Towards creating actionable knowledge in rice farming systems in Northern Ghana: the role of information systems

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Abstract

Information systems have been estimated to contribute to information provision and actionable knowledge creation for decision-making in rice farming systems. This, however, has been questioned within literature; suggesting not much impact on actionable knowledge creation for decision-making in rice farming systems. The study launches a probe into what information systems exist in rice farming systems in northern Ghana, their characteristics, their role in actionable knowledge creation, and opportunities to improving their relevance and impact in rice farming systems.

Keywords: *Information System, Actionable Knowledge, Decision-making, Ghana*

Introduction

In Ghana, farmers operate in a knowledge-based system with information systems playing a central role (Agyekumhene et a l, 2018; Annan and Dryden, 2015). Farmers, water managers and other actors at the local level interact with these information systems that are set-up with the aim of eliminating spatio-temporal barriers encountered by rice farmers. Although being found in a web of information systems presents opportunities, rice farmers must make sense of what information is communicated and adopted in their decision-making when confronting challenges such as water scarcity, pests and diseases. This study adopts an exploratory approach in answering the key question "what information systems are currently enabling actionable knowledge creation for decision-making in rice farming systems and to what degree is the knowledge produced actionable"?

Cross and Sproull (2004) suggest that information seekers do not only seek to obtain input from providers, but also undergo a process of constructing understanding based on social and physical circumstances. Cash et al. (2003) indicate that salience, credibility and legitimacy are three key characteristics of actionable knowledge. In borrowing from Cash et al., we use salience to refer to when scientific information is made responsive and context sensitive to the needs of decision-makers (see also Kirchhoff et al., 2013). Credibility delves into information being made accurate, of high quality and valid in a given system. Legitimacy is interpreted as where information is translated

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into knowledge in an open and unbiased process. In the end, knowledge that is actionable should translate into uptake and use in decision-making.

Methodology

The study uses an exploratory design in establishing insight into the subject of information, knowledge creation and how actionable these are in enabling adaptive decision-making in rice farming system. Exploration is essential in validating scientific conclusions (Jebb et al., 2017). A total of 27 rice farmers were selected from nine communities around the Bontanga scheme in the Kumbungu district (See **Figure 1**). Thus three farmers (1 rainfed, 1 irrigated, 1 practicing both) were interviewed in each community. Two Focus Group Discussions (FGDs) were organised in each community; one with rice farmers and the other with leaders of the community. FGDs were to provide further understanding on information flow and use, and how decision-making is locally contextualised. Data was cleaned and analysed using Atlas.ti software.

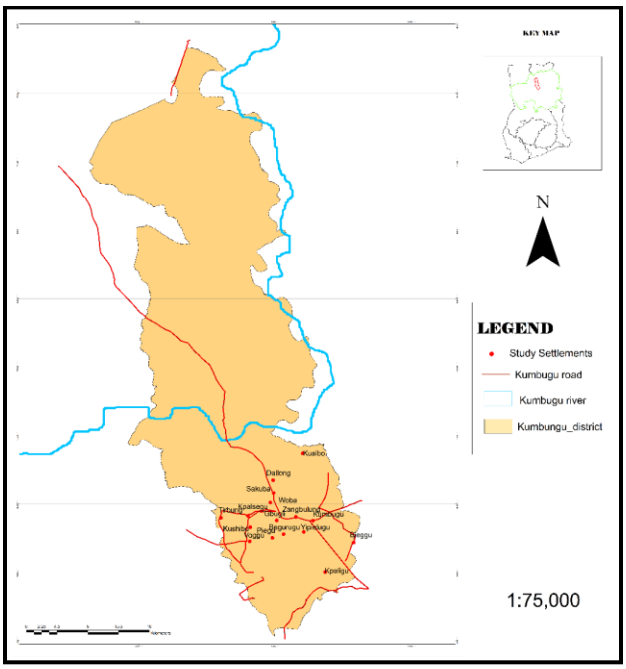


Figure 1: Map showing sampled communities in the Kumbungu District (Source: Nyamekye et al., 2018)

Findings

Information Systems Network

Farmers interact with four types of information systems in the study area. These include Virtual ICT Platforms, Commercial Radio, Community Radio and Farmer-to-Farmer systems (see Figure 2). Community Radio and Farmer-to-Farmer systems enabled knowledge creation with a greater reference to indigenous information. For example, for meteorological information and knowledge, indigenous indicators like direction of the wind and movement of ants is a cue to predicting weather and seasonal conditions which relevantly informs actionable knowledge creation relevant for adaptation to climate conditions. For both aforementioned systems, actionable knowledge meant highly salient knowledge. On the other hand, Commercial Radio and Virtual ICT Platforms, provided

such information based on scientific forecast which is further interpreted on such media as part of studio discussions on radio towards contributing to knowledge for informed adaptation amongst farmers.

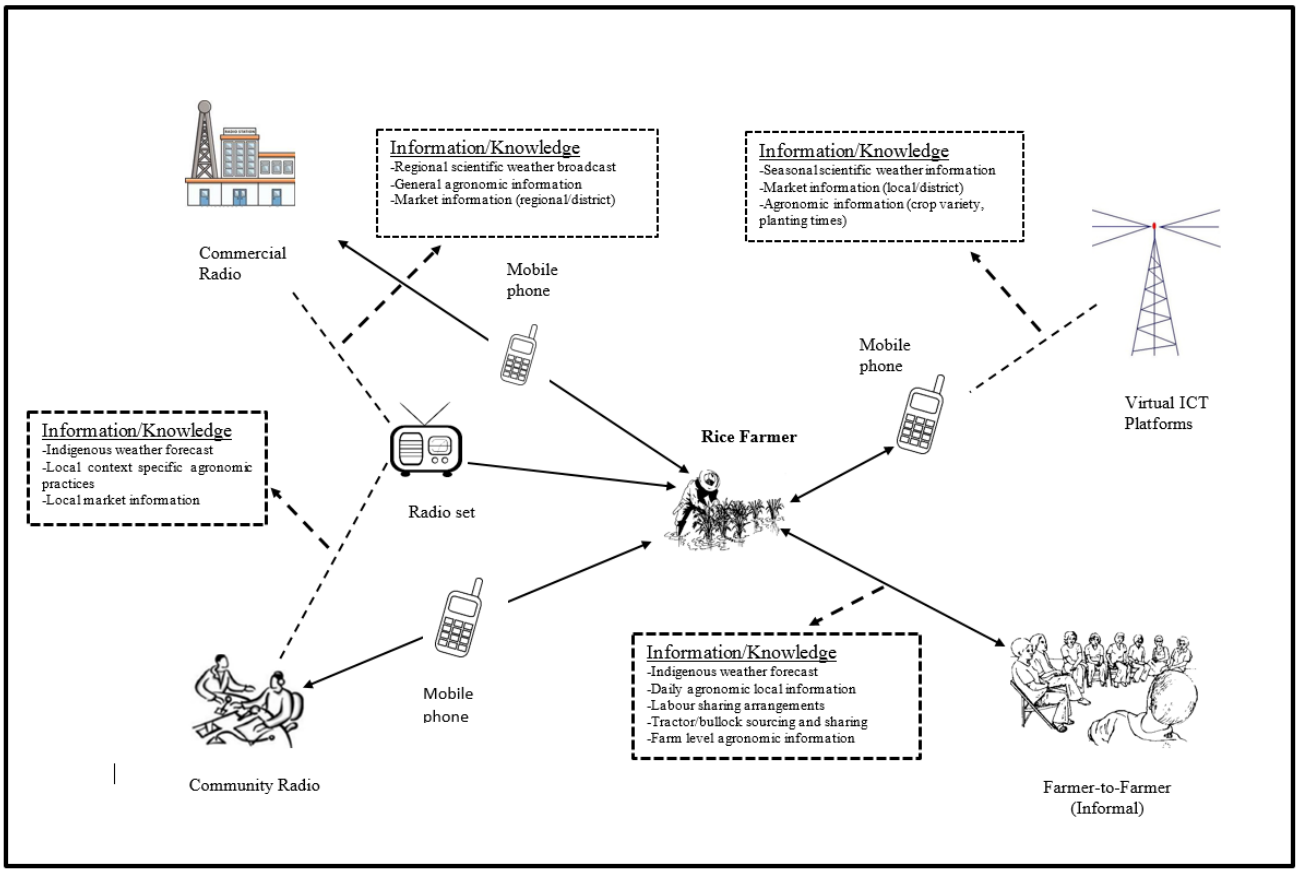
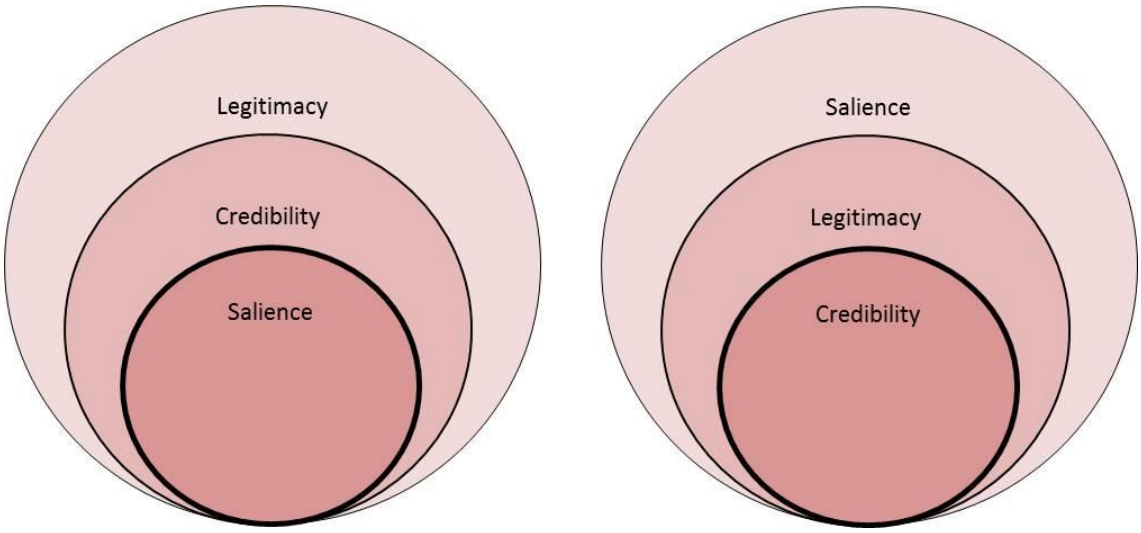


Figure 2: Information Systems Network for rice farmers in the Kumbungu District (Source: Authors' Fieldwork, 2017)

Information Systems and Actionable knowledge Creation

With the presence of a network of information systems, actionable knowledge creation is not limited to a particular information system since farmers engage with all systems identified within the study area. In an attempt to identify or create locally salient knowledge for farm level decisions, Farmer-to-Farmer systems and Community Radio Systems are driven by the factor of salience in creating actionable knowledge. For example, in such a setting, farmers decide on what variety of rice is suitable for the soil type in the area. Farmers who had a good harvest in the previous year share relevant information which informs discussions towards new actionable knowledge. Virtual ICT based systems and Commercial Radio on the other hand have credibility as the point of departure in ensuring information is made useful in the form of new knowledge.

In **Figure 3**, we emphasise what dimension of actionable knowledge is central within each of these systems and the transition process involved.



Community Radio and Farmer-to-Farmer Systems

Commercial Radio and Virtual Platforms

Figure 3: Creating Actionable Knowledge in Information Systems

Which System Contributes Most To Actionable Knowledge Creation?

Farmer-to-Farmer systems are observed to contribute most to overall actionable knowledge creation followed by Community Radio, Commercial Radio and Virtual Systems respectively. The Pre-season period is characterised by farmers interacting with these systems to ascertain which knowledge is readily actionable and hence relevant for their seasonal decisions. Adaptation at this stage requires actionable knowledge on water availability conditions for farm decision-making. Indigenous information based on observed indicators such as direction of the wind and movement of ants are translated into meteorological information as part of dialogue especially in Farmer-to-Farmer systems in the pre-season period. Within the season, Farmer-to-Farmer Systems continuously contribute to more salient actionable knowledge with Virtual Systems rather enabling the creation of more credible actionable knowledge. This is summarised in **Table 1**.

Table 1: Capacities of Information Systems to Create Actionable Knowledge, where 1 = Somewhat, 2 = Moderately, 3 = Very, 4 = Most (Source: Authors own)

Information System Factor	Farmer-to-Farmer	Community Radio	Commercial Radio	Virtual Systems
Pre-Season				
Salience	4	3	1	2
Credibility	3	4	2	1
Legitimacy	4	3	2	1
Remarks: Farmer-to-Farmer systems greatly provide salient actionable knowledge whereas Community radio systems enable creating of more credible knowledge for pre-season decision-making.				
In-Season				
Salience	4	3	2	1
Credibility	2	3	1	4
Legitimacy	3	4	1	2
Remarks: Farmer-to-Farmer systems contribute most to salient actionable knowledge whereas virtual systems present most valid actionable knowledge integrating local and indigenous knowledge systems.				
Post Season				
Salience	4	3	1	2
Credibility	3	4	2	1
Legitimacy	4	3	2	1
Remarks: Farmers need actionable local knowledge since farming is small scale and hence less outputs in terms of scale. Local actionable marketing knowledge is created and made salient mostly in Farmer-to-Farmer systems. Community Radio also contributes to validating knowledge through an interactive process of sharing.				
Overall Score (A)	31	30	14	15
Average (A/90)	0.34	0.33	0.16	0.17
Rank	1st	2nd	3rd	4th

Discussion

Adaptation in rice farming systems is hinged on useful and usable information towards managing changing conditions (Wilby et al., 2009). As presented in the results, information systems were central to knowledge brokerage and actionable knowledge creation (Bryan et al, 2008). Given the availability of numerous information systems, integrating information from all systems was keen for adaptation. As such, co-creation is key to ensure uptake of information in adaptation. Climate Services for instance, must engage farmers in a participatory process where indigenous information is integrated with scientific information in hydro-climatic models. Farmers must feel a sense of ownership of information systems if service providers intend to make the needed impact. The classification of farmers as 'end-users' and operators of information systems as 'producers' limit the creation factor which is relevant in defining actionable knowledge. Klerkx et al., (2012) argue for a shift from knowledge development to learning and adaptive capacity framed through collaboration (see also Kristjanson et al., 2009).

Breaking spatio-temporal barriers will also require a coordination of the process of information sharing (Luseno et al., 2003). Information service providers could explore more collaborative opportunities in sharing information. For example, Commercial and Community Radio systems could collaborate for more local level dissemination in the local dialects of farmers (Rees et al., 2000). Community Radio Systems could identify communal gatherings which were a source of farmer-to-

farmer knowledge for more coordinated interaction with farmers to increase trust, reliability and usefulness of information provided to farmers (Arbuckle et al., 2015).

As boundary objects (Carlile, 2002), information systems bring together numerous actors who would have possibly had limited room to interact in farming systems. In the governance of adaptation, such boundary objects could be made an integral part of policy and programme design for cross-level engagement in adaptation within rice farming systems.

Conclusion

The findings from this study present relevant knowledge for adaptation literature. Firstly, it emphasises earlier studies suggesting information as a key component of adaptation. It further establishes the connection between information, knowledge creation and decision-making in adaptation within farming systems. Thus for policy and programme design towards adaptation, there is the need for governments and private actors to explore an integration of information systems as well of participatory design and adoption of information systems. Local knowledge systems such as Community Radio and Farmer-to-Farmer systems must also be emphasised and tapped to increase the success rate of operationalising information systems.

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