www.wageningenur.nl/raais-toolkit (see also page 117).

Categorising constraints and challenges along project/program objectives

SESSION 9

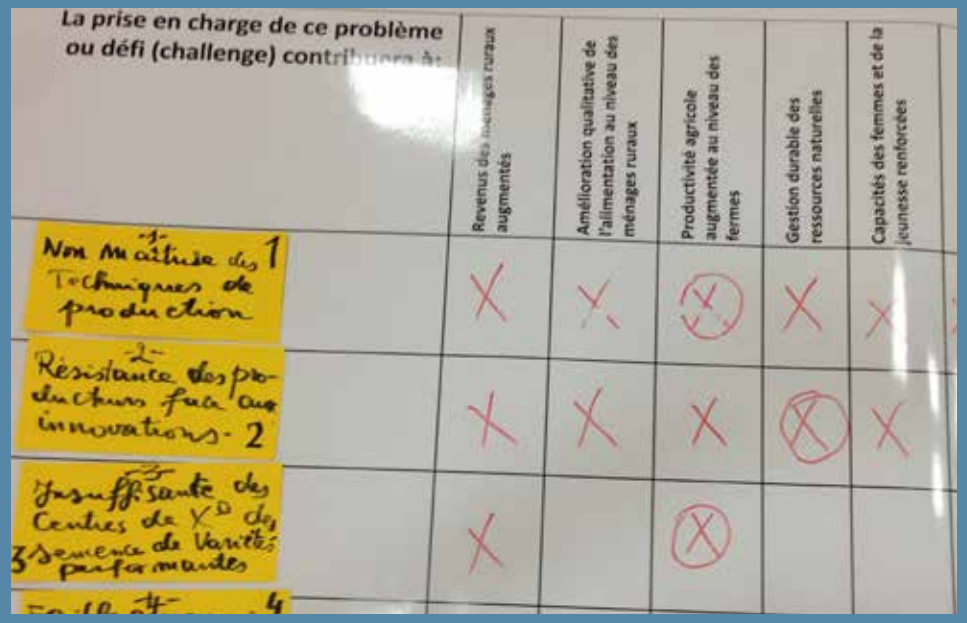


PHOTO 20 RAAIS workshop participants in Burundi identify how their constraints and challenges relate to different project or program objectives (in this case Humidtropics). PHOTO: M. SCHUT

Time	45 minutes
Activity	Stakeholder groups indicate how addressing the Top 5 constraints or challenges will contribute to achieving the project or program objectives. Two important issues: • More than one objective may be selected (indicated by an X) • Participants circle the objective that they think is most appropriate in relation to the constraint (indicated by circling the X) The session is followed by a short discussion (max 20 minutes).
Objectives	To identify how addressing the constraints will contribute to achieving a project's or a program's objective.
Role of facilitator	Support each of the groups to positioning their Top 5 cards along the objectives, encourage stakeholders to think critically when subdividing their constraints and challenges, make sure that the different stakeholder groups provide equal input to the discussion, facilitate questions and the answering of these questions.
Materials needed	• Pre-printed flipchart with project/program objective (see session materials) • Cards; Tape; Markers; Camera
Potential challenges	• Some constraints cannot be categorised under project/program objectives • More than one option is possible (indicated by the X on the flipchart), but stakeholder groups do need to identify the main project/program objective to which addressing the constraint or constraint will contribute (indicated by the circle around the X) (see Photo 20).
Session materials	Download: www.wageningenur.nl/raais-toolkit (see also page 118).

Categorising constraints that are Entry Theme specific or more generic in the agrifood system and in the agricultural innovation system

SESSION 10

PHOTO 21 Workshop participants in Benin subdivide between Entry Theme specific or more generic constraints in the agrifood system and in the agricultural innovation system. PHOTO: M. SCHUT

Time	20 minutes
Activity	Stakeholder groups (see Photo 21) categorise constraints and challenges along a gradient of: • Constraints and challenges that apply directly to the Entry Theme of the workshop. For example 'diseases in banana' or 'lack of improved fodder' when the Entry Theme is 'banana-livestock integration'. • Constraints and challenges that relate to more generic problems in the agrifood system (constraints and challenges that go beyond the specific Entry Theme). For example, 'limited agricultural extension' or 'agricultural inputs not available in a timely manner' or 'weed problems' have a broader impact than just on 'banana-livestock integration'. • Constraints and challenges that go beyond the agricultural system. For example, 'poor road infrastructure in rural areas' or 'illiteracy' have a broader impact than just on the agricultural sector.
Objectives	To distinguish between constraints that: • Are specifically related to the Entry Theme • Are more broadly related to innovation capacity in the agrifood system • Are related to the agricultural innovation system
Role of facilitator	Facilitate and animate discussion between stakeholders, encourage stakeholders to think critically when categorising their constraints and challenges, make sure that the different stakeholder groups provide equal input to the discussion.
Materials needed	• Pre-printed sheet (see session materials); Coloured cards; Camera
Potential challenges	Participants feel that constraints relate to two or three categories: need to position constraints as specifically as possible.
Session materials	Download: www.wageningenur.nl/raais-toolkit(see also page 119).

Subdividing between constraints that stakeholder groups can solve themselves versus problems solved with or by other stakeholder groups

SESSION 11A

PHOTO 22 RAAIS workshop participants in Tanzania subdividing between constraints and challenges they can solve themselves versus problems that can only be solved with or by other stakeholder groups. PHOTO: M. SCHUT

Time	20 minutes
Activity	Categorising the constraints and challenges in two categories (see Photo 22): • Problems that the participants can solve themselves. • Problems that can only be solved in collaboration with others.
Objectives	• To explore what constraints and challenges can be solved individually, and what problems can – according to the participants – only be solved in collaboration with others • To create awareness that the majority of constraints and challenges can only be addressed in collaboration with others, thereby stressing the need for a systems approach.
Role of facilitator	Facilitate and animate discussion between stakeholders, encourage stakeholders to think critically when subdividing their constraints and challenges.
Materials needed	• Pre-printed sheet (see session materials) • Coloured cards • Camera
Potential challenges	Exercise takes too much time.
Session materials	Download: www.wageningenur.nl/raais-toolkit (see also page 120).

Subdividing between constraints and challenges that are easy/difficult to solve

SESSION 11B

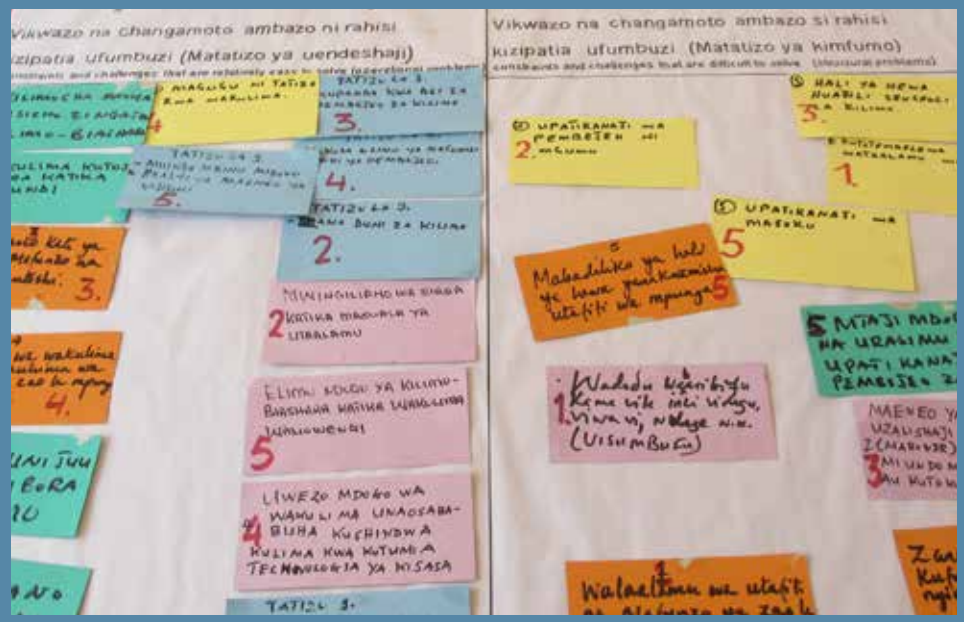


PHOTO 23 RAAIS workshop participants in Tanzania subdivide between constraints and challenges that are easy or difficult to solve. PHOTO: M. SCHUT

Time	25 minutes
Activity	Categorising the constraints and challenges in two categories (see Photo 23): • Constraints and challenges that are relatively easy to solve (operational problems). • Constraints and challenges that are difficult to solve (structural problems).
Objectives	To subdivide between operational and more structural constraints and challenges.
Role of facilitator	Facilitate and animate discussion between stakeholders. Here, it is important to subdivide between symptoms and root causes, the why question is very important; what are the underlying issues?
Materials needed	• Pre-printed flipchart • Coloured cards • Guide for note-taking (see Section 6.1) • Camera
Potential challenges	• Difference between this and previous exercise is unclear for participants: facilitator explains that the previous exercise was about whether challenges and constraints can be solved by the individual stakeholder group or in collaboration with others. • The concept of subdividing between problems that are difficult or easy to solve is quite tricky. What is difficult and what is easy to solve is prone to stakeholder interpretation. Problems that are easy to solve will generally be solved in practice one would say.
Session materials	Download: www.wageningenur.nl/raais-toolkit (see also page 121).

Identifying time path for addressing stakeholder constraints and challenges

SESSION 11C

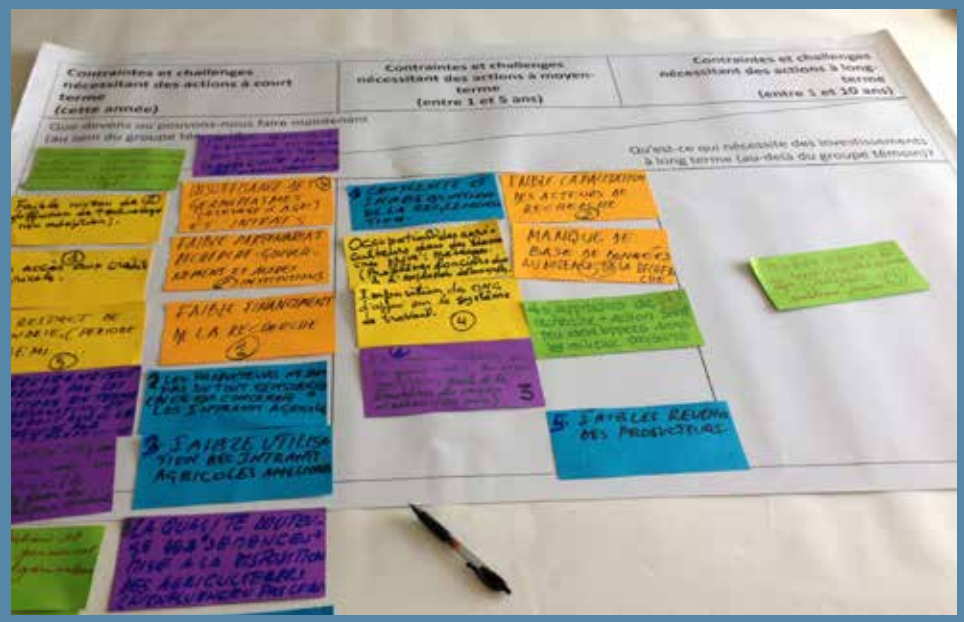


PHOTO 24 RAAIS workshop participants in DR Congo subdivide between constraints and challenges that require short-, medium- or long-term interventions. PHOTO: M. SCHUT

Time	25 minutes
Activity	Categorising the constraints and challenges in three categories (see Photo 24): • Constraints and challenges that require short-term interventions or actions (< 1 year). • Constraints and challenges that require medium-term interventions or actions (1-5 years). • Constraints and challenges that require long-term interventions or actions (> 5 years).
Objectives	To subdivide between constraints and challenges that can be addressed within a relatively short term and those that require more medium- and long-term efforts.
Role of facilitator	Facilitate and animate discussion between participants, ensure that stakeholder groups think critically about how they categorise their group's constraints and challenges.
Materials needed	• Pre-printed flipchart • Coloured cards • Guide for note-taking (see Section 6.1) • Camera
Potential challenges	Participants feel that all constraints and challenges require short-term action: facilitator should explain that it is about the time that addressing the constraints and challenges will take.
Session materials	Download: www.wageningenur.nl/raais-toolkit (see also page 122).

SESSION 12

Identifying different types of (R4D) domains that can support addressing the constraints

PHOTO 25 RAAIS workshop participants in China subdivide between constraints and challenges that require productivity innovation, natural resource management innovation, institutional innovation, or gender, nutrition and other innovations.

PHOTO: M. SCHUT

Time	30 minutes
Activity	Subdivide the constraints and challenges under R4D categories (see Photo 25): • Productivity innovation • Natural resource management innovation • Institutional innovation • Other (gender and nutrition innovation and so on)
Objectives	To subdivide constraints and challenges over the four R4D categories.
Role of facilitator	Facilitate and animate discussion between stakeholders. In this session, cards must be subdivided over the five categories. Each of the stakeholder groups positions their own cards under the five categories. This can be followed by a short discussion among the workshop participants.
Materials needed	• Pre-printed flipchart • Coloured cards • Guide for note-taking (see Section 6.1) • Camera
Potential challenges	Participants feel that constraints require more than one category: they should select the most appropriate category.
Session materials	Download: www.wageningenur.nl/raais-toolkit (see also page 123). Video Clip: www.youtube.com/watch?v=75kTC-GhAhA

Prioritising constraints under different R4D domainsby different gender groups

SESSION 13A

PHOTO 26 Female participants discuss and prioritise constraints and challenges during a RAAIS workshop in Ghana. PHOTO: M. SCHUT

Time	45 minutes
Activity	Male and female groups (see Photo 26) separately prioritise the constraints under the different research categories: • Productivity innovation • Natural resource management innovation • Institutional innovation • Other (gender and nutrition innovation, and so on)
Objectives	To gain insight into men's and women's priorities of constraints under the different R4D categories.
Role of facilitator	For this exercise, two sets of cards are needed as men and women will be prioritising the constraints and challenges separately. During the coffee break or lunch, the facilitator writes a second set of coloured cards (same colours, same constraints, same numbering) so that the two sets of constraints are identical. He/she facilitates and animates discussion between stakeholders. In this session, cards must be subdivided over the categories. Stakeholders collectively prioritise the cards under the categories. This can be followed by a short discussion among the workshop participants.
Materials needed	• Pre-printed flipchart • Coloured cards (2 sets of cards) • Guide for note-taking (see Section 6.1) • Camera
Potential challenges	Disagreement between stakeholders: facilitator animates the discussion in order to reach consensus.
Session materials	Download: www.wageningenur.nl/raais-toolkit (see also page 124-125).

Prioritising the Top 3 constraints under different R4D domains by women and men together

SESSION 13B

PHOTO 27 RAAIS workshop participants in Rwanda prioritise constraints and challenges under the different R4D domains. PHOTO: M. SCHUT

Time	45 minutes
Activity	Prioritise the constraints under the different research categories: • Productivity innovation • Natural resource management innovation • Institutional innovation • Gender, nutrition and other innovations (see Photo 27)
Objectives	To prioritise constraints and challenges over the four/five research categories.
Role of facilitator	Facilitate and animate discussion between stakeholders. In this session, cards must be subdivided over the categories. Stakeholders collectively prioritise the cards under the categories. This can be followed by a short discussion among the workshop participants.
Materials needed	• Pre-printed flipchart • Coloured cards • Guide for note-taking (see Section 6.1) • Camera
Potential challenges	Disagreement between stakeholders: facilitator animates the discussion in order to reach consensus.
Session materials	Download: www.wageningenur.nl/raais-toolkit (see also page 126).

Developing action plans

SESSION 14

PHOTO 28 RAAIS workshop participants in China working on action plans for productivity, natural resource management and institutional innovation for more diversified rubber production. PHOTO: M. SCHUT

Time	180 minutes
Activity	Identify subgroups: who wants to commit to the different Entry Points? (30 minutes). In subgroups (see Photo 28): develop work plans to address the prioritised constraints and challenges relating to: • Productivity innovation • Natural resource management innovation • Institutional innovation • Gender, nutrition and other innovation Work in small groups (90 minutes). Present work plan in plenary session (60 minutes).
Objectives	For participants to develop concrete work plans aimed at addressing prioritised constraints relating to the Entry Theme.
Role of facilitator	Facilitate and animate discussion between stakeholders, ensure that a designated person is taking notes of the discussion, support work in small groups.
Materials needed	• Pre-printed templates • Coloured cards • Guide for note-taking (see Section 6.1) • Camera
Potential challenges	Participants require more time to finalise the action plans to address the constraints and challenges.
Session materials	Download: www.wageningenur.nl/raais-toolkit (see also page 127-128).

6.1 RAAIS workshop guide for note-taking

To facilitate note-taking during the RAAIS workshop, a detailed guide for note-taking was developed. The guide captures quantitative data as well as stakeholder debate and discussions (see Photo 29). It is advisable for a designated person (not the workshop facilitator and not a workshop participant) to take notes. Discussions during sessions 13 and 14 can be recorded using a voice recorder. The guide for note-taking can be downloaded here: www.wageningenur.nl/raais-toolkit

Depending on the specific Entry Theme, objective and scope of the RAAIS, workshop sessions can be added or left out.

6.2 RAAIS workshop analysis tools

For each of the RAAIS workshop sessions, an analysis template has been developed (see Figure 5). This Excel spreadsheet facilitates basic quantitative analysis of the workshop results for each of the sessions. Results can be fed back to the workshop participants for validation and discussion. The Excel template spreadsheet can be downloaded here: www.wageningenur.nl/raais-toolkit

FIGURE 5 Screen shot of RAAIS workshop analysis tool.

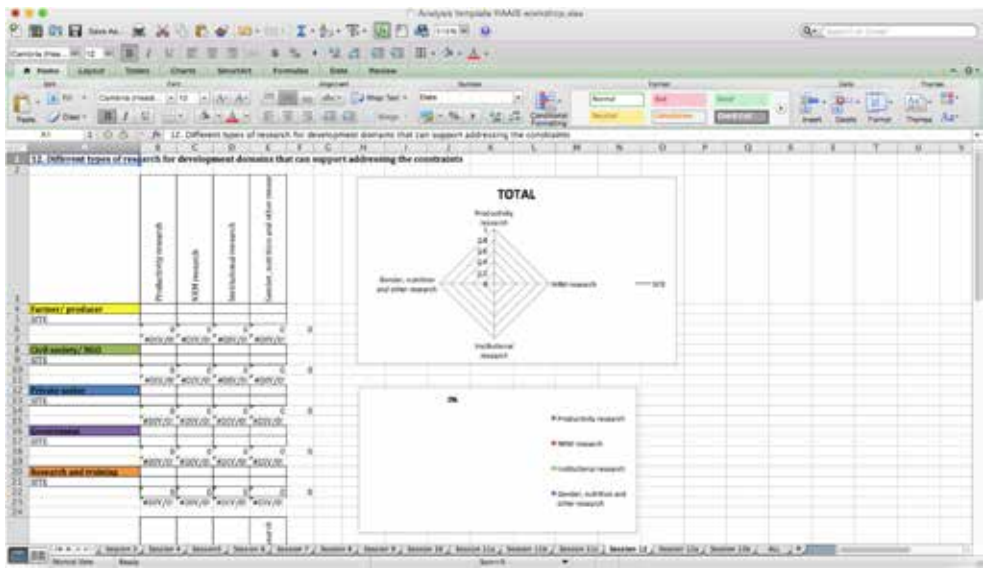
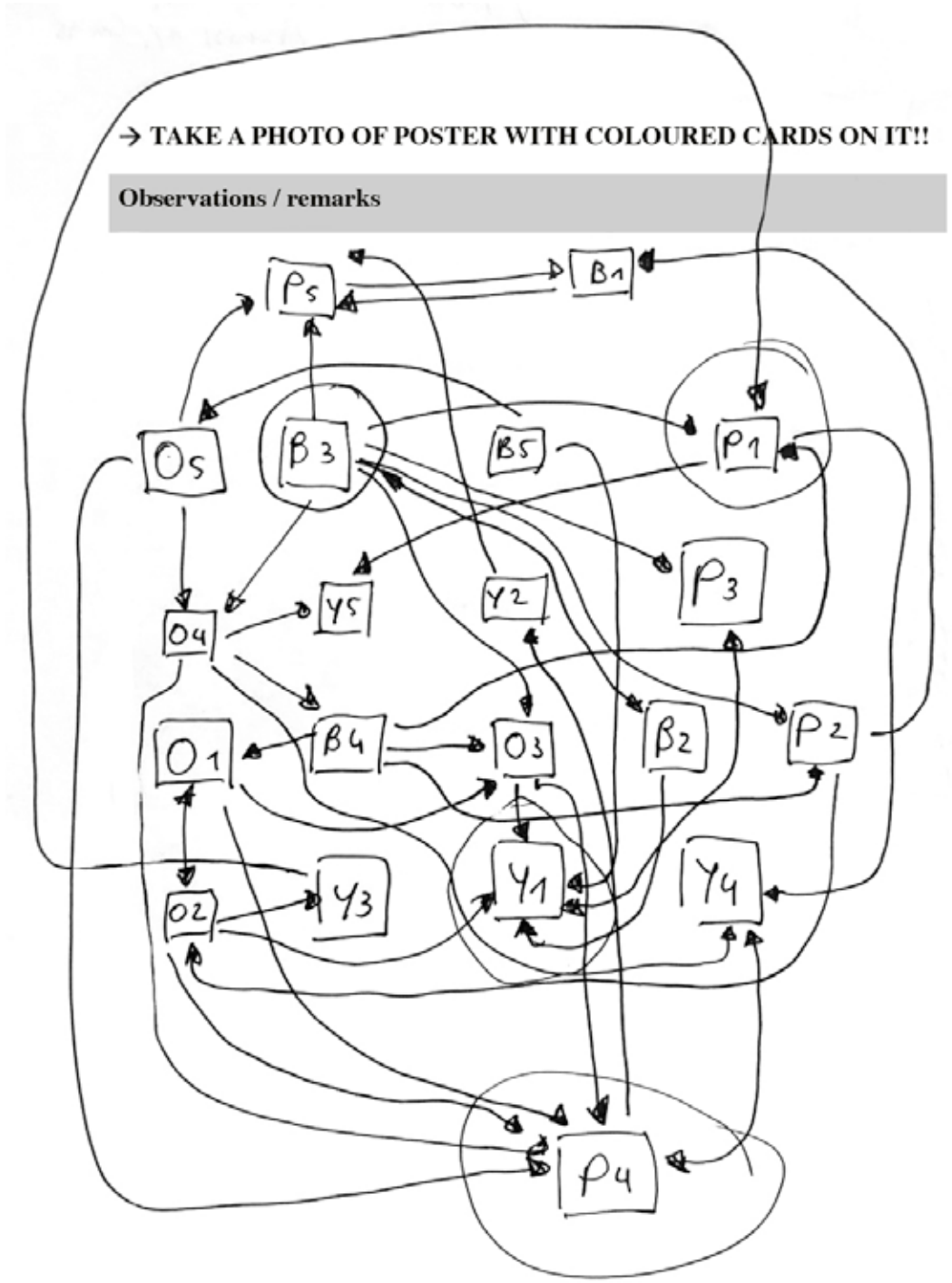


PHOTO 29 An example of how the guide for note-taking supports the capturing of workshop sessions and discussions. PHOTO: M. SCHUT



6.3 RAAIS post-workshop questionnaire

To assess RAAIS workshop participants' appreciation of the workshops implemented under Humidtropics, a post-workshop questionnaire was developed.

The questionnaire includes questions relating to:

1. General impression of the workshop?
2. What was the best element of the workshop?
3. What element(s) of the workshop need improvement?
4. Did participants feel free to express their opinion and ideas?
5. Did participants feel that different stakeholder groups were well represented in the workshop?
6. What are your main objectives for participating in the Humidtropics R4D platform?
7. What type(s) of activities should the Humidtropics R4D platform organise in order to be successful?
8. Are you willing to invest your own time and resources in participating in the Humidtropics R4D platform activities?
9. Who should lead the Humidtropics R4D platform?
10. Any other remarks/comments.

The RAAIS post-workshop questionnaire template can be downloaded here: www.wageningenur.nl/raais-toolkit

7

Reflexive monitoring and evaluation (M&E)

PHOTO 30 Reflection meeting in Gitega, Burundi in January 2015. PHOTO: M. SCHUT

7.1 RAAIS as a tool for Reflexive M&E

RAAIS workshops, and also surveys, present a rather static picture of the complex agricultural problem under review and the innovation capacity of the agrifood system in which the problem is embedded. However, initial RAAIS workshops and surveys can function as a baseline against which to compare future workshops and surveys.

In Burundi, Rwanda and DR Congo – where RAAIS workshops were organised in 2014 to identify Entry Points for innovation for sustainable intensification of agrifood systems – reflection meetings were organised in January 2015 (see Photo 30). Similar stakeholder groups as those participating in the first RAAIS workshops were involved in the reflection meetings. RAAIS baseline data were used to:

1. Reflect on the extent to which the project/program was working on demands or needs of different stakeholder groups as identified during RAAIS;

2. Assess whether current interventions align with the major on-site challenges as prioritised during RAAIS;

3. Ascertain the extent to which the implementation of RAAIS action plans had been successful in addressing project/program objectives and outcomes.

Additional information on how such reflexive M&E activities could be organised is presented below.

Responsiveness of R4D interventions to address the Top 5 challenges of different stakeholder groups identified during RAAIS

M&E ACTIVITY 1

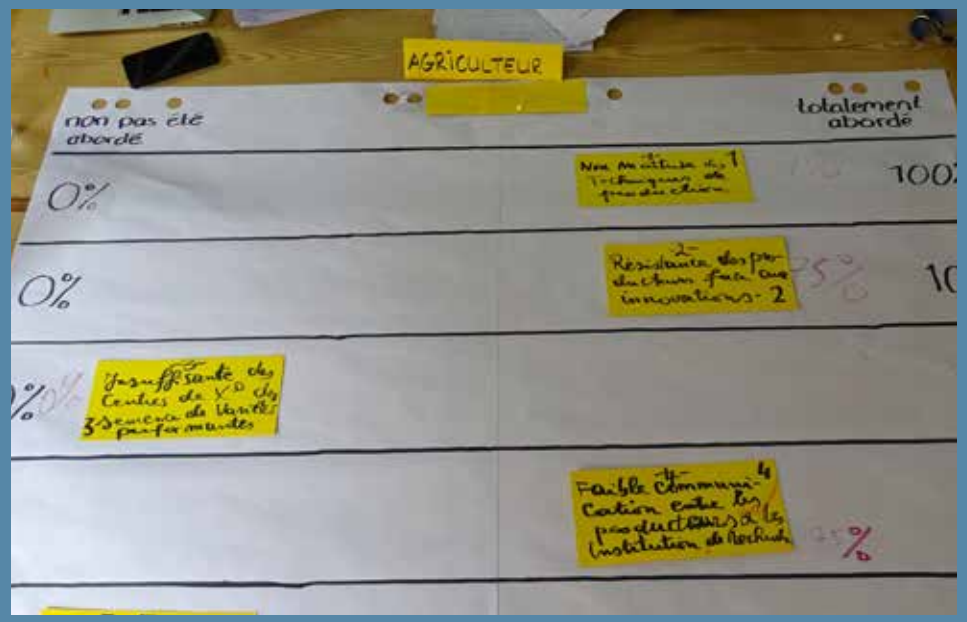


PHOTO 31 Farmer participants in an M&E reflection workshop in Burundi rank the extent to which R4D activities implemented respond to their needs and interests identified during the RAAIS workshop. PHOTO: M. SCHUT

Time	45 minutes
Activity	Participants are in homogeneous groups (farmers, NGOs, private sector, government and researchers). Each group receives five cards listing the challenges for their stakeholder group as identified previously by the RAAIS. The groups discuss the extent to which R4D interventions are currently targeting/or planning to target these challenges and, based on this, stakeholders locate the cards on a flipchart with five gradients starting at 0% (not targeted at all) and ending with 100% (fully targeted). After placing each of the five challenges on one of the rows, the group indicates on the flipchart the percentages of their challenges being targeted by Humidtropics' interventions (see Photo 31). After completing this exercise, the whole group passes by each table, and the different flipcharts are presented and explained. Questions to stimulate reflection may focus on why certain challenges/challenges of specific stakeholder groups are more or less targeted.
Objectives	To visualise and increase awareness and reflectivity on the responsiveness/demand-drivenness of current interventions to the needs and challenges identified by different stakeholder groups
Role of facilitator	Explain assignment and hand out flipcharts, markers and cards with challenges. Walk around answering questions and giving support when needed. Keep time: after 20 minutes of discussion in homogeneous groups, ask groups to write percentages and present flipcharts. Facilitate plenary discussion (e.g. ask questions on how certain challenges/challenges of specific stakeholder groups are more or less targeted).
Materials needed	Flipcharts (1 for each stakeholder group, see Photo 31); Markers; Cards with challenges as identified by the RAAIS; Camera ; Voice recorder (record presentations)
Potential challenges	• Lack of representation of certain stakeholder groups • Participants take very long to decide on percentages • Certain members in group dominate
Session materials	Download: www.wageningenur.nl/raais-toolkit (see also page 129) Video Clip: www.youtube.com/watch?v=hunY_ZbFhoM

Responsiveness of R4D interventions to site-specific challenges prioritised by stakeholders during the RAAIS workshop

M&E ACTIVITY 2

PHOTO 32 Participants in an M&E reflection workshop in Burundi assess the extent to which R4D activities respond to site-specific priorities identified during the RAAIS workshop. PHOTO: M. SCHUT

Time	45 minutes
Activity	This is a plenary exercise. A big flipchart with a table showing all Humidtropics interventions (including the platform itself) against the site-specific priorities as identified during RAAIS. One by one, participants should discuss the activities and evaluate whether, and if yes, how much, this activity is currently addressing or planned to address the site-specific priorities. Participants should put 0, 1, 2 or 3 crosses in each cell of the flipchart (see Photo 32). One of the meeting organisers enters the data in Excel and adds percentages for the relative impact of each activity on the site-specific priorities as well as the relative impact on each site-specific priority. The results can be briefly discussed.
Objectives	To assess whether current R4D interventions align with the major on-site challenges identified and prioritised by participants in the RAAIS workshops.
Role of facilitator	Explain exercise (especially explain very well that participants should indicate how much each activity is currently addressing or is planned to address each site-specific priority. Thus, what is the actual situation and what is already in the pipeline, NOT what is 'possible' but not yet happening/planned!?). Facilitate discussion and keep it moving when people elaborate too much on one example, remind participants to evaluate actual rather than potential targeting of site-specific priorities, and ask questions to check why they have decided on a certain number of crosses, engage those participants that keep silent.
Materials needed	• Flipchart with table with all Humidtropics interventions vis-à-vis the regions priorities • Markers; Camera; Computer with Excel sheet for entering data and calculating percentages
Potential challenges	• Lack of representation of participants involved in certain trials/interventions • Discussions take very long • Participants evaluate potential targeting • Participants are not aware of the activities and because of that have difficulty completing the exercise
Session materials	Download: www.wageningenur.nl/raais-toolkit (see also page 130). Video Clip: www.youtube.com/watch?v=1khYW4yROdw

Expected impact of implementation of RAAIS action plans and R4D activities on the project /program's objectives

M&E ACTIVITY 3

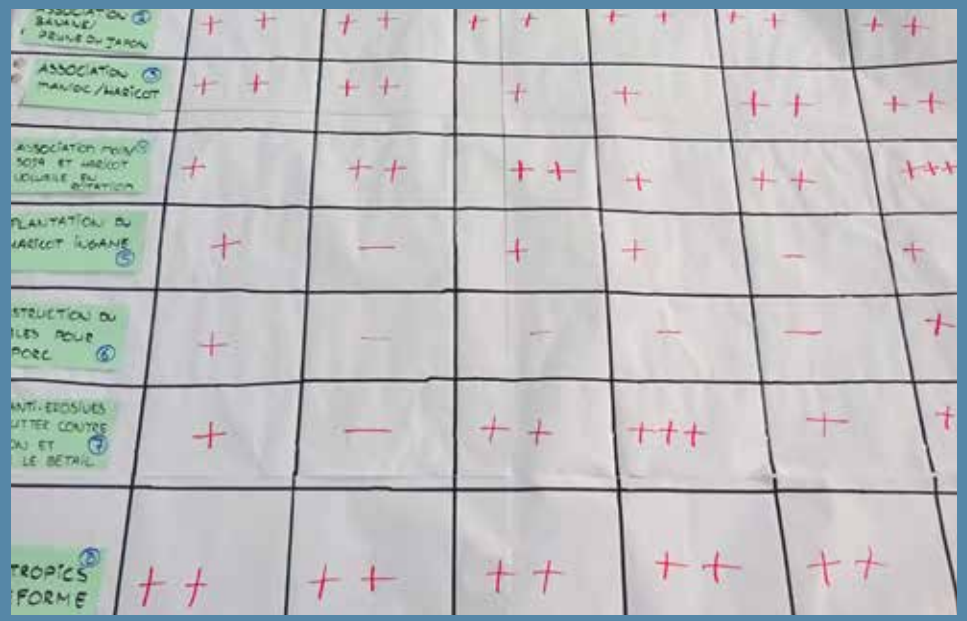


PHOTO 33 Participants in an M&E reflection workshop in Burundi assess the extent to which implemented R4D activities respond to the objectives of the research/ development project or program (in this case, Humidtropics). PHOTO: M. SCHUT

Time	45 minutes
Activity	This is a plenary exercise using a big flipchart with a table showing all R4D interventions (including the platform itself) vis-à-vis the project/program's objectives or outcomes. One by one, participants discuss the activities and evaluate whether, and if yes, how much, this activity currently impacts or is planned to impact the different types of objectives or outcome. They should indicate this on the flipchart by putting 0, 1, 2 or 3 crosses in each cell. This session is not followed by a plenary discussion/reflection.
Objectives	• To assess participants' perception of targeting the intermediate development outcomes (IDOs) with the current activities • To visualise which interventions target which IDOs, as well as to what extent, according to the participants • To visualise which IDOs are insufficiently covered
Role of facilitator	Explain exercise (especially explain very well that participants should indicate how much each activity is currently addressing or is planned to address each site-specific priority. Thus, what is the actual situation and what is already in the pipeline, NOT what is 'possible' but not yet happening/planned!?). Facilitate discussion and try to keep it moving when people are elaborating a lot on one example or activity. Remind participants to evaluate actual rather than potential targeting of site-specific priorities and ask questions to check why they have decided on a certain number of crosses. Engage those participants that keep silent.
Materials needed	• Flipchart with table showing all Humidtropics interventions vis-à-vis the IDOs (see Photo 33) • Camera; Markers; Voice recording/guide for note-taking (see section 6.1)
Potential challenges	Participants are not aware of certain interventions/activities
Session materials	Download: www.wageningenur.nl/raais-toolkit (see also page 131)

8

Reflection on experiences with RAAIS

'If this is what learning is, then it is so easy'

This is how a farmer reflected on the Humidtropics RAAIS workshop held in Kumasi, Ghana, in April 2015. Although RAAIS was well received, generated energy and enthusiasm, and was picked up by different projects and organisations, we also reflected on where the toolkit could be improved. We elaborate on this in the below sections.

RAAIS was developed and tested as part of the PARASITE program to identify and analyse constraints and opportunities for innovation to effectively address parasitic weeds in rain-fed rice production systems in Tanzania (April-October 2012) and Benin (June-August 2013). The results from the RAAIS in Tanzania are elaborated in Schut et al. (2015c). Comparative analysis of RAAIS in Tanzania and Benin can be found in Schut et al. (2015b). Data were gathered across national, zonal, regional and district levels. Multi-stakeholder workshops (with 68 participants in Tanzania and 66 participants in Benin) were organised in three study sites (districts) in Tanzania and Benin where parasitic weeds are endemic. In-depth interviews were held with representatives of national, zonal, regional and district level farmer cooperatives and associations, government, the private sector, NGO/civil society, and research and training institutes (42 in Tanzania, 65 in Benin). Across the three study sites in the two countries, a socio-economic farmer survey (152 in Tanzania, 182 in Benin) was conducted to study the impact of parasitic weeds on rain-fed rice farming (see N'cho et al., 2014 for more information). In Tanzania, a farmer-extensionist survey (120 farmers, 30 agricultural extension officers) was conducted to explore the effectiveness of the national agricultural extension policy across the three study sites (see Daniel, 2013 for more information). Additionally, for both countries, secondary data including crop protection, extension and general agricultural policy, national research priorities, agricultural censuses and agricultural training curricula were analysed. Data gathering and initial analysis took around three months for each of the countries and involved two researchers. We first conducted the in-depth interviews, followed by the multi-stakeholder workshops. In Tanzania, both the socio-economic farmer survey and the farmer-extensionist survey were conducted after the interviews and workshops. In Benin, the socio-economic farmer survey was conducted preceding the in-depth interviews and workshops. Secondary data collection occurred throughout the fieldwork in Tanzania and Benin.

TABLE 7 Overview of stakeholder groups targeted during RAAIS workshops in Burundi, Rwanda and DR Congo.

Study site and country	Location	Date	Stakeholder groups targeted (sample size)					
			Farmers	NGO/civil society	Private sector	Government	Research and training	Total
Gitega, Burundi	Helena Hotel, Gitega	26-02-2014	4	5	4	5	6	24
Kadahenda and Kayonza, Rwanda	Rwanda Agricultural Board provincial headquarters, Musanze	03-03-2014	3	3	1	5	7	19
	Dereva Hotel, Rwamagana	04-03-2014	6	2	3	2	5	18
Ngweshe, DR Congo	IITA Research Station, Kalambo	28-02-2014	4	6	3	3	6	22

RAAIS workshops were held under the CGIAR Research Program Humidtropics in February and March 2014 in Burundi, Rwanda and DR Congo (Table 7), in Cameroon, Nigeria and Ghana (in May 2014 and April 2015) and in China (in November 2014).

Below, we further reflect on the main objectives of RAAIS, as well as provide recommendations for further improvements and uses of RAAIS.

8.1 RAAIS' ability to provide specific Entry Points for innovation to address complex agricultural problems

RAAIS contributed to an integrated understanding of different problem dimensions, multi-level interactions and multi-stakeholder dynamics relating to parasitic weed problems. With regard to the different problem dimensions, interviews held under the PARASITE program demonstrated a potential relation between, for example, the preference for growing local, aromatic rice varieties (socio-cultural dimension), farmers' low capacity to purchase certified seeds (economic dimension) and the spread of parasitic weed seeds through the local rice seed system (technological dimension) (Rodenburg et al., 2015). Additionally, analysis of workshop data revealed how the untimely and insufficient availability of agricultural inputs provided by the government (institutional dimension) and limited interaction and collaboration among networks of key stakeholders (political dimension) form additional bottlenecks for addressing such problems. It created awareness that describing and explaining complex agricultural problems, and exploring and designing solutions, are unlikely to be successful if the different problem dimensions are analysed and treated separately (Hall and Clark, 2010; Spielman et al., 2009).

Gathering data across different levels (national, regional and district) enabled the analysis of the interactions and (mis)matches between different levels (Cash et al., 2006). An example that emerged during the PARASITE program RAAIS workshops and the interviews is Tanzania's national export ban, which prohibits the export of agricultural produce (e.g. rice) if the country has not been declared 'food secure.' This national export ban influences local market prices, and, consequently, also farmers' willingness and ability to invest in, for example, purchasing agricultural inputs such as fertilisers and seeds (e.g. Poulton et al., 2010). This, in turn, provided an opportunity for RAAIS to find Entry Points for innovation across different levels – a procedure that has been identified as a critical factor for addressing complex agricultural problems (e.g. Giller et al., 2008; 2011). As expected, and confirming previous reports (e.g. van Mierlo et al., 2010), the participatory analysis of multi-level interactions showed that stakeholders (insiders) often frame constraints and challenges at the level they represent (Schut et al., 2015c). This was complemented by our analysis as researchers (outsiders) of the multi-level interactions regarding the parasitic weed problem.

PHOTO 34 Humidtropics' partners monitor the growth of an improved common field bean variety grown in rotation with maize-soybean intercrop in Eastern Rwanda. PHOTO: A.N. HERO

The involvement of different groups of stakeholders was essential for enhancing the credibility, validity and quality of RAAIS, as well as for delineating the boundaries of the agrifood system and the agricultural innovation system, all of which are considered key challenges when AIS approaches are being used to analyse complex agricultural problems (Klerkx et al., 2012b). Furthermore, stakeholder participation provided a better understanding of the feasibility and acceptability of solutions for stakeholder groups. Under Humidtropics, RAAIS created the starting point for the implementation of R4D activities in Burundi, Rwanda and DR Congo,

aimed at improving soil fertility (see Photo 34). Working on constraints prioritised by stakeholders, and trying to address them through jointly designed R4D activities, stimulated engagement and provided a basis for collective action.

Although we believe that the stakeholder groups included under PARASITE and Humidtropics (see e.g. Table 7) provide a good starting point for conducting RAAIS, other stakeholder groups (for instance the media, religious groups) can be relevant depending on the specific Entry Theme (e.g. Ortiz et al., 2013) and depending on the type of complex agricultural problem under review. The triangulation of data resulting from the different methods enabled us to validate stakeholders' strategic communication, for instance to verify how the extension system as described by policymakers in interviews functioned in reality according to surveyed farmers. Triangulation was also important to validate findings, such as the relation between poor road infrastructure in Morogoro and Songea and constraints relating to market access and the performance of the extension system, which were identified in RAAIS workshops and interviews under the PARASITE program.

8.2 RAAIS' ability to provide generic Entry Points for interventions to enhance innovation capacity

RAAIS reveals interactions between complex agricultural problems, the innovation capacity of the agrifood system and the agricultural innovation system. An example from the PARASITE program shows how applying fertiliser in rain-fed rice production is seen as a promising management strategy to reduce infection levels of parasitic weeds and mitigate negative effects of the parasite on rice yields (Rodenburg et al., 2011). However, as was highlighted during the RAAIS workshops in both Benin and Tanzania, fertilisers are difficult to access in rural areas. In Benin, there is no well-developed private agri-dealer network and distribution infrastructure to support the supply of agricultural inputs. Furthermore, interviews showed that the public extension and input supply systems in Benin focus on the cotton sector, rather than on cereal crops – a clear institutional constraint that applies to problems other than parasitic weeds. Another example is that, in Tanzania, a private agri-dealer network and distribution infrastructure exists, but structures controlling the quality of fertilisers are functioning sub-optimally according to interviewed government officials. In some areas, fake agri-inputs are dominating

the market, resulting in a limited trust and willingness to invest in applying fertiliser, according to farmer representatives who participated in the workshops. The example shows how the absence or poor performance of fertiliser distribution infrastructure, limited farmer-extensionist interaction and lack of functional institutions for quality control (being structural conditions for innovation) hamper the innovation capacity in the agrifood system and its technological dimension (in this case fertiliser) and rice value chain dynamics. Another example is based on secondary data analyses that demonstrated the absence of an operational policy strategy to address parasitic weeds in Tanzania and Benin. In both the interviews and the workshops, stakeholders highlighted the general lack of interaction and collaboration between stakeholders in the agricultural sector (being a structural condition for innovation) as one of the main reasons for the absence or poor implementation of parasitic weed and other agricultural policies and strategies.

The aforementioned examples demonstrate how RAAIS can support the identification of generic Entry Points for innovation. Such innovations can directly contribute to addressing the complex agricultural problem under review, but can also have a spill-over effect in terms of addressing broader constraints that hamper the innovation capacity in the agrifood system. For example, the lack of stakeholder interactions and collaboration in the agrifood system can provide an Entry Point for the adaptation of the structural conditions in the broader agricultural innovation system, for example through investments in innovation brokers or multi-stakeholder platforms (Kilelu et al., 2013; Klerkx et al., 2010). Under Humidtropics, such platforms were established in each of the action sites to tackle Entry Theme specific as well as more generic complex agricultural problems.

8.3 Lessons learnt from applying RAAIS and recommendations for further improvement

On the basis of our initial experiences with RAAIS in Tanzania and Benin, we recommend conducting RAAIS in an interdisciplinary team of researchers with expertise on different dimensions of complex agricultural problems and different data collection methods (Hulsebosch, 2001). Other suggestions include experimentation with other combinations of methods, and on different types of complex agricultural problems. The workshop methodology could be made more interactive, in the sense of directly feeding back results of the sessions to participants to

stimulate reflection and validate analyses during the workshops. During the Humidtropics RAAIS workshop in Ghana in April 2015, we experimented positively with providing workshop participants direct feedback on the outcome of certain sessions (Figure 6).

As discussed in Section 7, the RAAIS multi-stakeholder workshops, but also the RAAIS surveys, present a rather static picture of complex agricultural problems and the innovation capacity of the agrifood system in which these problems are embedded. However, initial workshops and surveys can function as a baseline against which future workshops and surveys can be compared. Other methods such as secondary data analysis or in-depth interviews present a more dynamic image of how, for example, collaborations between stakeholders evolve over the years. Under Humidtropics, we started organising M&E reflection workshops to explore the extent to which stakeholder constraints and opportunities for innovation identified under RAAIS have been addressed through R4D activities (see Section 7). If such reflection workshops are repeated over time, they provide a good picture of stakeholders' assessment of whether R4D activities are responding to stakeholder needs and to prioritised site-specific constraints and challenges.

Our experiences show that ensuring social differentiation among workshop participants, interviewees and survey respondents (e.g. of different gender and age) was challenging, as, for example, the majority of workshop participants were male. Through direct feedback, the participation of gender and age groups can be discussed during the workshop (Figure 7).

The facilitation of the multi-stakeholder workshops ensured that different stakeholder groups could raise and discuss their ideas (Hulsebosch, 2001). Despite such efforts, unequal power relations and differences in ability to debate and negotiate that inherently exist between groups may have played a role. In line with our expectations, politically sensitive issues were more freely discussed in individual interviews than in a multi-stakeholder setting. Post-workshop questionnaires could provide additional insight into whether stakeholders felt that they could freely raise and discuss their ideas and needs. Such post-workshops questionnaires have been applied following RAAIS workshops held under Humidtropics. An example of the RAAIS post-workshop questionnaire can be found in Section 6.3.

FIGURE 6 Slide presented during the RAAIS workshop in Ghana with the objective of triggering discussion about structural constraints for innovation to intensify and diversify cocoa-based systems.

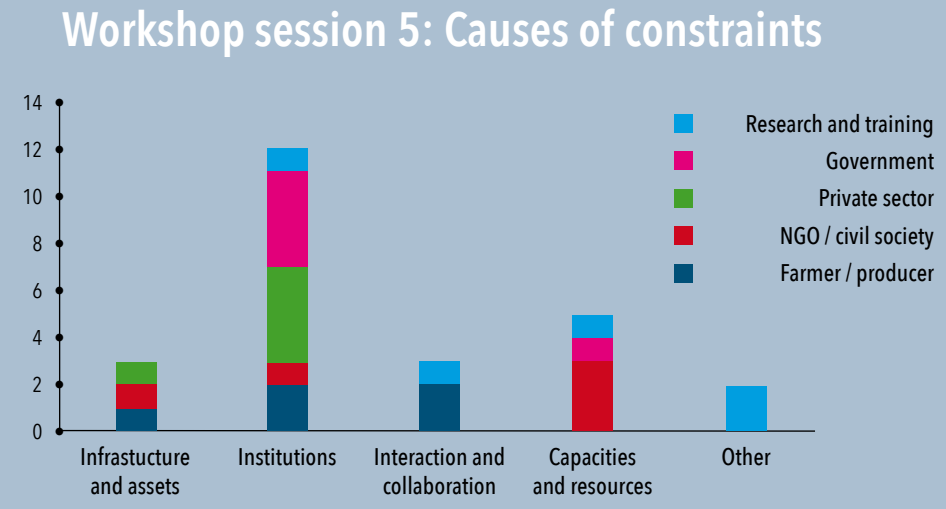
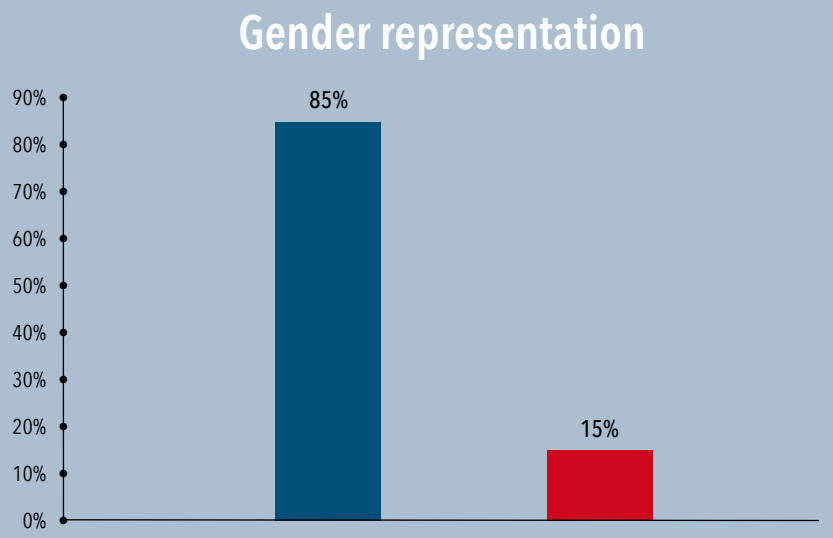


FIGURE 7 Slide presented during the RAAIS workshop in Ghana with the objective of triggering discussion about the representation of men and women in agricultural R4D activities.



The combination of different methods is essential. In terms of the sequence of data collection methods, we recommend first conducting and analysing the RAAIS multi-stakeholder workshops to identify constraints and challenges, and subsequently conducting the in-depth interviews and surveys that can provide more in-depth insight into the distribution and underlying root causes of these constraints and challenges. The workshops then provide a fast-track approach to identifying Entry Points for innovation that can subsequently be validated and explored in more detail using the in-depth interviews and the stakeholder surveys. This would furthermore increase the 'rapidness' of RAAIS as a diagnostic tool.

9

Reference materials

9.1 Scientific papers published in peer-review journals

Schut, M., Klerkx, L., Rodenburg, J., Kayeke, J., Raboanarielina, C., Hinnou, L.C., Adegbola, P.Y., van Ast, A., Bastiaans, L., 2015. RAAIS: Rapid Appraisal of Agricultural Innovation Systems (Part I). A diagnostic tool for integrated analysis of complex problems and innovation capacity. Agricultural Systems 132, 1-11. Available online (open access): www.sciencedirect.com/science/article/pii/S0308521X14001115

Schut, M., Rodenburg, J., Klerkx, L., Kayeke, J., van Ast, A., Bastiaans, L., 2015. RAAIS: Rapid Appraisal of Agricultural Innovation Systems (Part II). Integrated analysis of parasitic weed problems in rice in Tanzania. Agricultural Systems 132, 12-24. Available online: www.sciencedirect.com/science/article/pii/S0308521X14001255

Schut, M., Rodenburg, J., Klerkx, L., Hinnou, L.C., Kayeke, J., Bastiaans, L., 2015. Participatory appraisal of institutional and political constraints and opportunities for innovation to address parasitic weeds in rice. Crop Protection 74, 158-170. Available online: www.sciencedirect.com/science/article/pii/S0261219415300132

9.2 RAAIS Humidtropics workshop reports

Schut, M., L. C. Hinnou, 2014. Rapid Appraisal of Agricultural Innovation Systems (RAAIS) workshops Burundi, DR Congo, and Rwanda. Wageningen University (WUR) and International Institute for Tropical Agriculture (IITA). March 2014, pp. 128.

Hinnou, L. C., L. Idrissou and M. Schut, 2014. Rapid Appraisal of Agricultural Innovation Systems (RAAIS) workshop. Cameroun Action Site. International Institute of Tropical Agriculture (IITA) and Wageningen University (WUR). May 2014, pp. 29.

Hinnou, L. C., L. Idrissou and M. Schut, 2014. Rapid Appraisal of Agricultural Innovation Systems (RAAIS) workshop. Nigeria Action Site. International Institute of Tropical Agriculture (IITA) and Wageningen University (WUR). May 2014, pp. 19.

Schut, M., J. Hammond and X. Yang, 2014. Rapid Appraisal of Agricultural Innovation Systems (RAAIS) workshop Xishuangbanna, China. Wageningen University (WUR), International Institute for Tropics Agriculture (IITA) and ICRAF. November 2014, pp. 52.

Schut, M., R. Asare, L. Idrissou and M. Alasan Dalaa, 2015. Rapid Appraisal of Agricultural Innovation Systems (RAAIS) workshop Action Ghana. CGIAR Research Program on Integrated Systems for the Humid Tropics. Wageningen University (WUR) and International Institute for Tropics Agriculture (IITA). April 2015, pp. 46.

9.3 RAAIS blog-post and media

- humidtropics.cgiar.org/participatory-diagnostic-tool-to-analyze-complex-agricultural-problems
- twitter.com/marc_schut/status/530373379304353794

References

Amankwah, K., Klerkx, L., Oosting, S.J., Sakyi-Dawson, O., van der Zijpp, A.J., Millar, D., 2012. Diagnosing constraints to market participation of small ruminant producers in northern Ghana: An innovation systems analysis. NJAS, Wageningen Journal of Life Sciences 60-63, 37-47.

Basu, S., Leeuwis, C., 2012. Understanding the rapid spread of System of Rice Intensification (SRI) in Andhra Pradesh: Exploring the building of support networks and media representation. Agricultural Systems 111: 34-44.

Beintema, N., Stads, G.-J., Fuglie, K., Heisey, P., 2012. ASTI Global Assessment of Agricultural R&D Spending. International Food Policy Research Institute, Washington DC, Agricultural Science and Technology Indicators, Rome, Italy and the Global Forum on Agricultural Research, Rome, Italy.

Blay-Palmer, A., 2005. Growing innovation policy: the case of organic agriculture in Ontario, Canada. Environment and Planning C: Government and Policy 23: 557-581

Carlsson, B., Jacobsson, S., Holmén, M., Rickne, A., 2002. Innovation systems: analytical and methodological issues. Research Policy 31: 233-245.

Carlsson, B., Stankiewicz, R., 1991. On the nature, function and composition of technological systems. Journal of Evolutionary Economics 1: 93-118.

Cash, D.W., Adger, W.N., Berkes, F., Garden, P., Lebel, L., Olsson, P., Pritchard, L., Young, O., 2006. Scale and cross-scale dynamics: governance and information in a multilevel world. Ecology and Society 11, 8. www.ecologyandsociety.org/vol11/iss12/art18

Chung, C.C., 2012. National, sectoral and technological innovation systems: The case of Taiwanese pharmaceutical biotechnology and agricultural biotechnology innovation systems (1945-2000). Science and Public Policy 39: 271-281.

Cooke, P., Uranga, M.G., Etxebarria, G., 1997. Regional innovation systems: Institutional and organisational dimensions. Research Policy 26: 475-491.

Daniel, E., 2013. Assessment of agricultural extension services in Tanzania. A case study of Kyela, Songea Rural, and Morogoro Rural Districts. Wageningen University and Research Centre/ Africa Rice Center, Wageningen, the Netherlands/Dar es Salaam, Tanzania: 45.

Douthwaite, B., Kuby, T., van de Fliert, E., Schulz, S., 2003. Impact pathway evaluation: an approach for achieving and attributing impact in complex systems. Agricultural Systems 78: 243-265.

Engel, P.G.H., 1995. Facilitating innovation: an action-oriented approach and participatory methodology to improve innovative social practice in agriculture. Wageningen University, Wageningen, the Netherlands: 300.

Faysse, N., 2006. Troubles on the way: An analysis of the challenges faced by multi-stakeholder platforms. Natural Resources Forum 30: 219-229.

Freeman, C., 1988. Japan: a new national innovation system?, in: Dosi, G., Freeman, C., Nelson, R., Soete, T. (Eds.), Technology and Economic Theory, London: 330-348.

Freeman, C., 1995. The national system of innovation in historical perspective. Cambridge Journal of Economics 19: 5-24.

Funtowicz, S.O., Ravetz, J.R., 1993. Science for the post-normal age. Futures 25: 739-755.

Gildemacher, P.R., Kaguongo, W., Ortiz, O., Tesfaye, A., Woldegiorgis, G., Wagoire, W.W., Kakuhenzire, R., Kinyae, P.M., Nyongesa, M., Struik, P.C., Leeuwis, C., 2009. Improving Potato Production in Kenya, Uganda and Ethiopia: A System Diagnosis. Potato Research 52: 173-205.

Giller, K.E., Leeuwis, C., Andersson, J.A., Andriesse, W., Brouwer, A., Frost, P., Hebinck, P., Heitkönig, I., van Ittersum, M.K., Koning, N., Ruben, R., Slingerland, M., Udo, H., Veldkamp, T., van de Vijver, C., van Wijk, M.T., Windmeijer, P., 2008. Competing claims on natural resources: what role for science? Ecology and Society 13: 34. www.ecologyandsociety.org/vol13/iss32/art34

Giller, K.E., Tittonell, P., Rufino, M.C., van Wijk, M.T., Zingore, S., Mapfumo, P., Adjei-Nsiah, S., Herrero, M., Chikowo, R., Corbeels, M., Rowe, E.C., Baijukya, F., Mwijage, A., Smith, J., Yeboah, E., van der Burg, W.J., Sanogo, O.M., Misiko, M., de Ridder, N., Karanja, S., Kaizzi, C., K'Ungu, J., Mwale, M., Nwaga, D., Pacini, C., Vanlauwe, B., 2011. Communicating complexity: integrated assessment of trade-offs concerning soil fertility management within African farming systems to support innovation and development. Agricultural Systems 104: 191-203.

Guest, G., Bunce, A., Johnson, L., 2006. How Many Interviews Are Enough? An Experiment with Data Saturation and Variability. Field Methods 18: 59-82.

Hall, A., Clark, N., 2010. What do complex adaptive systems look like and what are the implications for innovation policy? Journal of International Development 22: 308-324.

Hall, A., Rasheed Sulaiman, V., Clark, N., Yoganand, B., 2003. From measuring impact to learning institutional lessons: an innovation systems perspective on improving the management of international agricultural research. Agricultural Systems 78: 213-241.

Hekkert, M.P., Suurs, R.A.A., Negro, S.O., Kuhlmann, S., Smits, R.E.H.M., 2007. Functions of innovation systems: A new approach for analysing technological change. Technological Forecasting and Social Change 74: 413-432.

Hermans, F., Stuiver, M., Beers, P.J., Kok, K., 2013. The distribution of roles and functions for upscaling and outscaling innovations in agricultural innovation systems. Agricultural Systems 115: 117-128.

Hounkonnou, D., Kossou, D., Kuyper, T.W., Leeuwis, C., Nederlof, E.S., Röling, N., Sakyi-Dawson, O., Traoré, M., Van Huis, A., 2012. An innovation systems approach to institutional change: Smallholder development in West Africa. Agricultural Systems 108: 74-83.

Hulsebosch, J., 2001. The use of RAAKS for strengthening community-based organisations in Mali. Development in Practice 11: 622-632.

International Institute for Sustainable Development, 2014. Rapid Rural Appraisal (RRA).

Jiggins, J., 2012. Diagnosing the scope for innovation: Linking smallholder practices and institutional context. NJAS, Wageningen Journal of Life Sciences 60-63: 1-122.

Kilelu, C.W., Klerkx, L., Leeuwis, C., 2013. Unravelling the role of innovation platforms in supporting co-evolution of innovation: Contributions and tensions in a smallholder dairy development programme. Agricultural Systems 118: 65-77.

Klein Woolthuis, R., Lankhuizen, M., Gilsing, V., 2005. A system failure framework for innovation policy design. Technovation 25: 609-619.

Klerkx, L., Aarts, N., Leeuwis, C., 2010. Adaptive management in agricultural innovation systems: the interactions between innovation networks and their environment. Agricultural Systems. 103: 390-400.

Klerkx, L., Schut, M., Leeuwis, C., Kilelu, C., 2012a. Advances in knowledge brokering in the agricultural sector: towards innovation system facilitation. IDS Bulletin 43: 53-60.

Klerkx, L., van Mierlo, B., Leeuwis, C., 2012b. Evolution of systems approaches to agricultural innovation: Concepts, analysis and interventions, in: Darnhofer, I., Gibbon, D., Dedieu, B. (eds.), Farming Systems Research into the 21st century: the new dynamic. Springer, Dordrecht: 457-483.

Leeuwis, C., 2004. Communication for rural innovation. Rethinking agricultural extension (with contributions of Anne van den Ban). Blackwell Science, Oxford.

Leeuwis, C., Schut, M., Waters-Bayer, A., Mur, R., Atta-Krah, K., Douthwaite, B., 2014. Capacity to innovate from a system CGIAR research program perspective. Penang, Malaysia: CGIAR Research Program on Aquatic Agricultural Systems. Program Brief: AAS-2014-29: 5.

Lundy, M., Gottret, M.V., Ashby, J., 2005. Learning alliances: an approach for building multi-stakeholder innovation systems, ILAC Brief 8. Bioversity, Rome.
McNie, E.C., 2007. Reconciling the supply of scientific information with user demands: an analysis of the problem and review of the literature. Environmental Science & Policy 10: 17-38.
N'cho, S.A., Mourits, M., Rodenburg, J., Demont, M., Oude Lansink, A., 2014. Determinants of parasitic weed infestation in rainfed lowland rice in Benin. Agricultural Systems 130: 105-115.
Ortiz, O., Orrego, R., Pradel, W., Gildemacher, P., Castillo, R., Otiniano, R., Gabriel, J., Vallejo, J., Torres, O., Woldegiorgis, G., Damene, B., Kakuhenzire, R., Kasahija, I., Kahiu, I., 2013. Insights into potato innovation systems in Bolivia, Ethiopia, Peru and Uganda. Agricultural Systems 114: 73-83.
Papaioannou, T., Wield, D.V., Chataway, J.C., 2009. Knowledge ecologies and ecosystems? An empirically grounded reflection on recent developments in innovation systems theory. Environment and Planning C: Government and Policy 27: 319-339.
Poulton, C., Dorward, A., Kydd, J., 2010. The Future of Small Farms: New Directions for Services, Institutions, and Intermediation. World Development 38: 1413-1428.
Rodenburg, J., Schut, M., Demont, M., Klerkx, L., Gbehounou, G., Oude Lansink, A., Mourits, M., Rotteveel, T., Kayeke, J.M., van Ast, A., Akanvou, L., Cissoko, M., Kamanda, J., Bastiaans, L., 2015. Systems approaches to innovation in pest management; reflections and lessons learned from an integrated research program on parasitic weeds in rice. International Journal of Pest Management DOI:10.1080/09670874.2015.1066042.
Rodenburg, J., Zossou-Kouderin, N., Gbehounou, G., Ahanchede, A., Toure, A., Kyalo, G., Kiepe, P., 2011. Rhamphicarpa fistulosa, a parasitic weed threatening rain-fed lowland rice production in sub-Saharan Africa. A case study from Benin. Crop Protection 30: 1306-1314.
Russell Bernard, H., 2006. Research methods in anthropology. Qualitative and quantitative approaches (4th ed.). AltaMira Press, Oxford, UK.
Schut, M., Florin, M.J., 2015. The policy and practice of sustainable biofuels: Between global frameworks and local heterogeneity. The case of food security in Mozambique. Biomass and Bioenergy 72: 123-135.
Schut, M., Klerkx, L., Rodenburg, J., Kayeke, J., Raboanarielina, C., Hinnou, L.C., Adegbola, P.Y., van Ast, A., Bastiaans, L., 2015a. RAAIS: Rapid Appraisal of Agricultural Innovation Systems (Part I). A diagnostic tool for integrated analysis of complex problems and innovation capacity. Agricultural Systems 132: 1-11.
Schut, M., Rodenburg, J., Klerkx, L., Hinnou, L.C., Kayeke, J., Bastiaans, L., 2015b. Participatory appraisal of institutional and political constraints and opportunities for innovation to address parasitic weeds in rice. Crop Protection 74: 158-170.
Schut, M., Rodenburg, J., Klerkx, L., Kayeke, J., van Ast, A., Bastiaans, L., 2015c. RAAIS: Rapid Appraisal of Agricultural Innovation Systems (Part II). Integrated analysis of parasitic weed problems in rice in Tanzania. Agricultural Systems 132: 12-24.
Schut, M., Rodenburg, J., Klerkx, L., van Ast, A., Bastiaans, L., 2014a. Systems approaches to innovation in crop protection. A systematic literature review. Crop Protection 56: 98-108.
Schut, M., Van Paassen, A., Leeuwis, C., 2013. Beyond the research-policy interface. Boundary arrangements at research-stakeholder interfaces in the policy debate on biofuel sustainability in Mozambique. Environmental Science & Policy 27: 91-102.
Schut, M., van Paassen, A., Leeuwis, C., Klerkx, L., 2014b. Towards dynamic research configurations: A framework for reflection on the contribution of research to policy and innovation processes. Science and Public Policy 41: 207-218.

Sims, B.G., Thierfelder, C., Kienzle, J., Friedrich, T., Kassam, A., 2012. Development of the conservation agriculture equipment industry in sub-Saharan Africa. Applied Engineering in Agriculture 28, 813-823.
Singh, R.K., Murty, H.R., Gupta, S.K., Dikshit, A.K., 2009. An overview of sustainability assessment methodologies. Ecological Indicators 9: 189-212.
Spedding, C.R.W., 1988. An introduction to agricultural systems, 2nd ed. Elsevier Applied Science Publishers, New York.
Spielman, D.J., 2005. Innovation Systems Perspectives on Developing-Country Agriculture: A critical review, ISNAR Discussion Paper 2. IFPRI, Washington: 58.
Spielman, D.J., Ekboir, J., Davis, K., 2009. The art and science of innovation systems inquiry: applications to sub-Saharan African agriculture. Technology in Society 31: 399-405.
Temel, T., Janssen, W., Karimov, F., 2003. Systems analysis by graph theoretical techniques: assessment of the agricultural innovation system of Azerbaijan. Agricultural Systems 77: 91-116.
Thitinunsomboon, S., Chairatana, P.A., Keeratipibul, S., 2008. Sectoral Innovation Systems in Agriculture: The Case of Rice in Thailand. Asian Journal of Technology Innovation 16: 83-100.
Totin, E., van Mierlo, B., Saidou, A., Mongbo, R., Agbossou, E., Stroosnijder, L., Leeuwis, C., 2012. Barriers and opportunities for innovation in rice production in the inland valleys of Benin. Njas-Wageningen Journal of Life Sciences 60-63: 57-66.
van Ittersum, M.K., Ewert, F., Heckelei, T., Wery, J., Alkan Olsson, J., Andersen, E., Bezlepkina, I., Brouwer, F., Donatelli, M., Flichman, G., Olsson, L., Rizzoli, A.E., van der Wal, T., Wien, J.E., Wolf, J., 2008. Integrated assessment of agricultural systems. A component-based framework for the European Union (SEAMLESS). Agricultural Systems 96: 150-165.
van Mierlo, B., Leeuwis, C., Smits, R., Woolthuis, R.K., 2010. Learning towards system innovation: evaluating a systemic instrument. Technological Forecasting and Social Change 77: 318-334.
Whitley, E., Ball, J., 2002. Statistics review 4: Sample size calculations. Critical Care 6: 335-341.
Wieczorek, A.J., Hekkert, M.P., 2012. Systemic instruments for systemic innovation problems: A framework for policy makers and innovation scholars. Science and Public Policy 39: 74-87.
World Bank, 2006. Enhancing agricultural innovation: how to go beyond the strengthening of research systems. World Bank, Washington DC, USA: 118.
World Bank, 2012. Agricultural Innovation Systems: an investment sourcebook. The World Bank, Washington.

Appendices

SESSION 1 AND 2

Stakeholder group	
Farmer / producer representatives	
Civil society /NGO / Development project representatives	
Private sector representatives	
Government representatives	
Representatives from research and training institutes	

Specifications	
colour	Colour
page orientation	Portrait
size	100 x 140 cm
number of flipcharts needed	1
downloadable version	www.wageningenur.nl/raais-toolkit

SESSION 3 AND 4

Different dimensions of constraint	Biophysical	Technological	Socio-cultural	Economic	Institutional	Political
1.						
2.						
3.						
4.						
5.						

Specifications	
colour	Black and white
page orientation	Portrait
size	100 x 140 cm
number of flipcharts needed	5 (depending on the # of stakeholder groups)
downloadable version	www.wageningenur.nl/raais-toolkit

SESSION 5

What is causing the constraints and challenges?

1. Infrastructure and assets

a. Roads, irrigation schemes, agricultural inputs distribution
b. Telecommunication
c. Financial infrastructure
d. Assets, such as vehicles for transport workers or agricultural produce
e. Agricultural machines
f. Agricultural inputs/ seeds

2. Institutions

a. Agricultural policies
b. Laws
c. Regulation, incentives
d. (Food) quality standards
e. Agricultural subsidies
f. Monitoring and Evaluation
g. Organisational mandates
h. Market (access)
i. Trade agreements
j. Social-cultural norms and values
k. Informal rules of the game
l. Lobby
m. Resistance to change

Specifications

colour	Black and white
page orientation	Portrait
size	140 x 240 cm
number of flipcharts needed	1
downloadable version	www.wageningenur.nl/raais-toolkit

3. Interaction and collaboration

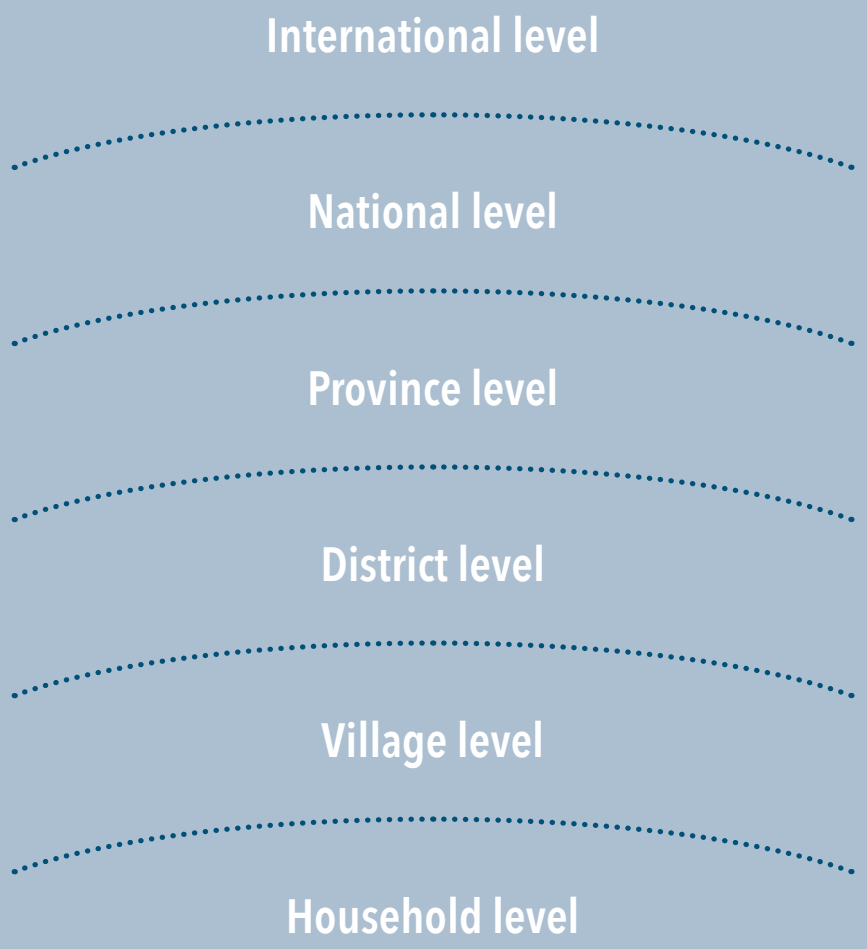
a. Multi-stakeholder interaction for learning and problem-solving
b. Systematic development and sharing of knowledge and information (strategic intelligence)
c. Public-private partnerships
d. Existence and strength of networks (too strong or too weak)
e. Existence of representative bodies (e.g. farmers association)
f. Power-dynamics and politics

4. Capabilities and resources

a. Agricultural entrepreneurship
b. Availability of labour
c. Access to knowledge and education
d. Availability of financial resources
e. Access to credit/ microfinances
f. Capacity to mobilise funds

5. Other

SESSION 6 AND 7



Specifications	
colour	Black and white
page orientation	Portrait
size	140 x 240 cm
number of flipcharts needed	1
downloadable version	www.wageningenur.nl/raais-toolkit

SESSION 8

Specifications	
colour	Black and white
page orientation	Portrait
size	140 x 200 cm
number of flipcharts needed	5 (depending on the # of stakeholder groups)
downloadable version	www.wageningenur.nl/raais-toolkit

SESSION 9

Adressing this constraint / challenge will contribute to	Project / program objective 1	Project / program objective 2	Project / program objective 3	Project / program objective 4	Project / program objective 5	Etcetera
1.						
2.						
3.						
4.						
5.						

Specifications	
colour	Black and white
page orientation	Landscape
size	100 x 140 cm
number of flipcharts needed	5 (depending on the # of stakeholder groups)
downloadable version	www.wageningenur.nl/raais-toolkit

SESSION 10

Constraints and challenges that only apply to the specific Entry Theme(s)	Constraints and challenges that also apply to broader issues in the agrifood system (beyondt he specific Entry Theme(s))	Constraints and challenges that also apply to problems beyond the agricultural system

Specifications	
colour	Black and white
page orientation	Landscape
size	100 × 140 cm
number of flipcharts needed	1
downloadable version	www.wageningenur.nl/raais-toolkit

SESSION 11A

Constraints and challenges that can be adressed by the stakeholder group	Constraints and challenges that can only be adressed in collaboration with other stakeholder groups

Specifications	
colour	Black and white
page orientation	Landscape
size	100 × 140 cm
number of flipcharts needed	1
downloadable version	www.wageningenur.nl/raais-toolkit

SESSION 11B

Constraints and challenges that are relatively easy to address	Constraints and challenges that are relatively difficult to address

Specifications	
colour	Black and white
page orientation	Landscape
size	100 × 140 cm
number of flipcharts needed	1
downloadable version	www.wageningenur.nl/raais-toolkit

SESSION 11C

Constraints and challenges that require short-term actions < 1 year	Constraints and challenges that require middle-term actions between 1-5 years	Constraints and challenges that require long-term actions > 5 years

Specifications	
colour	Black and white
page orientation	Landscape
size	100 × 140 cm
number of flipcharts needed	1
downloadable version	www.wageningenur.nl/raais-toolkit

SESSION 12

Agricultural productivity research	Natural Resource Management research	Institutional, policy and market research	Nutrition, gender and other types of research
E.g. livestock feed production, soil fertility, intercropping, weed control research, breeding fertilizer trials, etc.	E.g. research on soil erosion, agro- forestry, water management, dimate change research, etc.	E.g. research on markets/ value chain dynamics, gender, policy development and implementation, land tenure, multi- stakeholder processes, etc.	E.g. dietary needs assessment, analysis of nutrient intake, research related to inclusion of gneder and age groups, etc.

Specifications	
colour	Black and white
page orientation	Landscape
size	120 x 200 cm
number of flipcharts needed	1
downloadable version	www.wageningenur.nl/raais-toolkit

SESSION 13A

Women

Productivity research	Natural Resource Management research	Institutional, policy and market research	Nutrition, gender and other types of research
E.g. livestock feed production, soil fertility, intercropping, weed control research, breeding fertilizer trials, etc.	E.g. research on soil erosion, agro- forestry, water management, dimate change research, etc.	E.g. research on markets/ value chain dynamics, gender, policy development and implementation, land tenure, multi- stakeholder processes, etc.	E.g. nutrition, gender research, etc.
1.	1.	1.	1.
2.	2.	2.	2.
3.	3.	3.	3.
4.	4.	4.	4.
5.	5.	5.	5.

Specifications

colour	Black and white
page orientation	Landscape
size	120 x 200 cm
number of flipcharts needed	2 in total: 1 (women) and 1 (men)
downloadable version	www.wageningenur.nl/raais-toolkit

Men

Productivity research	Natural Resource Management research	Institutional, policy and market research	Nutrition, gender and other types of research
E.g. livestock feed production, soil fertility, intercropping, weed control research, breeding fertilizer trials, etc.	E.g. research on soil erosion, agro- forestry, water management, dimate change research, etc.	E.g. research on markets/ value chain dynamics, gender, policy development and implementation, land tenure, multi- stakeholder processes, etc.	E.g. nutrition, gender research, etc.
1.	1.	1.	1.
2.	2.	2.	2.
3.	3.	3.	3.
4.	4.	4.	4.
5.	5.	5.	5.

SESSION 13B

Overall top-3 under different research for development domains			
Productivity research	**Natural Resource Management research**	**Institutional, policy and market research**	**Nutrition, gender and other types of research**
E.g. livestock feed production, soil fertility, intercropping, weed control research, breeding fertilizer trials, etc.	E.g. research on soil erosion, agro- forestry, water management, dimate change research, etc.	E.g. research on markets/ value chain dynamics, gender, policy development and implementation, land tenure, multi- stakeholder processes, etc.	E.g. nutrition, gender research, etc.
1.	1.	1.	1.
2.	2.	2.	2.
3.	3.	3.	3.

Specifications	
colour	Black and white
page orientation	Landscape
size	120 x 200 cm
number of flipcharts needed	1
downloadable version	www.wageningenur.nl/raais-toolkit

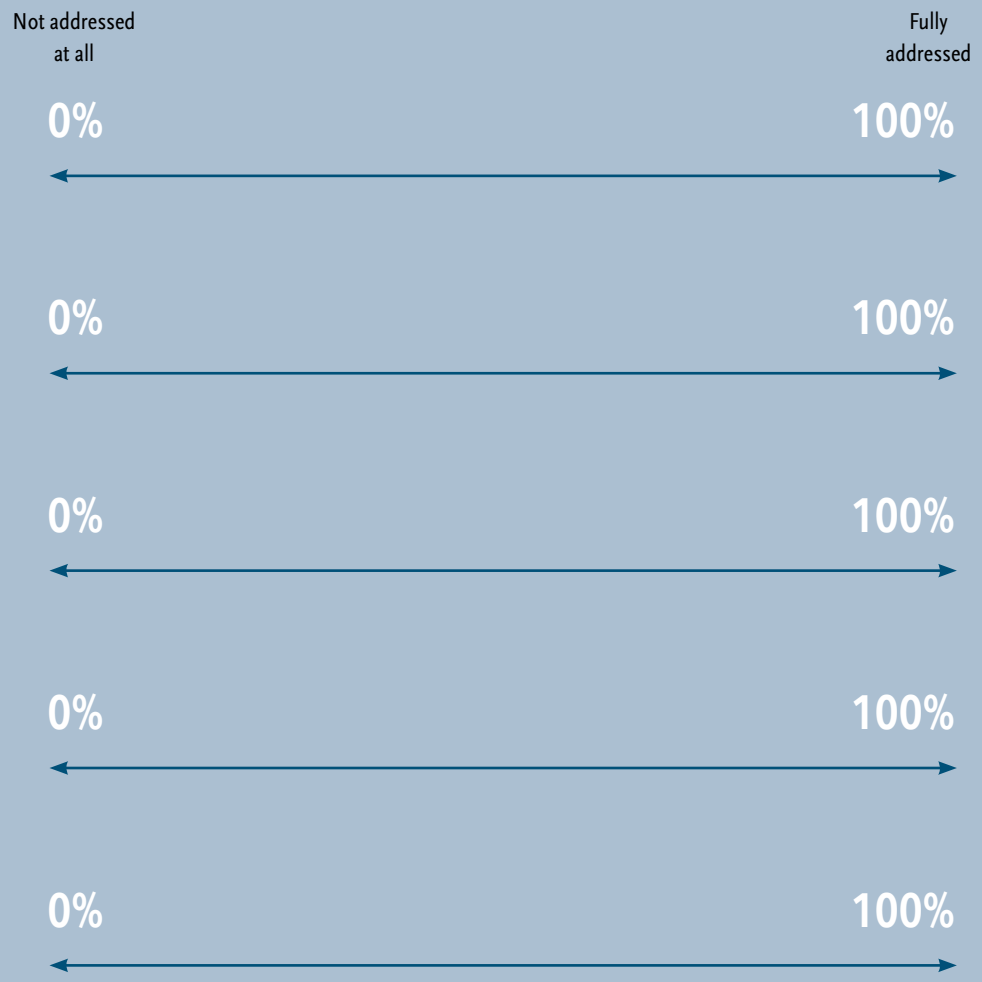
SESSION 14

From constraints and challenges to entry points and best bets for innovation	
Theme Name the theme.	
Research for Development domain (1) productivity, (2) NRM, (3) institutional or (4) gender, nutrition and other.	
Constraint Copy the constraint as is written on the card.	
Theme leader(s) Names, organisation and email.	
Key-objective(s) Formulate realistic and measurable objectives.	
Description of the activity Description of the activity (200-500 words).	
Other team members Name(s) and email.	
Partners Names of organisations and contact persons.	
Where At what location will the activities take place.	
Project duration Start and end date.	
Sub-activities Provide a list of detailed sub-activities.	
With what Innovation Platform will this activity be undertaken? Specify innovation platform.	

From constraints and challenges to entry points and best bets for innovation (continued)

Research protocol/ methodology What research/ development approach will be used, more detailed research protocol can be attached.	
Potential limitations for project implementation What are expected to be the main challenges and how will these challenges be overcome.	
How does this R4D project relate to the project/ program's objectives Specify how this theme contributes to below objectives. Objective 1 Objective 2 Objective 3 Etc.	
How will data be collected and analysed? Indicate how monitoring and evaluation will be organised.	
How will results be reported to other stakeholders involved/ multi-stakeholder platform Indicate how collaboration with, and reporting to, the platforms will be organised.	
Estimated resources necessary to execute the activities Consider natural resources (land), human resources (labour) as well as financial resources (funding).	
Who is contributing? What can farmers, private sector, development partners, government, research – contributions can be financial or in kind (land/ labour).	

M&E ACTIVITY 1



Specifications

colour	Black and white
page orientation	Landscape
size	120 x 200 cm
number of flipcharts needed	1
downloadable version	www.wageningenur.nl/raais-toolkit

M&E ACTIVITY 2

	Prioritised productivity constraint 1	Prioritised NSM constraint 1	Prioritised institutions and market constraint 1	Prioritised gender constraint 1	Prioritised nutrition constraint 1	Etcetera
Research for development activity 1						
Research for development activity 2						
Research for development activity 3						
Research for development activity 4						
Research for development activity 5						
Etcetera						

Specifications	
colour	Black and white
page orientation	Landscape
size	150 x 170 cm (depending on # priorities and R4D activities)
number of flipcharts needed	1
downloadable version	www.wageningenur.nl/raais-toolkit

M&E ACTIVITY 3

	Project/ program objective 1	Project/ program objective 2	Project/ program objective 3	Project/ program objective 4	Project/ program objective 5	Etcetera
Research for development activity 1						
Research for development activity 2						
Research for development activity 3						
Research for development activity 4						
Research for development activity 5						
Etcetera						

Specifications	
colour	Black and white
page orientation	Landscape
size	150 x 170 cm (depending on # of R4D activities and program/ project objectives)
number of flipcharts needed	1
downloadable version	www.wageningenur.nl/raais-toolkit

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