



Assessing participatory processes and outcomes in agricultural research for development from participants' perspectives



Kristal Jones ^{a,*}, Leland L. Glenna ^{b,1}, Eva Weltzien ^{c,2}

^a Department of Agricultural Economics, Sociology and Education, The Pennsylvania State University, 301 Armsby, University Park, PA 16802, USA

^b Department of Agricultural Economics, Sociology and Education, The Pennsylvania State University, 105-C Armsby, University Park, PA 16802, USA

^c International Crops Research Institute for the Semi-Arid Tropics, BP 320 Bamako, Mali

A B S T R A C T

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To analyze the experiences of farmers involved in a participatory plant breeding project in West Africa, we develop a two-dimensional framework for evaluating the process and outcomes of participatory agricultural research for development projects. On one axis, we draw on existing typologies to describe the participatory process as consultative, collaborative, or collegial. On another axis, we theorize and test the outcomes of participation; specifically, whether the process achieves instrumental goals, is empowering for participants, or is manipulative toward participants. Qualitative interviews with farmers and technicians indicate a range of instrumental and empowering outcomes emerging from the participatory process, which support food security through access to seeds and a new ability to share information learned through the research process.

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1. Introduction

This paper presents analysis of a participatory plant breeding (PPB) project in West Africa to assess if and how participatory approaches to agricultural research for development can support and strengthen both practical and strategic outputs that can contribute to food security for individual farmers and communities. Research for development efforts that incorporate participatory processes strive to increase adoption rates and reduce adoption time for new technologies by making them relevant and more directly accessible for end users. Many approaches, including the incorporation of agroecological principles into participatory projects, also seek to build farmers' capacity to further innovate and implement solutions to place-specific needs and challenges (Guzmán and Dent, 1994; Holt-Giménez, 2006). In PPB, the technological outputs to be adopted include both new crop varieties and seeds of them. The individual and community capacities built focus on new communication and social connections that can support further innovation and diffusion of varieties and information (Okali et al., 1994). Participatory agricultural research for development also works to

increase farmers' and rural households' well-being by expanding access to food. Emphasis on the types of access supported by the research for development process depend in part on the institutional and epistemological context within which projects are being implemented, and the understanding of food security that derives from that context.

As defined in the dominant international development discourse, food security for rural, agricultural families and communities can be achieved by supporting and ensuring "physical, social and economic access" to food (FAO, 2009: 8). Mooney and Hunt (2009) argue that definitions of food security and its constituent parts are framed by varying understandings of the global agri-food system and the role of agriculture in meeting individual and community needs. One space of contestation within the food security framework is the question of the causes of hunger, and the most appropriate solutions to it. As Warner (2008) highlights, agricultural research for development in the past focused on developing more efficient technologies that were then transferred to farmers to increase the amount of food being produced, supporting physical access. PPB and other participatory approaches to agricultural research and technology development emerged out of initial efforts of farming systems research to offer an alternative to the Green Revolution research for development model. Rather than focusing on a few crop species and the intensive use of external inputs, farming systems and other alternative agricultural research for development approaches most commonly aimed to target

* Corresponding author. Tel.: +1 406 600 2025.

E-mail addresses: klj175@psu.edu (K. Jones), llg13@psu.edu (L.L. Glenna), e.weltzien@icrisatml.org (E. Weltzien).

¹ Tel.: +1 814 863 8636.

² Tel.: +223 20 70 92 00.

technology development to farmers' needs, to improve research efficiency and to strengthen farmers' capacities (Matlon et al., 1984; Christinck et al., 2005).

Recent research indicates that the Green Revolution increased food security for only some farmers, and generally not for the most vulnerable (Evenson and Gollin, 2003). In response to these observations, De Schutter and Vanloqueren (2011), Pretty et al. (2011), and others argue for a new approach to addressing food security that incorporates the diverse social, economic, and environmental needs of farmers. The emphasis on recognizing and addressing the social and economic needs of farmers is reflected in farming systems and agroecological approaches to participatory agricultural research for development, as well as in calls for food sovereignty (Warner, 2008; Holt-Giménez and Peabody, 2008). Mooney and Hunt (2009) situate food sovereignty within the conversation about the causes of hunger, arguing much like Sen (1981) that in the food sovereignty frame, hunger and food insecurity are understood to be the consequence of inequitable social and economic relationships, rather than the result of technological shortcomings. Food sovereignty can also be situated in direct challenge to the epistemological roots of the contemporary global agri-food system, and the techno-centric definitions of food security that derive from it (see for example Desmarais, 2002; Holt-Giménez and Peabody, 2008). PPB as an alternative approach to research and technology development can be situated within either a food security or food sovereignty (or seed sovereignty (see Kloppenburg, 2010)) frame, depending on the institutional and epistemological context. When focused primarily on developing new varieties and diffusing new seeds, a familiar and locally reproducible agricultural input, PPB is well suited to contribute to efforts to achieve food security through place-based technology development. When emphasizing agrobiodiversity conservation, self-determination and the expansion of social and informational networks, PPB also has the potential to contribute to food sovereignty by supporting farmers' ability to innovate with varieties and seeds to meet their own specific needs and capabilities.

PPB is still a relatively new approach to agricultural research for development, and efforts to analyze and evaluate PPB processes and impacts have focused more on articulating a framework than on applying the framework to specific projects (Sperling et al., 2001; Badstue et al., 2012). Participatory research for development, however, has a long history of what its proponents refer to as putting people, rather than technology, at the center of the change process, to meet a range of desired outcomes (Chambers and Jiggins, 1987). In the context of agricultural research for development, PPB and other participatory approaches are described as being "client driven," thereby supporting the development and spread of technology and information that is appropriate and accessible within specific social contexts (Ashby and Sperling, 1995). As has been widely documented, the participatory nature of PPB projects allows for learning by research staff about farmers' needs and priorities, which supports the development of varieties well adapted to local natural and social conditions (Ceccarelli and Grando, 2007; Dawson et al., 2008; Weltzien et al., 2008b). In addition to meeting material needs, like physical access to inputs that can increase food production more durably than the conventional transfer-of-technology approach to development, participatory research for development approaches are also described as having the potential to support empowering outcomes by shifting the innovation and communication processes between farmers and researchers (Johnson et al., 2003). PPB projects can target and often do target both practical/material and strategic/empowering goals in their project objectives, which as described above have the potential to contribute to both food security and food sovereignty (Weltzien et al., 2005). The capacity building for all actors that can

come from collaborative research approaches is an important strategic outcome of the PPB process, but one that is less easily measured than material effects like yield increases or number of new varieties created (Sperling et al., 2001).

Building on early theories that social change is in part driven by a commitment to analyzing and reconfiguring power and knowledge differentials, some participatory projects specifically target social and institutional changes to enhance the capacity of small-holder farmers to participate in, contribute to, and benefit from agricultural development (Badstue et al., 2012; Weltzien et al., 2003; Chambers, 1989; Freire, 1970). However, there have been few systematic efforts to combine evaluation of both the process and outputs of participatory approaches to agricultural development and natural resource management (Chiffolleau, 2005; Johnson et al., 2003; Weltzien et al., 2003). This paper fills a gap in the academic literature by applying the frameworks that do exist to link types of participatory processes with the outcomes, in order to test the theoretical and anecdotal claims that participation enhances and facilitates a range of materially and strategically desirable development goals (Neef and Neuber, 2011). As Mosse (2001) suggests, empirical evidence from a specific context is imperative for assessing the participatory process, as well as possible and actual outcomes, in a given place. This paper assesses a snapshot in time of a PPB project after several years of varietal selection, testing, and while seeds that result from this project are beginning to be made available. This does not mean other that material effects and innovation processes have not occurred in tandem with the PPB varietal selection and testing process. The purpose of this evaluation is to analyze both the specific processes of the PPB project, and farmers' direct experiences with and perceptions of the participatory process. Initial evidence suggests that farmers appreciate new connections to one another, fostered by the PPB process, which facilitate continued information exchange and innovation, as well as use of the new varieties (Weltzien et al., 2008a).

The second section of this paper begins by briefly reviewing the roots of participatory technology development and the notion of empowerment within different participatory or emancipatory frameworks. We then combine the dominant framework from the CGIAR system (Johnson et al., 2003) that characterizes different types of participation within a participatory project with several similar articulations of the intended outcomes of development processes that work toward shifting social relationships to support transformative learning. The methodological section describes how two different types of primary qualitative data were gathered and analyzed using the combined matrix of process and outcome that is developed in the literature review. The next section then presents a narrative description of a PPB project and its processes in West Africa, with analysis of the types of participation that occur as the project proceeds. The following section analyses the outcomes of the PPB process from the point of view of the farmer, and asks questions of both farmers' and technicians' about what kind of learning and change occurred for farmers as a result of interactions during the PPB process. Finally, the concluding section combines the analytical results of the previous two sections to further explore which types of participation lead to which types of outcome, and offers insight into what types of outcomes are realistic to expect from which type of participatory process. By applying the combined framework offered by the CGIAR system and sociological theories of empowerment, this paper demonstrates that the empowering impacts of participatory processes for farmers occur not through changed power dynamics between farmers and researchers, but through new and durable connections among farmers themselves, which are facilitated by the participatory process.

2. Process and outcomes in participatory approaches

Participatory agricultural research for development refers to “the process of combining local farmers’ knowledge and skills with those of external agents to develop site-specific and socioeconomically adapted farming techniques” (Reinjtnes et al., 1992). Participatory approaches were initially developed as an alternative to the top-down transfer of technology model for agricultural research and extension. Though the immediate outcomes of participatory research for development are often material, as new seeds or techniques emerge from the research process, Okali et al. (1994: 124) make the point that “empowerment as a larger objective is closely associated with farmer participatory research,” though the levels or dimensions of empowering change depend on a project’s outputs and process. The literature exploring the relationship between empowerment and participation is wide-ranging, and in synthesizing it here, two important themes emerge. The first is that participatory research for development does not unequivocally lead to either useful scientific research or transformative change for participants; it is the relationships between process, outcome and motivation that we explore below. A second and related theme in the literature on participation and change is an explicit recognition that the process and epistemological underpinnings of the research process will condition the potential for and types of empowering outcomes possible.

Proponents of participation as potentially empowering build upon Freire (1970) and Sen (1999), who argue the process and outcome of transformative change cannot be neatly separated and must be considered together. However, it is much easier to categorize and critique processes, as a set of discrete plans and interactions, than to measure or even characterize empowerment as an outcome, especially since power and empowerment are often theorized to be context-specific and relational (Mosse, 2001). Empowerment in participatory research for development is generally defined as changes in the innovation process that shift power dynamics between farmers and researchers, so that individual farmers feel free and able to engage in and contribute to the learning-innovation process (Okali et al., 1994; Gonsalves et al., 2005). Given this emphasis on situated and individual learning processes, it is therefore appropriate and useful to bracket assessment of empowering outputs at the level of individual farmers’ interactions and changes (Johnson et al., 2003). Rocha (1997) offers a typology of empowerment that mirrors assessments of participation by characterizing the level at which an individual can exercise new agency. Social development literature provides a similar framework for understanding empowerment by theorizing different levels where power dynamics can shift and provide new opportunity (Kabeer, 1999). Immediate empowerment, in Kabeer’s (1999) typology, focuses on individual agency, of the sort theorized by Sen’s (1999) capabilities approach to development, by expanding substantive freedoms of choice. Other theorists, particularly critical feminists, argue that participatory approaches in mainstream development have an over-emphasis on individual achievement and therefore neutralize the possibility for empowering change, since changes in individual agency do not necessarily dislodge structural power differentials likely to be present through the research for development process (Cooke and Kothari, 2001; Cornwall, 2003). In addition, questions about who defines the participatory process and legitimate outcomes are raised by participatory action researchers in order to challenge didactic understandings of empowerment (Cuéllar-Padilla and Calle-Collado, 2011).

These categorizations and critiques of empowerment and participation offer an important lens through which to return to the foundations of the participatory process and its possible outcomes.

Early practitioners conceptualized participation as multidimensional, and they recognized that the actual division of time and energy spent on participatory research and development projects between locals and experts might vary across time and space within the project (Cohen and Uphoff, 1980). In addition, the participatory research for development process varies based on the underlying research goals. PPB projects, for example, are focused at least in part on generating new varieties of crops, a material output that is evaluated within the framework of conventional scientific inquiry. In contrast, Douthwaite and Gummert (2010) describe how some research for development, particularly when focused on adapting technologies to specific agricultural production settings, emphasizes the innovation process rather than the generation of a specific technology or technique as the end goal. Recent schemas for evaluating degrees of participation in projects incorporate this awareness of the epistemological differences that can arise in projects that involve some level of scientific expertise (Kleinman, 2000; Sperling et al., 2001). When assessing participatory research for development projects that link the scientific method with participatory approaches, the heuristic of degree of participation is useful as another means for assessing how much epistemological space there is for participants to shift from “being merely recipients and beneficiaries to actors who influence and provide key inputs to the process” (Gonsalves et al., 2005: iv).

Lilja et al. (2001) develop a five-mode typology for describing/analyzing participatory research projects based on the degree and type of decision making which farmers contribute to a joint activity. Between the extreme categories of conventional (incorporating no farmer–researcher interactions) and farmer experimentation (no professional researcher participation), they focus on three degrees of interaction: consultative, collaborative, and collegial (Lilja et al., 2001). As mentioned above, Johnson et al. (2003) strive to capture variation in the ultimate outcomes of participation, calling outcomes of participation functional if they effectively achieve material project objectives, and empowering if they enhance farmers’ long-term capacity to communicate with researchers, to innovate, and potentially to alter social power dynamics. The relationships between process and outcome are influenced by the epistemological approach that influences the research process, but are more complicated than a simple one-to-one relationship between positivistic science and material outcomes, on the one side, and an open process leading to empowering results (this complexity is reflected as well in Cooke and Kothari’s (2001) critiques, as discussed above). The framing of participation as potentially leading to both functional and empowering outcomes also has corollaries in feminist theories of change, most specifically in Molyneux’s (1985) articulation of practical and strategic gendered interests as two distinct but related outcomes of actions oriented toward material and transformative change.

3. Two-dimensional framework for assessing the process and outputs of participation

Drawing on theories and assessments of the processes and outcomes of participation, especially Lilja et al. (2001) and Johnson et al. (2003), we create Fig. 1 below to evaluate participatory projects according to the type of participation and the type of impact experienced by participants. However, we propose three modifications to the existing typologies. First, we use instrumental in place of functional. In social theory, instrumental goals focus on efficient and efficacious means to achieve a particular end, without concern for the values associated with the means or ends, and without concern for processes. By referring to outcomes as instrumental or empowering, we seek to draw a clearer distinction between an outcome-oriented focus and a procedural focus. The

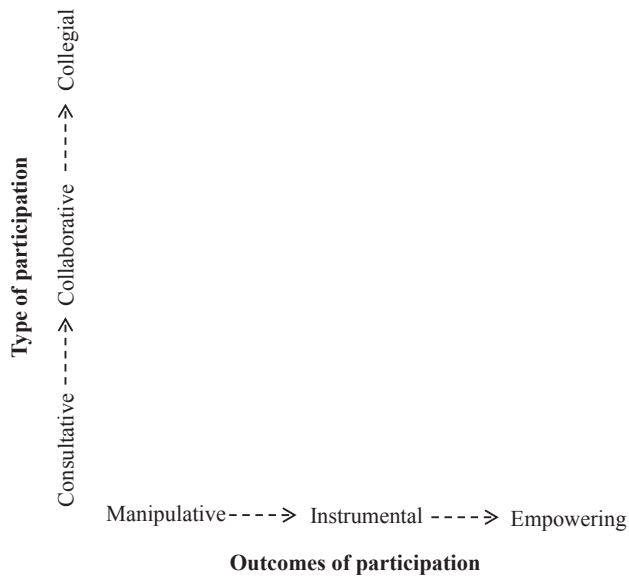


Fig. 1. Axes of the type of participation and outcomes of participation.

two approaches are not necessarily mutually exclusive, but they represent different types of goals, and in the context of participatory agricultural development, can reflect as well different understandings of how best to increase access to food in agricultural communities. Second, we include a category acknowledging that participatory can be used with manipulative intent (Dryzek, 2005). Manipulation, as a proactive and one-sided agenda, is antithetical to a genuine commitment to participatory goals, and so manipulative participation becomes almost an oxymoron, but remains a theoretical possibility. Third, and most importantly, by conflating the degrees of participation in the process with the predicted outcomes, current typologies of participation serve only as *ex ante* assessments of goals, rather than providing useful metrics for understanding actual project outputs. Specifically, Johnson et al. (2003) claim that collaborative and collegial participation is empowering, while consultative participation is functional (instrumental). Keeping the type of participation and assumed outcomes discretely tied to one another enables only a one-dimensional analysis of participation, hindering practitioners' ability to accurately assess complex outcomes of the participatory process.

The columns in Fig. 1 are not mutually exclusive, and they are useful for categorizing the dynamic process and varied outcomes of participatory projects. For example, Mendum and Glenna's (2010) description of a PPB project that incorporated farmers into the process of setting the research agenda to focus on farmers' needs and in shaping dissemination strategies might be labeled collaborative, instrumental, and possibly empowering. Dawson and Goldberger's (2008) description of a PPB project in which wheat breeders supported farmers in developing their own new wheat varieties which would be more suitable for their diverse farming systems and microclimates might be designated as collegial and empowering, since knowledge was mutually shared in ways that gave farmers new skills and information with which to make ongoing and independent decisions.

Collegial and collaborative participation may imply a sense of being preferable to consultative participation, but we do not intend to assign normative status to the various types of participation. In many cases that involve high levels of scientific or technical expertise, communication and control of problem analysis and project goals do not immediately lend themselves to a shift from

outside experts to participant communities, so that consultative participation might be the most appropriate process to achieve desired outcomes (Kleinman, 2000). Moreover, participatory research projects like PPB are not static, one-time efforts, since the process of varietal development, evaluation and release often generates new knowledge upon which to build future work, so that instrumental and empowering outcomes are not mutually exclusive, and are often planned for together. As Sen (1999) asserts, however, the process of development, which can create the potential for new freedoms to learn, must be accompanied by the long-term goal of substantive freedom of opportunity to act; instrumental outcomes without empowerment might limit the long-term positive impacts of participatory processes.

4. Research setting and methods

4.1. The PPB programs and their setting

The PPB programs with which this research project was undertaken is coordinated by the International Crop Research Institute for the Semi-Arid Tropics (ICRISAT), a member of the CGIAR Consortium, the Centre International de Recherche Agricole pour le Développement (CIRAD), national agricultural research systems in Mali (Institut d'Economie Rurale, IER), Burkina Faso (Institut National pour l'Environnement et la Recherche Agricole, INERA) and Niger (Institut National de Recherche Agricole au Niger, INRAN) and farmer organization partners. The programs have been working in West Africa for close to ten years and have focused primarily on varietal development and evaluation of sorghum (*Sorghum bicolor* L. Moench) in Mali and Niger, and pearl millet (*Pennisetum glaucum* [L.] R. Br) in Niger; both are local staple grain crops. This research project focuses on several program sites: the rural communes of Siby and Dioila in Mali, the Boucle de Mouhoun in Burkina Faso, and the rural communes of Bokki and Serkin Haoussa in Niger. The three countries share similar ecological settings, situated just south of the Sahara, in the Sahelian and Sudanian zones (SWAC/OECD, 2007). All have substantial agricultural sectors, mostly of subsistence farming based on sorghum, pearl millet and maize (FAOSTAT, 2012).

Farmers involved in these PPB projects are not currently working with other research for development plant breeding programs for sorghum or pearl millet. Some have done field trials in the past with NARS, but PPB as a complete process is a new approach to agricultural research for development programs in West Africa. Around Serkin Haoussa, Niger, farmers have a long-standing (more than fifteen years) familiarity with specific improved varieties of pearl millet that have been distributed by the government or aid projects, but a range of improved varieties have not been widely available there. In the project areas in Mali and Burkina Faso, improved varieties of sorghum have been sporadically available through extension or development projects but are not consistently available from state or commercial seed sources. The most common traits identified by farmers interviewed in this study are drought tolerance, short maturation cycle (to better cope with variable rains), and resistance to striga, a parasitic weed. By connecting farmer knowledge and needs to research for development institutions, these PPB projects have the potential to provide an interactive and iterative learning environment for farmers and research technicians.

4.2. Methodology

This study uses a qualitative approach to evaluate experiences of process and outcome for individual farmers involved in PPB projects. The overview of the PPB process presented in the following

section was documented and analyzed by accessing project documents, as well as through participant observation (by the first author) and long-term experience (of the third author). All primary data presented on farmers and technicians' experiences was collected by the female graduate student (first author) during two months of fieldwork in June and July 2010. Semi-structured interviews were conducted with participating farmers, ICRISAT research technicians, and local agricultural technicians at the two sites in Mali and Niger, and one in Burkina Faso, and used to evaluate actual outcomes of the PPB process (see Table 1 for demographic information of those interviewed). Research sites were chosen from the list of villages active in the PPB project based on limitations of time and travel, and individuals were identified by local technicians' mental lists of farmers participating in field trials or varietal selection. Without complete random sampling, there is likely to be a bias toward those more interested in or with a longer history of participation – local technicians choose engaged and enthusiastic farmers. However, farmers with more PPB experience are more likely to have reflected upon their experiences with the PPB process and so provide a population of interest for examining long-term outcome of participatory processes. To ensure that women's unique experiences were included, we purposively sampled women participants in each village, since women's domestic demands often keep them from the participating as fully as men and so from being included in a technician's ad hoc sample. We also interviewed each technician involved with implementing the PPB protocol with farmers in the field. In four of the five research sites, these technicians work within the farmer organizations and provide consistent support to farmers throughout the PPB projects. In Bokki, Niger, a research technician, who works with the research station scientists to implement the projects, was interviewed as he provides primary support to the farmer organization in this area. In the subsequent analysis, we will refer simply to technicians, since all have been trained in both technical agronomic skills and participatory approaches.

For both farmers and technicians, interviews focused on their experiences with and perceptions of participation in the PPB projects. All participants were asked what they taught and what they learned from one another, and the data presented below is analyzed for different outcomes of different types of interactions (those between farmers and technicians, and among farmers). Asking technicians and farmers the same questions, what they taught and what they learned, allows for analyses that compare and contrast the perceptions of farmers and technicians alike. French is the official language of all three countries in which this study was conducted and the graduate student who conducted fieldwork speaks French fluently. However, almost all of the farmers

interviewed primarily speak local languages, which meant that translators were needed. During the interviews, questions were posed in French and translated into the local language, with responses translated back into French. The interviews were recorded and later translated into English. The layers of translation would make it inappropriate to do a formal discourse analysis on farmers' comments. However, as Temple and Young (2004) argue, translation occurs at multiple levels throughout the qualitative research process, and given the confidence we have in our translators and our own understanding of context, we argue that the perspectives shared by the program participants survive the layers of translation and that our use of them is appropriate. Halai (2007) reviews literature on presenting translated qualitative data and finds no clear rules or best practices for attributing translated quotations. Because of the multiple layers of translation in this research project, the data (quotations) are presented as representative of a specific theme the data are presented in single quotation marks rather than double quotation marks (Peters, 1973).

5. Characterizing the PPB process in West Africa

The PPB projects discussed here, the first to work with sorghum and pearl millet in these West African countries, have focused on three stages of the plant breeding process: priority setting and targeting, variety development and varietal testing (Weltzien et al., 2003, 2008a; Omany et al., 2007). At the beginning of the breeding projects, work on priority setting was the dominant activity. It was mostly carried out through open-ended discussions between researchers and farmers before, during and after harvest of diverse existing improved varieties, grown by farmers in their own fields (Weltzien et al., 2008a). Project breeders, technicians and extension workers led these open-ended discussions, which also provided farmers the chance to ask questions. These consultations led into collaborative variety testing, and variety development, while also influencing and triggering changes in the orientation of the other PPB stages creating new diversity, as well as starting seed dissemination of preferred varieties, and continuing to provide insights into further refining priorities and target traits for the breeding programs. These discussions also led to the identification of the specific farmer organizations as partners for continued collaboration.

This first stage of the PPB program might be characterized as consultative. The researchers and technicians sought feedback from farmers on a number of agronomic and post-harvest characteristics. The information sharing was primarily uni-directional, from farmer to technician, since researchers and technicians continued to lead the research process. These initial interactions clarified to farmers that the project focused on research for technology development – in this case, developing new varieties of sorghum – so that it would not be confused with a pure development project. Thus the foundation was created for ongoing expert–farmer interactions, with the potential for transforming it into a collaborative or collegial relationship.

Once farmer preferences and priorities were clarified, experimental varieties were identified for multi-location evaluation trials. Farmers participated in two types of variety evaluation trials: the first step was geared to identify the best performing new varieties in the target zones of the three projects from a set of twenty to thirty varieties. The second stage of testing focused on those varieties preferred by farmers. Three- or five varieties were tested by farmers under their own crop management conditions. In each participating village, at least four farmers were chosen (usually by the village or farmer group interested in the project) to install and manage a field trial. Technicians worked with the farmers to structure the trials in such a way that the data gathered could be

Table 1
Sample of farmers and technicians interviewed.

	Farmers		Technicians	
	Gender (percent M/F)	Average age	Gender (percent M/F)	Average age
Mali				
Farmers <i>n</i> = 50	48/52	45	100/0	35
Technicians <i>n</i> = 3				
Burkina Faso				
Farmers <i>n</i> = 8	50/50	44	100/0	36
Technicians <i>n</i> = 1				
Niger				
Farmers <i>n</i> = 28	39/61	48	100/0	40
Technicians <i>n</i> = 2				
Total				
Farmers <i>n</i> = 86	45/55	46	100/0	37
Technicians <i>n</i> = 6				

systematically analyzed by the research team, while also being useful and accessible to farmers in the area. Everyone in the participating village was invited for a day-long field visit at the end of the season, prior to harvest, to evaluate the varieties based on their own set of preference criteria. The most simple evaluation techniques involved using a set of three notecards, each a different color, with which to vote for their most preferred, least preferred, and “has potential” varieties. After the harvest, another group evaluation day was held and focused on cooking characteristics, which increased emphasis on women’s preferences and selection criteria, as they are responsible for the processing and use of cereal grains. In preparation for the cooking trials, the results from the field trials were presented to farmers who conducted the trials, and any other farmers from the village interested in the discussing the results.

We characterize this second stage of the PPB project as collaborative. Field trials have a traditional knowledge-diffusion structure, and in this case, the knowledge is shared in many directions. The technicians actively and genuinely worked with the farmers to both educate and learn from the farmers in a two-way information exchange. Furthermore, because of the interactive evaluative aspect of farmer participation, there was a potential peer-education aspect to this stage of the process, a theme which emerged clearly in the following analysis of interviews with participating farmers.

In addition to open-ended evaluations of the varieties in the field tests, the individual farmers who conducted the trials kept detailed notes about the varieties and their characteristics throughout the season, from planting through post-harvest storage and consumption. Technicians worked with farmers to develop methods of documenting farmers’ preferences that work for those who are illiterate or otherwise unfamiliar with note-taking and formal writing. Data gathered by farmers were kept by them, usually in notebooks, and also shared with technicians and primary researchers to be compiled at the end of the season. With the combination of individual and group data, technicians analyzed preferences based on different geographic areas and crop growing conditions, as well as across social divisions (male and female preferences, people of different ages). The technicians also compiled and analyzed the grain yield performance of the tested varieties across all the farmers’ fields, and research station testing sites. Both types of results were presented at meetings attended by representatives from the villages where farmers conducted trials and led by technicians, who presented the compiled analyses of farmers’ data and facilitated discussion among farmers, technicians and researchers. The discussions were focused on a range of issues, specific varieties that merit seed production for large scale distribution, preferences for certain plant characteristics, as well as the target growing conditions for future variety testing, and methods used for evaluation. These meetings resulted in decisions about which varieties to choose for commercial seed production, as well what type of trials to conduct the following season, what type of agronomic treatments to include, and which villages might like to join the effort or might drop the activities.

As consultation and collaboration on varietal and trait identification, selection, and trials has continued, the final step of the PPB process, the seed production of improved varieties best suited to the local environment, has also gotten underway (Daloheun et al., 2011; Morris and Bellon, 2004). The PPB projects in West Africa have focused on seed production and dissemination systems that currently exist and ways to strengthen and expand them to support the use of improved varieties. Many of the farmers’ groups and villages that initially participated in field trials and selections have now moved towards certified seed production and sales. Several farmers’ cooperatives successfully produce and market improved

variety seeds that were developed and selected in their areas. Thus farmers are exploiting new business opportunities arising from their contributions to variety development and testing.

6. Farmers’ and technicians’ perceptions of the outcomes of participation

Participatory approaches to research for development are based on consistent evaluation, iterative learning, activities which are part of both the process as well as methods used to generate the intended project outcomes (Johnson et al., 2003; Weltzien et al., 2003). The following analysis of quotes from semi-structured interviews with farmers and technicians who participated in the PPB project in West Africa confirms the basic theoretical assertion that both instrumental and empowering outcomes are important to participants, and that different types of participation can lead to one or both types of outcomes. The data presented here are quotes that are representative of common themes that emerged during qualitative analysis. The order below follows the order that the questions were posed to either the farmer or the technician.

6.1. Farmers, why did you choose to participate?

‘He accepted in order to have performing varieties, early varieties.’

‘He knows that they can gain new knowledge. And with INERA, there is information and also seeds. And with the utilization of improved seeds, people can improve their harvest.’

‘He did it to look for a variety of his choice, so that he could keep planting that.’

‘She said that when you choose to participate in activities, you will learn new knowledge from participation. That’s what motivated her, knowledge.’

‘Because she wants to learn and teach others.’

In all three countries, most farmers expressed interest in the instrumental aspects of the PPB projects, placing a strong emphasis on the desire to increase their yields and highlighting the changes in soil quality and rainfall as reasons that improved or new inputs or techniques were required to bolster food security. The single strongest reason for choosing to be involved was the perception that participation would bring access to new technologies. Seeds, fertilizer, and implements were all mentioned, although the focus was generally on improved variety seeds. Many farmers expressed interest in connecting to technicians’ knowledge about new techniques and inputs, focusing not on the process of acquiring that knowledge but rather on the practical utility of increased yields. As can be seen from the last three quotes, however, many farmers also expressed a strong desire to learn more and make their own decisions, which suggests that participation in the program meant more to them than merely gaining access to improved varieties. Interest in combining knowledge of their unique situations with the expert knowledge captured in improved variety seeds suggests a goal of increasing agency through participation. Many also expressed an interest in knowledge to be shared with others as a way to help beyond improving yields in their own fields. Though farmers did not explicitly explore the differences between gaining and sharing knowledge within the community and knowledge coming from the outside, their interest and confidence in gaining knowledge to use and share suggests the possible emergence of empowerment.

6.2. Farmers, what did you learn from research technicians?

'Use of fertilizer.'

'Modern practices.'

'He learned about lots of varieties. So now, he makes a choice.'

'She learned how to do a test ... she saw that it's a good thing, to do all of that to be able to see what a good variety is.'

Farmers repeatedly discussed the instrumental outcomes of participation. Most of the responses to the question "What did you learn from research technicians?" focused on the outputs – technologies or techniques – and why they are practically useful. The primary focus was on seeds, particularly learning the new varieties' names and characteristics, and how and when to use them. People also discussed agronomic practices, often starting out very specific by listing the spacing rules or the timing between rounds of weeding. As they continued to talk, however, many would eventually characterize what they learned as 'modern practices.' Knowledge learned from the technicians was new and called for change, and many farmers contrasted this to their own, traditional crop management practices, which they deemed no longer sufficient.

In addition to the predominant focus on instrumental ends, some farmers did highlight the effects of the process of participation, stating that they gained a new ability to act and make decisions for themselves with the knowledge they gained. All of these farmers talked about choice – new knowledge afforded them increased ability to make decisions that make sense for their context. Many talked about knowing about the improved varieties, so that they could find what works best for them. A few farmers mentioned that training in varietal selection meant that they could continue to create, evaluate and choose varieties to meet future needs. Though those needs are still material, the confidence to use those skills in new ways suggests a sense of empowerment through the potential to change future innovation processes, which could turn participatory plant breeding into a farmer-managed process. This is an example how practical knowledge communicated from technicians to farmers has the potential to become empowering for individuals as they adapt and use new information to meet their own needs and goals for change.

6.3. Technicians, what did farmers learn from you?

'Selection of the best varieties.'

'To see the difference between the old practices and the new system.'

'The farmers ... compare the varieties that are sensitive to these practices and the varieties that are not sensitive to this. Sometimes, they can choose one variety [that they prefer].'

'Really our emphasis is on participatory work. We don't just tell the farmers. It's better to be behind them, and they do it. And that really helps them find a solution.'

Like farmers, technicians had diverse perceptions of what farmers learned from them. All mentioned the practical outcomes, such as varietal selection, knowledge of improved varieties, and the usefulness of new practices. For farmers, material outcomes like these were fairly distinct from any more abstract changes in their abilities to make decisions. Technicians' comments about farmers choosing their own varieties, however, were set in broader

expressions of supporting farmers in making their own decisions. Some of the research technicians were clear that their role is in fact just that – supporting, facilitating, and even structuring the learning process. Technicians' experience of being 'behind' the farmer throughout the process seemed to hold an implicit assumption that farmers had the experience of being supported and empowered to make new decisions and take new actions. Perceptions by technicians of empowerment through a change in social interactions between technicians and farmers stands in contrast to farmers' own expressions of mostly material outcomes, in the form of seeds and information, from their direct interactions with technicians.

6.4. Farmers, what did you learn from other farmers?

'He said that, with the inter-farmer visits, if you go to someone else's field, and if you see that he's done good work, you can ask, how did you do that? And he can tell you, and you can learn the techniques.'

'He said that the exchanges between farmers brought him a lot ... knowledge, that's the first thing.'

'She said that, what she has learned with [the local trainer], she really is like a counselor. She gives good advice. It's she who directs a group, but she really gives advice about how to work with people, and how to coordinate people.'

Much of what was learned among farmers during the PPB process seemed instrumental in nature. Farmers often mentioned learning about better techniques and improved seeds by just noticing certain fields and asking their owners what they were doing. In addition, there is also a sense of something more than just the practical value of the information being learned. Farmers expressed that they have access to information through new channels that they can choose to use, or not. There is no formal project for stopping by the field on the way home to ask about a new variety you just noticed. Instead, farmers can better access others' knowledge and experiences, when and how they see fit, as it meets their other goals and priorities. There was little direct discussion of broader, more strategic use of information and the participatory process. However, some farmers did highlight the ways in which participation in farmer exchange visits will be more than instrumental in their lives. Even the ability to ask for seeds or information is an important step toward thinking about needs and priorities in a more strategic way and is consistent with Freire's (1970) perspective on empowerment in the sense that it must emerge from within an individual or community. Many farmers expressed not only instrumental but also potential beginnings of immediately empowering experiences working with and learning from one another.

6.5. Farmers, what did other farmers learn from you?

'She said that the other farmers made visits to her, in her field. There was a variety that farmers wanted for seeds. So, those who didn't do tests, asked for a little bit of seed from her.'

'He did a demonstration field last year. So that when people passed by cart, they saw it, they came and said what type of field is this? What variety? And he would explain to them, the demonstration plan, and the different varieties. So he found that people learned from him.'

'He said that he taught the other farmers, not the other testers, but the other farmers. He would call them and show them what

they are doing, and then the others too can apply it in their own fields.'

'If someone goes to a training, if she comes back and went only for the training, that's not good. You are obligated to do restitution [feedback workshop].'

Similar to discussing what they learned from others, many farmers saw what they taught as being useful in a practical, immediate way. Mostly they identified sharing new techniques and varieties of seed, which did often originate from the PPB project itself, meaning that the knowledge was originally transferred from research technician to farmer. Some farmers were very clear about that, seeing themselves as more of a conduit to spread the exact same information. Others, however, discussed sharing their knowledge, of varieties and practices, with those who asked. Rather than continuing to see that knowledge as static from its initial use with the research technicians, many farmers seemed to see themselves sharing their knowledge and combining it with other knowledge in a variety of ways.

As farmers talked about what they had taught one another, the tenor of the conversation often changed. People seemed proud, content, and often emphasized the responsibility they felt to share their knowledge with others. This ethos might come in part from the PPB projects directly. Throughout the interviews with farmers who work with the projects, they consistently mentioned how dedicated the principal breeders (foreign scientists who work primarily on the research stations) were to the projects and to the farmers themselves. All of the technicians work long and hard to keep the projects going. It seems possible, then, that the collegial aspects of the process, where farmers feel supported to build on specific knowledge, might instill in participants a desire to continue the sharing and exchange process that they have appreciated. Many farmers also highlighted the nature of exchanging information, so that knowledge is created. The energy and confidence with which people spoke about learning from and teaching each other suggest that new, empowering communication and learning networks may emerge out of the PPB process.

7. Discussion and conclusion

Participatory approaches to research for development start from the premise that the processes used to develop new technologies can achieve a range of material and socially transformative outcomes. This situated approach to research for development stands in contrast to the transfer-of-technology model that seeks efficient processes to generate standardized, uniform outcomes. Whether done through consultative, collaborative, or collegial approaches, participatory approaches can achieve instrumental outcomes by directing technology development efforts to address material needs in individuals' lives, as well as empower individuals by expanding their ability to make substantive decisions about their own agricultural systems (Christinck et al., 2005; Neef and Neuber, 2011; Sen, 1999). To evaluate the outcomes of participatory processes, we develop here a two-dimensional typology to evaluate a series of PPB projects in West Africa. Our analysis, depicted below in Fig. 2, suggests that by utilizing a contextualized, inclusive innovation process, PPB has the potential to contribute to both strategic outcomes of building capacity and empowering farmers to enact further change, as well as to material goals of making accessible useful technologies to improve food security.

The first stage of the PPB projects we analyze here was by design consultative and had instrumental outcomes. However, the second and third stages of the projects could be called collaborative. Interviews with the farmers and technicians suggest that the

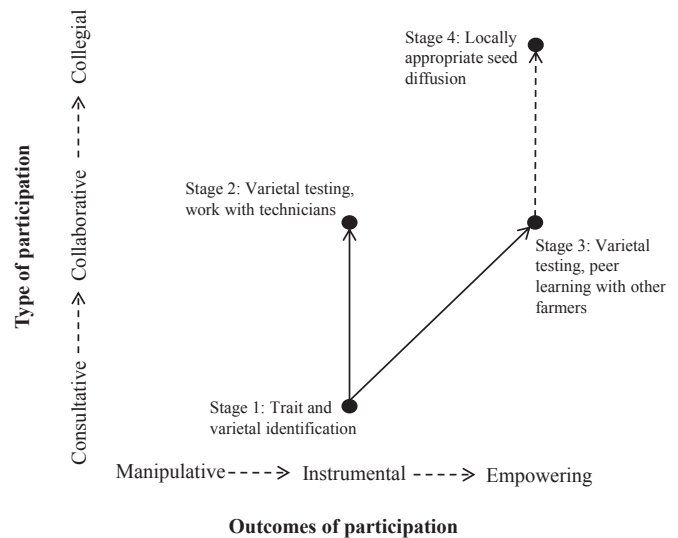


Fig. 2. Relationships between process and outcome in West African PPB projects.

collaboration yielded both instrumental and empowering outcomes. Most farmers discussed their interactions with technicians as facilitating instrumental outcomes, which contrasts with technicians' characterization of participatory processes inevitably leading to empowering outcomes based on the social relationships between themselves and farmers. More reflection by the technicians on approaches to the participatory process that support farmers' experiencing empowering outcomes as well as strengthening the feedback loop from technicians to farmers will help PPB and other participatory research for development projects better assess and continue to adapt their project processes to intended outcomes.

It is important to note that the practical knowledge shared in one direction, from technicians to farmers, was an important foundation for collegial exchanges among farmers themselves. Specifically, when farmers came together to collaborate with the technicians and scientists, there was an opportunity to begin to develop an empowering peer-education network as they shared knowledge with each other. Much like participants in other participatory agricultural research for development projects, farmers in West Africa also highlighted the immediate empowerment that derives from using knowledge learned during the project to assess and meet their own individual needs, both material and abstract (see Almekinders, 2011, for an example from Central America). Molyneux (1985) suggests that it is often necessary to address practical needs in order to focus on more strategic goals. As farmers' comments to us suggest, farmers are increasingly interested in critically analyzing their own needs and their ability to meet them as a result of the participatory process.

Our analysis of these PPB projects confirms insights from the literature that farmers appreciate the ability to learn from and with one another, in part because exchanging information broadens overall knowledge (see Weltzien et al., 2008a; Rist et al., 2007). The sentiments expressed by farmers when discussing their interactions with technicians focused on material needs that can now be met with new information and seeds. In contrast, farmer-to-farmer exchanges were characterized as means to learn, share, make choices, and use knowledge in new ways. The sense of responsibility to share new information seemed to come in part from recognition that, just as an individual farmer had taken in new knowledge, made it his or her own and benefited from it, others too should have the chance to do so. Though farmers tended to

emphasize individual decisions and knowledge acquisition, rather than process, their discussions of their interactions with one another and the mutual learning and exchange that takes place during PPB projects belied an implicit interest in process. And their comments indicated that the social connections formed through the PPB process were ongoing and continued to be sources of useful information and a sense of confidence.

Evaluations of the long-term impacts of participatory research for development efforts must include both concrete efforts to generate instrumental and empowering outcomes throughout the project processes as well as explore the empowering outcomes for all project partners. The use of scarce resources to focus on instrumental goals first and to address empowerment issues secondarily is a common theme in practical development and research for development approaches. However, as Sen (1999) argues, there is no reason to assume that people can continue to meet their instrumental needs without assistance unless they are empowered to achieve those needs in the long term. In the context of achieving food security, individuals must have not only physical access but also social and economic access to food or the inputs to produce it. In addition to focusing on instrumental outcomes, such as increasing crop yields and access to new varieties, PPB and other participatory research for development approaches are inherently also addressing strategic goals that can help generate the freedom to use new knowledge in ways (Sen, 1999). Though the research and analysis presented here do not suggest that food or seed sovereignty as distinct arrangements are emerging in West Africa at this point, the empowering relationships among farmers generated by the PPB process could provide the foundation for a move toward more autonomy over decisions made in agricultural production systems in the region.

The material effects of the incorporation of improved varieties into local seed networks could have wide-ranging effects on how the later stages of PPB projects continue to evolve, as well as effects on farmers' decision-making processes about adopting new seeds and information into their individual agricultural practices. Innovative methods of diffusing and supporting the adoption of seeds will be necessary to achieve the targeted material impacts while maintaining the participatory focus on people and their diverse needs. This research offers an analysis understanding the processes and outcomes of PPB, and provides lessons upon which to build as the projects move toward seed dissemination. In particular, farmers have identified knowledge exchange among themselves as an empowering and appropriate way to adopt new information about seeds, and these farmer networks might well provide an important route to further dissemination of improved variety seeds on a scale beyond the scope of the individual PPB projects.

Participation as a process is ongoing throughout a project and ideally, beyond its end. The needs being met, however, can be explored and described at a given point in time, and the participatory process altered accordingly. The initial interests of farmers, for improved variety seeds, seem to have been met, as evidenced by their comments and the high demand for trials of the varieties. More strategic goals of supporting social and economic access to new seeds for food security should build upon the empowering aspects of the PPB process: interactions and knowledge sharing among farmers themselves.

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