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Mapping the Complex World of the Smallholder: An Approach to Smallholder Research for Food and Income Security With Examples from Malaysia, India and Sri Lanka.

Patrick O'Reilly[a]

[a]*Crops For the Future Research Centre, Jalan Broga, Semenyih, Selangor, Malaysia*

Abstract

Smallholders continue to account for up to 87% of all agricultural holdings and 70% of the global food supply while consuming only 30% of the world's agricultural resources. However global investment in agriculture R&D is increasingly concentrated in a smaller number of countries and focusses on research concerning physical aspects of a limited number of commodity crops. While the benefits of this research to smallholders is significant. This approach to agricultural research reflects the needs of commodity food chains, rather than those of smallholder food webs. Leading to a focus on the alignment of the latter to approaches and practices more reminiscent of the former. This perspective may overlook the inherent strengths of smallholder systems and as a consequence, fail to maximise their potential and reduce the capacity of smallholders to engage in autonomous development strategies. A modified livelihood approach which allows for an exploration of complexity in smallholder systems offers a useful entry point for developing interdisciplinary research to support sustainable productivity gains in the smallholder sector

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* *Corresponding author. E-mail address:* patrick.oreilly@cffresearch.org

1. Introduction

Current estimates suggest that an increase of up to 50% in food production will be needed to meet the needs of a growing population over the next 35 years. While the intensive production of a small number of key species has contributed to dramatic increases in agricultural productivity and food supply, the worlds' perceived dependence on a narrow range of crops produced in input intensive systems has given rise to concerns over the environmental sustainability of large scale, intensive agriculture. Simultaneously there has been a renewed recognition of the

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important role that smallholders play in maintaining global agriculture. Smallholders continue to play a central role in crop production producing approximately 70% of the world's food on up to 87% of the world's current agricultural land and employing only 30% of agricultural resources. In addition the fact that small holder systems are adapted to the local agro-ecological conditions, supports the idea that they are less demanding on the local environment and require less external inputs in the form of artificial fertilisers and agri-chemicals. The fact that smallholder systems are known to produce a range of crops in a variety of rotation and intercropping systems is linked to significant local benefits to the household and community such as; supporting dietary diversity, reducing risk and has led to the popular characterization of smallholder agriculture as inherently more environmentally and socially sustainable than monocultures[1,2] It is therefore ironic that smallholder systems and many of the crops that they produce operate in a peripheral position in relation to agricultural research and development. In the engagement between smallholders and the research and development communities the predominant tendency is for the latter to produce solutions which support the further adoption of intensive monoculture of major crops.

In order to do so thisd paper considers way in which scientific research in relation the relationship between this scientific research and agricultural development approaches. Before outlining an alternative approach as employed in recent research which employs smallholder complexity as its starting point.

1.1 Agricultural research and development

Technologies and science continue to evolve dramatically as the challenges that face agriculture change. However in many respects research priorities continue to adhere to certain ideas about paradigmatic science in which *"innovation is understood primarily to mean technological innovation: innovations are scientific discoveries that can be given technological application".*[3]Central to this episteme is the idea of functional differentiation, experts "carve nature by its joints," [4]to study and represent its discrete segments. A key feature of this process is that the scientific aspect of this work is portrayed as being discreet and based on objective forms of scientific validation. Alroe and Noe argue that research trajectories are still largely shaped by the "traditional politics of expertise" [5] within which scientific problems remain necessarily reductive; separate aspects of the crop are examined in isolation with limited consideration given to the wider biotic, abiotic and social context in which it is embedded. This approach contributes to technologies which reflect conventional commercial interests and favour styles of production that are suited to larger commercial ventures. Indeed it could be argued that, to a very large extent, this research trajectory supports the need of the most inefficient (in terms of resource use) and least sustainable production systems.
Simultaneously current approaches to agricultural research fail to respond to the needs one of its principle customers groups, smallholders. Leadign to questions as to how science ghered to their needs should be organised. A common feature of small holders systems are that they integrate a range of different types of knowledge and resources in delivering outputs. Complexity may offer a useful point of entry for research that addresses the complex challenges facing smallholders.

1.2 Integrating biological and environmental factors into an analyses of small holder farming

Farming practice is proposed as the point of entry within an analytical framework which explores the complexity of small holder practices such practices represent the co-produced outcomes of dynamic interactions between human, biotic (that is the biological) and abiotic (non-biological) factors within a specific spatial and temporal context. Farmers evaluate and incorporate aspects of the physical environment in which they are located into their farming practice, in a similar fashion they also interact with the biological environment. The relationship between these domains is dynamic; events in human, biotic or abiotic domains influence the others as, for example, in the case of climate change or soil degradation impacting local markets and plant species.

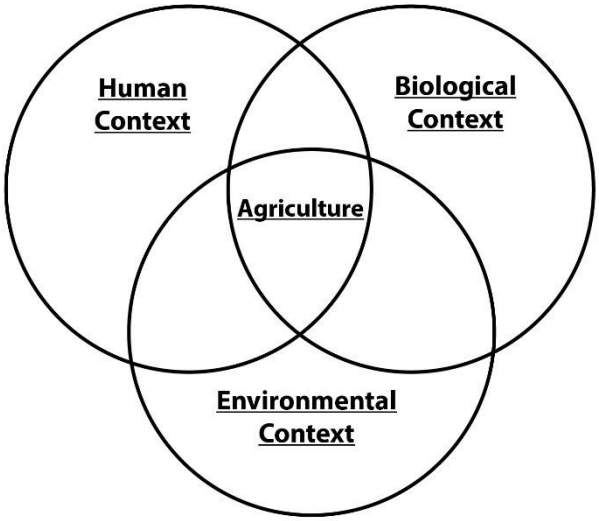
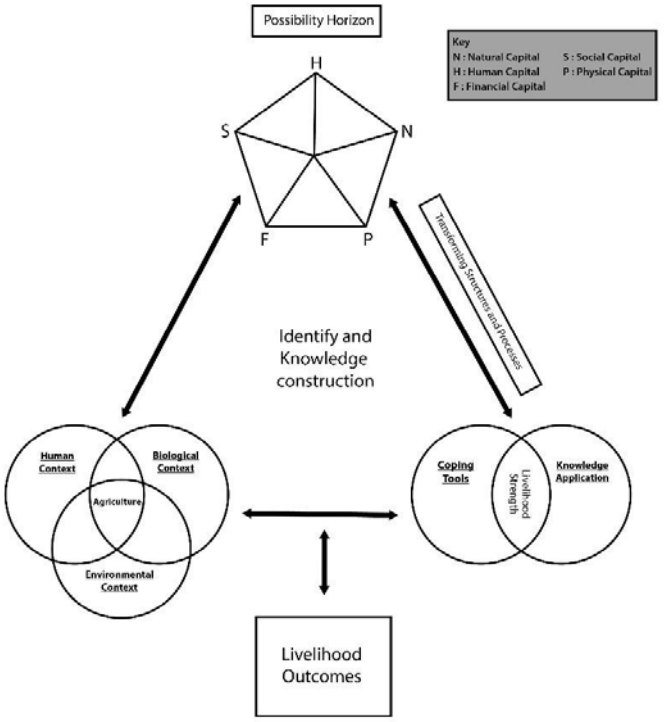


Figure 1: Farming Practice Matrix

Methodology

2,1 Farming practices and context in a livelihood framework

This idea forms the basis of a modified livelihood framework. The framework (figure 2) proceeds from the idea that a person's knowledge bank and identity determines how they perceive their constraints, opportunities and possible livelihood strategies. The range of possible strategies adopted by actors is in turn influenced by what they (in our case, smallholders) specifically perceive as the range of possible outcomes (a 'possibility horizon') dynamically shaped through interactions with the local context (understood as three domains, namely: human, biotic and abiotic). In constructing a livelihood strategy, smallholders draw on their existing knowledge of this context in identifying possible assets in developing coping strategies to achieve outcomes within their possibility horizon. In pursuing these strategies, their livelihood strategies then impact the context and knowledge as part of a dynamic process. This opens up possibilities for the incorporation of a wide range of disciplines in the study of complex small holder systems as well as an exploration of this complexity itself.



Research employing this approach was undertaken in marginal farming communities in including Sidama, Ethiopia, Chittagong, Bangladesh, and Bihar, India, with compatibilities with sister studies in Malaysia and Sri Lanka. Within each research site a sample of between 10 to 20 participants were interviewed using guided snow-ball sampling to assure a cross section of socio-economic status and gender. Data collection occurred in two phases, the first was a social mapping exercise, the second phase a semi-structured interview process based on the framework outlined above. Here we focus on findings concerning seed supplies.

2.2Seed Supply

Conventional views make a clear distinction between formal and informal seed systems. The production of major crops is largely based on the former which encompass a chain of contributors starting with plant breeding, followed by the production of and release of certified desirable varieties. By contrast underutilised crops are often associated with informal seed systems, also referred to as local, traditional or farmer seed systems, as with the dualism between large scale commercial and smallholder systems very clear distinctions are made between the formal, regulated system and the informal systems with the latter generally regarded as being inferior.

However, while in some respects results from Bihar and Sri Lanka align with historical trends concerning increasing take up and access to formal seed systems, a range of informal factors continue to influence farmers seed selection practices. In the case of Bihar access to subsidised seeds, is heavily influenced by finance, and access to officials. Sri Lankan data suggests that access to seeds is highly varied between regions and that this is linked to the initiatives of

specific agricultural officers. In this context the intimate understanding that smallholders have of their own land and interpersonal relationships are critical in relation to seed supply choices opportunities. In Bihar India movements of local germplasm formed an important aspect of local informal practice, smallholders swap seeds, change seed sources, and share tips on new methods within home or community networks. In addition there is evidence in Sri Lanka Africa and India of a very significant local trade in seed. In India local shops provide locally produced seed produced by some local farmers and selling them to others. Other sources of germplasm include family members, outside villages, and local weekly markets.

One feature of local seed selection is that Farmers' adoption of new varieties and crops produced through formal and informal systems is approached with skepticism. Farmers' experimentation is central to seed choice. New varieties, even hybrids, are tested on a small piece of their land. What the findings of our research to date illustrate is that seed selection in smallholder systems is a complex process. Which draws on aspects of both formal and informal seed systems. The integration of new varieties produced in formal seed breeding and dissemination programmes is subjected to local validation processes as those employed in relation to informal crops. A critical issue in this respect is that the seed selection practices rely on multiple forms of knowledge including besides formal extension knowledge personal experimentation, observation, previous personal experience and word of mouth. In this context local seed traders play a central role in disseminating farmers findings about specific seeds and crops.

2. Discussion

So far the research suggest that a recognition of complexity may help to inform development practitioners and policy makers. Smallholders operate in a space where established scientific deistintions between local and expert knowledge are less important than the question of what knowledge is useful. While formal interventions have significant grassroots impact, the way in which smallholders respond to them contradicts many of the assumptions of these models. Smallholders successfully incorporate both expert and local knowledge into their practices. These practices involve experimental method and knowledge dissemination. Further reflection and research, especially in regards to the manner and role of knowledge generation within complex smallholder practices. An understanding of complexity in smallholder practice may support the development of strategies based on self-provisioning as opposed to approaches which are dependent on input intensive production of modern hybrids of major crops .

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