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Experimental By Nature: Rice Farmers in Ghana

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A project in Ghana tried to encourage government extension agents to change their attitudes. Instead of merely teaching new techniques, they were supposed to engage rice farmers in a two-way learning experience. The extension agents accepted some of the project philosophy, but they still thought that the goal of the project was to teach new technology to farmers, rather than to encourage farmer learning and innovation. Even so, the farmers actually did experiment, because it is in their human nature to do so. Some project staff, especially the researchers, did gain more appreciation for farmer experiments. In the future, participatory research should be done with more active involvement from the researchers, instead of leaving much of the daily work in the hands of extensionists.

Key words: West Africa, participatory research, farmer experiments, agricultural research, PLAR

Introduction

In 1940, British mycologist and novelist E. C. Large reviewed the previous 200 years of research on plant pathology. Large was a scientist with a great respect for Louis Pasteur, Anton De Bary, the Rev. Miles Berkeley, and other earlier scientists. Yet, he noted in a matter-of-fact tone that in 1750 Mathieu Tillet encouraged French peasants to do experiments on wheat bunts (a type of fungal disease), to convince them that the disease was contagious. He wrote approvingly that H. Marshall Ward worked in the field with coffee planters in Ceylon to solve coffee wilt in the 1870s. Large sneered at those British scientists who took decades to find a cure for potato late blight (which triggered the Irish potato famine), partly because they sent their assistants to do the fieldwork, instead of going to on-farm trials themselves. He notes how Professor Pierre-Marie-Alexis Millardet got the idea for Bordeaux mix (fungicide) by observing the local practice of spraying copper sulfate on grapes near paths to discourage people walking by from snatching grapes. The estate manager, Ernest David, agreed to do experiments for the professor in the 1870s, leading to the wildly successful fungicide still used today (Large 1940). All of this would now be called "farmer participatory research," but Large simply called it research. Jules Pretty (1991) also described how formal research in Britain was all done on farms in Victorian times. In the late 19th and early 20th century, United States scientists routinely performed agricultural trials on the farms of collaborating growers (Campbell, Peterson, and Griffith 1999).

About the time that Large was writing, seed companies in the United States were creating hybrid maize seed, curtailing decades of local research on open pollinated varieties. Farmers would now reap higher yields if they reared hybrid maize, but they would have to buy the seed every year (Kloppenburg 1988).

International research centers based the green revolution on conventional, scientific plant breeding for high yielding varieties that would respond to [mineral] fertilizers. As research became more compartmentalized and reductionist, the intermediate goals (e.g., publishing in peer reviewed journals) became more immediate than the ultimate goals of finding solutions to farmers' problems.

Research shifted to experimental stations where real world messiness could be kept to a minimum. Scientists could reach the station quicker, saving costs. The flat, uniform land made replication easier, and the crops were tended by workers who followed out scientists' instructions faithfully and would not, for example, harvest the crop before the data could be gathered.

By the 1980s, agricultural scientists had so little contact with farmers that a new generation of writers, many of them social scientists, began to rediscover farmer experiments. At first, it was enough to simply observe that farmers did

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experiments, as evoked in the title of one of Paul Richards' (1989b) articles "Farmers Also Experiment," which followed on his earlier book also devoted to documenting the experiments of Mende-speaking rice farmers in Sierra Leone (Richards 1986). Fourteen years earlier, respected American anthropologist Allen Johnson (1972) wrote that smallholder farmers in northeastern Brazil frequently experimented, for example, with new crop varieties, and that no two families farmed exactly alike—in short, their work was creative while "traditional." Johnson's paper was carefully argued and well written, yet it was ignored until it was rediscovered after the work by Paul Richards. Then, within a few years, there were several programmatic statements encouraging scientists to collaborate with farmers (e.g., Biggs 1989; Farrington and Martin 1987; Fujisaka 1989; Rhoades 1987).

The topic of farmer experiments has endured in anthropology, which had previously placed too much emphasis on tradition and conformity. Recent ethnographies frequently describe farmer experiments. For example, Zapotec farmers experiment with crop varieties, machinery, and fertilizer at different altitudes. As a result, their agriculture is neither traditional nor modern. "Fused might be a better term" (González 2001). Ben Orlove (2002) described in great detail how peasant fishing-farming communities on the shores of Lake Titicaca invented new types of boats, net, and other gear to catch trout after they were introduced into the Lake in the 1930s. As Glenn Stone (2004) puts it, for smallholder farmers, each year, each plot is an experiment.

However, the change in agricultural research was slight. Twenty years after the rediscovery of farmer experiments, anthropologist Stephen Brush (2004) wrote that mainstream agricultural research remained disciplinary, commodity-specific, and based on experimental stations. Scientists in agricultural institutes resented the rhetoric of participatory research about reversing normal agricultural science. Problems with participatory research included sustaining farmer involvement, selecting farmers, and using information from farmers. Farmers were interested in new technology but lacked the time to do research and soon tired of it. Farmer collaborators were chosen ad hoc, usually biased towards wealthier men (Brush 2004).

About the same time that anthropologists and others were rediscovering farmer experiments, development experts began to appreciate local knowledge, which anthropologists had valued for many years (Brokensha, Warren, and Werner 1980; Sillitoe 1998). Many approaches followed up this new respect for farmers' intellect and creativity, and two of the most influential were the participatory rural appraisal (PRA) and the farmer field school (FFS). The PRA proposed staying with villagers for a week and using drawings and other visual aids (e.g., cropping calendars, transect walks, historical time lines) to help farmers and visitors interact to learn about local agriculture and its constraints (see Chambers 1992; Mosse and Lewis 2006). The PRA was an able method for determining farmers' constraints, but not as good at finding solutions. It also made exaggerated claims about its ability to "empower" farmers (Mosse 2005; Rhoades 1998).

The FFS uses weekly sessions with groups of about 25 farmers "from seed to harvest" to stimulate experiential learning (Gallagher 2003; Winarto 2004). But neither the PRA nor the FFS were designed for agricultural research. The PRA was basically a method for social research. The FFS started as an extension method in Indonesia in the 1980s to teach integrated pest management, although it was later adapted for research (Nelson et al. 2001).

A Pragmatic Innovation

By the 1990s, there was still not an established protocol for actually doing research with farmers, and few scientists were convinced of its value. Thus, it was an innovation in the late 1990s, when two young agronomists, who had had earlier experience with farmers in Mali, devoted a year to working with two villages in Côte d'Ivoire, spending nearly two days a week in the field, discussing rice with farmers and learning from each other. For example, the scientists and the farmers realized that the biggest problem (in these villages) was drainage. So they dug a drainage ditch and built some bunds (small ridges of earth) to distribute the water evenly. It was also important that the scientists were from an international agricultural center (WARDA, now AfricaRice). They called their farmer-friendly approach "PLAR" (participatory learning and action research) (Defoer and Wopereis 2007).

Brief Project History

The PADS project (Participatory Adaptation and Diffusion of Technologies for Rice-Based Systems) began in 2000, hosted at the Africa Rice Center (AfricaRice, a member of the CGIAR—Consultative Group for International Agricultural Research), then headquartered in Côte d'Ivoire, with project activities there and in The Gambia, Ghana, and Guinea. It was designed to use the PLAR approach, where extension agents would hold weekly sessions with farmers over the course of the rice growing season and encourage farmers to experiment with a range of techniques (Defoer and Wopereis 2007). A manual for extensionists explained how to encourage small-scale experiments with various technical options, including timing of land preparation, mineral fertilizer doses and times of application, water management, new rice varieties, and various ways to control weeds. The manual had 28 modules, chapters corresponding to weekly sessions with farmers (Defoer et al. 2004). When Bentley read the manual, he thought it was written so clearly that the readers would easily grasp the main point: that the farmers would try the suggestions they liked and fine-tune some of them qualitatively.

This progressive approach would have seemed revolutionary in 1980, but would have seemed common 100 years earlier. By the 2000s, it added useful research protocols and a practical attitude to an idea that was fashionable but in fact not often implemented: farmers could be involved in research. The PLAR adopted much of the philosophy of the PRA (e.g., respect for local agendas and spending long periods of

time in villages). The PLAR adopted weekly meetings and a seed-to-harvest approach from FFS, but gave farmers more encouragement to conduct experiments in their own fields on whatever topic they thought relevant for them.

The PLAR also bears some resemblance to another approach, called CIAL (committee for local agricultural research), which is better known in Latin America. Like the CIAL, PLAR organizes farmers to experiment around specific themes (Ashby et al. 2000). Similarities between the CIAL and the PLAR were unintentional and the creators of the PLAR did not use the CIAL as a model (Wopereis, personal communication, 2008). The two approaches have a different philosophy of experimentation; the CIAL encourages farmers to experiment in formal, community-level trials, and then a committee of farmers reports back to the community, while the PLAR tries to spark farmers to do more varied, individual experiments and works with 20 or 30 farmers instead of a committee of five.

PLAR sessions are supported by a facilitator, and they are designed with a healthy respect for farmer knowledge, especially for the qualitative and idiosyncratic way that farmers experiment. This understanding comes partly from reading Paul Richards' accounts of rice farmers' experiments in West Africa (e.g., Richards 1986, 1989a). Unlike the FFS, with a group learning plot, PLAR encourages each farmer to experiment on a small portion of his or her own land. PLAR presents farmers with new ideas every week, which each farmer is free to try (or not) at home. So one farmer may test ideas one, three, and five, while another tries numbers three, four, and seven. Thus, in the PLAR, farmers test more than one variable at a time, in the same treatment, in contrast to scientific method but wholly consistent with the way farmers normally test new ideas (Saad 2002).

The PADS project was influenced by some of the original creators of the PLAR, who thought that the project would encourage farmer experiments. The leaders of the PADS project at the international level accepted this, but the grassroots extension agents were never quite convinced that farmers could or should experiment. They saw the project as a way of simply teaching farmers how to grow rice more intensively.

Skeptical Extension Agents

However, in 2008, the project's final evaluation team documented various farmer experiments (see Table 1). Occasionally, the facilitators (extension agents) did show a regard for farmer experiments, for example in the town of Biemso Number 1, in the Ashanti region, the facilitators and farmers explained how they had learned together that rice should be transplanted when the seedlings were just two weeks old, not two or three. Farmers observed that if they started transplanting when the rice nursery was three weeks old, they did not finish transplanting until the rice was four weeks old, and by then, the seedlings were too big. The extensionists agreed. But in most other cases, extensionists failed to see the reason behind farmers' changes in the technology.

For example, researchers, extensionists, and farmers in the Western Region, Ghana, all knew that farmers had not adopted transplanting in lines, and they all knew the reason why (transplanting in lines takes more time). The farmers in the west were Ewe-speaking migrants from the Volta region towards the east of Ghana. They had brought lowland rice cultivation with them to the Western Region. (Lowland rice is more intensive and has greater water management, although rain-fed upland rice had been grown previously in Western Ghana.) Before the PADS Project, they were already transplanting rice, however even after the PLAR training, they did not plant it in lines (Antwi Dei 2007). Although their planting style was basically geometrical, with each rice hill an equal distance from its neighbors, all project staff called it "haphazard" or "random" transplanting, reflecting and conveying a negative bias against it.

In Bandema, Upper East, a farmer named Lamisi, who had facilitated two groups herself, recalled an experiment she had done with three small plots of land, of equal size, fertilized with animal manure and chemical fertilizer. She even had a control group with no fertilizer. It was actually more like a formal trial than a typical farmer experiment. Just as she finished explaining it, one of the extension agents who had sat quietly through three meetings laughed at her. "Their own experiment!," he snickered.

When the evaluators asked farmers what they had learned from extensionists, they could typically talk for an hour with no further questions. But when the question was reversed (what did facilitators learn from farmers?), both groups typically responded with a blank look, as though the question made no sense to them. Even when pressed, most extensionists could not name a single example of something they had learned from farmers. Sometimes the extension agents mentioned a social topic (e.g., "the importance of working with a united group"), but it was difficult for them to conceive of learning something about agriculture from farmers.

The extensionists made at least one important change in the way they conducted the PLAR; instead of each farmer having an experimental plot, there was one demonstration plot with the extensionist in charge of the design. This gave the extension agents more control over the experiment and downplayed the role of the farmers. Essentially, this change stripped independent farmer experiments from the project.

The extensionists actually missed opportunities to learn from farmers. In group discussions with the authors, project staff consistently led farmers to discuss how their yields had improved with the project. Higher yields can increase returns to land, but in Ghana, land was not usually the limiting factor of production. Farmers and staff acknowledged that land was abundant in most of Ghana, labor was scarce, and capital was even scarcer. Farmers in West Africa are often not motivated to adopt land-saving technology unless they have access to markets and without some previous development that enhances the value of the land. The land is often not as valuable as it seems (Erenstein 2006).

Table 1. Adaptations of Technology by Project Farmers in Ghana

Original project idea	Farmer adaptation	Reason farmers made the change	Sites documented
Transplant seedlings at two to three weeks	Transplant seedlings at two weeks	When farmers started transplanting at three weeks, by the time they finished, the plants were four weeks old and too big to transplant.	Biemso No. 1, Ashanti Region and elsewhere (the extensionists generally did appreciate this innovation)
Direct seeding with a dibble	Direct seeding with hoes	Farmers already had the hoes and knew how to use them. They could easily dig a hole with one hand and flick seed in from a bowl held in their other hand.	Karni, Upper West
Stake a long piece of twine across the field. Plant along it to keep the furrow straight.	Direct seed without a guide line	The line was too much work to move, and farmers could plant in straight lines without it.	Champe, Northern Region
Transplant in lines	Transplant uniformly	Farmers can plant rice much faster, saving on labor, if they plant the seedlings uniformly, at an equal distance and not in lines.	All three sites in Western Region
Direct seeding	Refilling bare spots. Farmers wait for the rice to germinate, then return and pluck plants from hills with too many, transplanting them to places where seed did not sprout.	Increases yields (probably based on an earlier farmer practice of filling in bare spots following broadcasting of seed)	Karni, Upper West
Dig a pit and bury crop residues for composting†	Manure and household refuse as organic fertilizer	Saves the labor of digging the pit	Bandema, Upper East; Busa, Upper West
Dig a pit, haul weeds and other organic matter to the pit, compost it, and then haul it back to the field†	Piling cut weeds in small mounds in the field, covered with soil, as compost	Saves much labor for digging and hauling	Karni, Upper West
Compost, organic fertilizer	Animal manure applied to patches in the field where the soil had a crusty white surface	Farmers noticed that rice would not grow in white soil, but manure improved it (and they did not have enough manure for the whole field).	Bandema, Upper East

†The compost pit was not part of the original PLAR curriculum. The compost pit is an inappropriate technology, which was introduced later by a project staff member.

In Yilonayili in the Northern Region, we mentioned labor, and the farmers became quite animated. Planting in lines and transplanting both require more labor. In obvious frustration, one elder raised his voice and complained, "Everyone is busy [at planting time]" (meaning that it was hard to hire labor for planting). The facilitator leading the discussion did not realize that this was a valid expression of research demand (i.e., the farmer was saying that new technologies must not increase labor demands). Instead, the facilitator chided the grey-haired farmer for his remarks and told him to reflect on how his yields were now higher.

Often the evaluators had to probe, because (in stark contrast to the PLAR philosophy) farmers and extensionists hesitated to even admit that they had changed the technology. For example, in Champe, Northern Region, an extensionist said he had taught the group to plant in a straight line by following a piece of twine. Right on cue, a farmer brought out a large roll of blue plastic string, wrapped around a stick. Both twine and stick seemed remarkably clean for tools which were supposedly used in the soil. The evaluators asked whether or not the farmers found the ball of string tedious to use. "No," the extension agent said, not waiting

Table 2. Technology Adopted by PLAR Farmers as Recommended

PLAR technology	Reason farmers adopted it	Sites documented
Bunding (building small berms in the rice field to divide it into smaller parcels)	The bund can be opened or closed to let irrigation water in or to drain the field.	Biemso No. 1, Ashanti Region; Karni, Upper East; all sites in Western Region
Leveling (after flooding the field, move soil until the field is level)	Allows uniform distribution of water, improves yields, helps drown weeds	Biemso No. 1, Ashanti Region; Karni, Upper East; all sites in Western Region
Transplanting (make a nursery of rice seedlings, which are later transplanted to the field)	Helps increase yields, especially important if land is the limiting factor	Biemso No. 1, Ashanti Region†
Placing 3-4 seeds per hole	Farmers saw that they used much less seed, but obtained higher yields.	Most sites in Northern, Upper East and Upper West regions
New varieties	Higher yielding, suitable for local conditions	Karni, Upper East and other sites especially Northern Region

†As mentioned in Table 1, farmers in the Western Region also transplant, but not in lines.

for the farmers to reply, "a child holds each end of the twine and moves it for them." Later, the evaluators took one of the farmers aside who admitted that with a little practice, they had soon learned to plant in straight lines without following a string. This saved time and labor, so it was a useful adaptation, exactly the kind of fine-tuning that the PLAR is designed to encourage, yet the facilitators had so misunderstood the project intent that they acted like *extension agents* who wanted to teach a new technique and unlike facilitators who should have encouraged such changes. In Mali, however, PADS Project staff members were more open to farmer experiments and encouraged more of them (Van Mele et al. n.d.).

Researchers Get the Point

Although few extensionists valued farmer experiments, researchers on the other hand were more likely to do so. For example, project staff in Ghana met Ibrahim Tanko in Tanokrom, a village of migrants who have settled in Ashanti Region; Mr. Tanko became frustrated with birds eating his rice. He set up fishing nets around his small rice field and noticed that birds avoided it. Birds swooping into the field became tangled in the net, which then discouraged other birds from coming. Researchers are now making a video of the technology to show to other farmers. Mr. Tanko had not taken the PLAR. Instead, he and his neighbors had seen and discussed four videos on rice seed from Bangladesh (translated into Twi) (see Van Mele 2006). The point is that the Ghanaian researchers appreciated his innovation with the bird nets, and their attitude was influenced by their experience with PLARGhanaian researchers on the PADS project also observed a farmer practice called "rice ratooning" (harvesting the rice and leaving the base of the plants in the field to grow new grain). The researchers tested ratoon cropping in a formal experiment at Crops Research Institute (CRI), concluding that ratooning was indeed feasible in humid lowland areas in parts of southern Ghana.

Sometimes the Technology is Appropriate

Of course, farmers do not always modify or invent technology. Sometimes they learn a new idea, which they can adopt as is because it is already appropriate. In the PADS project, several technologies were adopted essentially the way the extensionists taught them (Table 2). One of the most dramatic adoptions was direct seeding with three to four seeds per hole. In village after village, farmers explained in a tone of amazement how they learned that just three to four seeds per hole used less than half the seed they had previously used and that yields were actually higher. "We used plenty of seed, and the plants were so small." It is counter-intuitive that using less seed will yield more, but farmers saw that with fewer seeds per hill, each individual plant was more vigorous and grew larger panicles.

What farmers chose to adopt was often influenced by the natural or economic environment. For example, they opted for herbicides if they had some money and if they perceived labor to be scarce—especially in more commercial rice-farming areas like the Western Region. These farmers also adopted chemical fertilizer. While all farmers knew that chemical fertilizer increased yields, the farmers in the Western Region were the only ones renting land (average landholding one hectare) at commercial rates (Antwi Dei 2007). For them, land was a scarce resource and increasing yields by buying fertilizer made economic sense.

Farmers adopted bunding and field leveling in irrigated rice, because the bunds around and through the field helped to impound the water in small sections within the field, and, hence, to hold the water evenly in each section, especially if the land was smooth and level. On the other hand, in rain-fed lowland areas, project farmers tended to make no bunds (or to make them lower and to put fewer bunds in the field) because in dryer fields, farmers were more interested in simply getting water to reach as much of the field as possible, and there was less water to hold within the bunds. However, placing three to four seeds per hole was a new option for direct seeding, which is practiced in rain-fed areas (which are not transplanted), so farmers in rain-fed upland areas adopted this idea.

Failure to Communicate

When project technologies were ready for adoption, the PLAR sessions handily convinced the farmer groups to use the new techniques. This experience may have also reinforced extensionists' idea that the PLAR was for teaching, not research. In spite of an excellent manual, training, and leadership from headquarters, the project was still not able to fully communicate its philosophy to its staff. In Ghana, the project facilitators were actually extension agents for the Ministry of Food and Agriculture.

The extensionists were carrying certain mental baggage: they wanted to work with farmers in small groups and teach them to produce more food and to increase their incomes. This may sound paternalistic, but there are worse motivations than wanting to teach people useful knowledge. The extensionists were bright, personable young people. By the time we visited the project, some of them were back at the university earning higher degrees. Some of them left their studies temporarily to take long bus trips back to their old field sites, to visit with us and see their old worksites again. The extensionists could speak English and the local language (which varied from place to place). Most of them spoke several languages. They lived in the villages and clearly liked the farmers.

In Ghana, some extension agents perform services for farmers outside of their official tasks. For example, they may buy inputs (like herbicide) for farmers and bring them out to the village. The farmer pays for the materials, but enjoys the convenience of shopping without going to town.

Both the farmers and the extension agents are satisfied with this paternalistic relationship, and in formal interviews with foreign visitors, usually through translators (who occasionally are themselves the extension agents), the farmers and the extension agent act their parts, with the extensionists portraying themselves as the bringer of new ideas and the farmers acting as faithful adopters.

Remarkably, the extension agents and the farmers never seem to have understood that the project intended to encourage farmer experiments. The extensionists thought that the evaluators wanted to hear that the farmers had simply adopted every novelty they were taught. Occasionally the extension agents blurted out that the farmers were "difficult" and refused to adopt some technologies. The farmers themselves were usually reluctant to admit that they had changed the extensionists' recommendations, only discussing the change listed in Table 1 when pressed to do so. As David Mosse (2005) observed in India, impoverished farmers are eager to enter into paternalistic relations with extension agents (or other outsiders), motivated by the small amounts of materials they may receive (e.g., seeds and fertilizer), besides the new information, not to mention the prestige that comes from working with outsiders.

In the end, in Ghana, the farmers did indeed adapt the technologies to their own conditions, as they always do, even though the extensionists did not want them to, but ironically, exactly as the authors of the manual and the project coordinator hoped they would. So the project came full circle. Smallholder farmers are experimental by nature. People experiment more productively when given techniques to try (e.g., a new planting style). Basic scientific information alone, uncoupled from a technology, does not always inspire farmer experiments (Bentley 2006; Bentley et al. 2006).

In fairness to the extension staff, most of the technologies invented by farmers in Ghana were so subtle they were difficult to notice (see Sumberg and Okali 1997). Although some of the innovations from this project (e.g., transplanting after two weeks, direct seeding with a hoe and transplanting without twine, making compost in piles in the field instead of in a pit) could become part of the future curriculum.

Positive Results

Not all innovations need be tested scientifically. If farmers say they can plant in lines without following a piece of blue string, and if an independent observer can see that the rice is indeed in a line, then the local people no doubt can plant a straight line freehand. AfricaRice turned some local innovations from the PADS project into radio scripts and shared them through the Canadian NGO, Farm Radio International, with 300 partner radios across rural Africa. Of the radio scripts that they offered to African stations, the ones from the PADS project were among the ones that rural radio staff most often chose to broadcast. Because the PADS ideas had been filtered by farmers, they appealed to the staff of small, local stations who know what their audience wants to listen to.

The project had at least three positive results in Ghana. First, in several pilot villages, farmers are still enthusiastically using the techniques they learned in the PLAR, especially bunding of irrigated rice and planting just three or four seeds to a hole: less seed yields a greater harvest. All 20 of the trained villagers in Bandema adopted rice nurseries and transplanting as a result of the project (Kaburi 2007).

Second, at least some staff (researchers more than extensionists) became sensitive to farmer innovations, appreciating, for example, the nets frightening birds. And third, after the project, one of the former facilitators started his own radio talk show through the Ministry of Food and Agriculture (MoFA). The former PLAR facilitator heads the program and appears

frequently on the air. The show is broadcast one hour a week in the Fanti dialect of the Twi language from a station covering most of the Western Region. The radio host talks about agriculture but especially rice. He talks for 15 minutes, and for the next 45 minutes, farmers call in with comments and questions. "The show is a lot like a PLAR, with talking first and then farmers' comments and questions," the facilitator explained.

There are 2,000 farmers for every extension agent in Ghana, so only a fraction of the farmers will ever have much direct contact with extensionists. Mass media can help keep the learning content of a consistent, high quality, and get it to a large audience (see also examples in Van Mele, Salahuddin, and Magor 2005). In the future, face-to-face approaches like PLAR should be combined with media in other ways. The farmers and extension agents who have had an experience like PLAR can appear on camera or on the air to discuss what they learned for a larger audience (Van Mele et al. 2007; Zossou et al. 2009). After writing the first draft of this paper, AfricaRice went on to do just that. They filmed four videos (in Mali) with farmers who had experimented with new rice techniques in the PADS project. The farmers spoke on-camera and demonstrated their ideas in the field. The videos were soon translated into various African languages for use by grassroots organizations and farmers or to broadcast them on television. The videos can be seen on http://www.africarice.org/warda/guide-video.asp.

Conclusion

As linguist Steven Pinker (1994) writes, beginning as children, humans talk because they must. Just as humans have a language instinct, they have technology instinct (Mithen 1996). Like people in all walks of life, farmers cannot resist tinkering with new techniques. They will do this whether outsiders tell them to or not, regardless of any project or agency's philosophy. Farmers are experimenters, no matter what happens, even if outsiders do not encourage them to do so.

Wolpert (2000) argues that science is an elite social institution, with members of a certain intellectual class with an affinity for the counter-intuitive. His argument may be overstated, but development projects are also elite social institutions, peopled not just by scientists but by various other groups as well, each with their own agenda. As Mosse (2005) observed on a project in India, the farmers wanted to be clients of the project. The grassroots extension agents wanted to get on with the daily work of delivering seed, information, and materials. Research scientists wanted to publish and create novel ideas (including new plant varieties). The social scientists wanted to promote "participation" not quite realizing at the time that the other actors on the project were already busy trying to "participate" by putting forward their own goals. All of these groups (social and agricultural scientists, extensionists, and even farmers) occasionally had to reframe their agenda in tune with the frequent policy changes coming from London.

The PADS project was also a complex setting, where people could create their own tensions or simply talk past each other. As renowned anthropologist Mary Douglas (1987) observed, people in complex organizations are not robots; they form their own opinions and are capable of following their own agendas.

From about 1940 to 1980 when scientists drifted away from direct contact with farmers, extensionists (who had existed in Switzerland, France, Germany, Britain, and the United States since the mid-19th century) (Jones 1981) became a model copied in many tropical countries. Although extension in Africa began with colonial agricultural departments in the late 1800s and with missionary farms (Jones and Garforth 1997), most African countries began extension in the 1960s, 1970s, or even 1980s, mostly with United States assistance (Birmingham 1999). The extensionists became social intermediaries between scientists and farmers.

Perhaps it was unrealistic of the PADS project to expect the extensionists to conduct on-farm research or stimulate farmers to experiment, since the extensionists are not researchers themselves. Perhaps farmer research should be facilitated by researchers, not by extensionists. However, there was also a mistake with the project design: too little attention was given to documenting useful innovations from the PLAR villages and reporting them to other colleagues on the project. Scientists should be more involved with participatory research, not just to improve the research but also because lengthy contact with farmers (and extensionists) enriches scientists' understanding. Farmers may make observations that scientists would miss, like ratooning in Ghana. For many scientists, spending time in the field has become a luxury, and intermediate goals, like publications, workshops, and committees, have become more important than solving problems. An approach like PLAR can give scientists enough structure to work productively with farmers in the field, although researchers should be more careful to report results to other farmers and other scientists.

References

Antwi Dei, Kwaku
2007 Investigating the Socioeconomic and the Institutional Outcome of the PLAR Approach in Some Lowland Rice Growing Communities in Ghana. M.Sc. thesis, Kwame Nkrumah University of Science and Technology, Kumasi, Ghana.

Ashby, Jacqueline A., Ann R. Braun, Teresa García, María del Pilar Guerrero, Luis Alfredo Hernández, Carlos Arturo Quirós, and José Ignacio Roa
2000 Investing in Farmers as Researchers: Experience With Local Agricultural Committees in Latin America. Cali, Colombia: CIAT.

Bentley, Jeffery W.
2006 Folk Experiments. Agriculture and Human Values 23(4):451-462.

Bentley, Jeffery W., Sylvie Priou, Pedro Aley, Javier Correa, Róger, Torres, Hermeregildo Equise, José Luis Quiruchi, and Oscar Barea
2006 Method, Creativity, and CIALs. International Journal of Agricultural Resources, Governance, and Ecology 5(1):90-105.

Biggs, Stephen
1989 Resource-Poor Farmer Participation in Research: A Synthesis of Experiences From Nine National Agricultural Research Systems. Comparative Study No. 3. OFCOR Projects. The Hague, The Netherlands: ISNAR.

Birmingham, Deirdre M.
1999 Revisiting Agricultural Extension: Experiences in Less Industrialized Countries. Journal of International Agricultural and Extension Education 6(2):19-26.

Brokensha, David W., D. Michael Warren, and Oswald Werner
1980 Indigenous Knowledge Systems and Development. Lanham, Md.: University Press of America.

Brush, Stephen B.
2004 Farmers' Bounty: Locating Crop Diversity in the Contemporary World. New Haven, Conn.: Yale University Press.

Campbell, C. Lee, Paul D. Peterson, and Clay S. Griffith
1999 The Formative Years of Plant Pathology in the United States. St. Paul, Minn.: The American Phytopathological Society.

Chambers, Robert
1992 Rural Appraisal: Rapid, Relaxed, and Participatory. Brighton, United Kingdom: University of Sussex, Institute of Development Studies.

Defoer, Toon, and Marco Wopereis
2007 Apprendre pour Changer: Exemple de la Culture du Riz Pluvial dans les Bas-Fonds. *In* Exploitations Agricoles Familiales en Afrique de l'Ouest et du Centre: Définition, Enjeux, Perspectives. Mohamed Gafsi, Jacques Brossier, Patrick Dugué, and Jean-Yves Jamin, eds. Pp. 403-424. Paris: Edition Quae.

Defoer, Toon, Marco C. S. Wopereis, Philip Idinoba, Thomas K. L. Kadisha, Salif Diack, and M. Gaye
2004 Manuel du Facilitateur: Curriculum d'Apprentissage Participatif et Recherche Action (APRA) pour la Gestion Intégrée de la Culture de Riz de Bas-Fonds (GIR) en Afrique Sub-Saharienne. Cotonou, Benin: WARDA, CTA, IFDC, CGRAI.

Douglas, Mary
1987 How Institutions Think. London: Routledge and Kegan Paul.

Erenstein, Olaf
2006 Intensification or Extensification?: Factors Affecting Technology Use in Peri-Urban Lowlands Along an Agro-Ecological Gradient in West Africa. Agricultural Systems 90(1-3):132-158.

Farrington, John, and Adrian Martin
1987 Farmer Participatory Research: A Review of Concepts and Recent Fieldwork. Agricultural Administration and Extension 29(4):247-264.

Fujisaka, Sam
1989 A Method for Farmer-Participatory Research and Technology Transfer: Upland Soil Conservation in the Philippines. Experimental Agriculture 25(4):423-433.

Gallagher, Kevin
2003 Fundamental Elements of a Farmer Field School. LEISA Magazine 19(1):5-6.

González, Roberto J.
2001 Zapotec Science: Farming and Food in the Northern Sierra of Oaxaca. Austin: University of Texas Press.

Johnson, Allen W.
1972 Individuality and Experimentation in Traditional Agriculture. Human Ecology 1(2):149-159.

Jones, Gwyn E.
1981 The Origins of Agricultural Advisory Services in the 19th Century. Social Biology and Human Affairs 46(2):89-106.

Jones, Gwyn E., and Chris Garforth
1997 The History, Development, and Future of Agricultural Extension. *In* Improving Agricultural Extension: A Reference Manual. Burton E. Swanson, Robert P. Bentz, and Andrew J. Sofranko, ed. Pp. 3-12. Rome: FAO.

Kaburi, Noella
2007 Investigating the Opportunities and Mechanism of Out- and Up-Scaling Participatory Social Processes and Technical Options in Lowland Rice Farming in the Upper East Region. B.Sc. thesis, University for Development Studies, Tamale, Ghana.

Kloppenburg, Jack Ralph, Jr.
1988 First the Seed: The Political Economy of Plant Biotechnology, 1492-2000. Cambridge, United Kingdom: Cambridge University Press.

Large, Ernest C.
1940 The Advance of the Fungi. London: Jonathan Cape.

Mithen, Steven
1996 The Prehistory of the Mind: A Search for the Origins of Art, Religion, and Science. London: Phoenix Books.

Mosse, David
2005 Cultivating Development: An Ethnography of Aid Policy and Practice. London: Pluto Press.

Mosse, David, and David Lewis
2006 Theoretical Approaches to Brokerage and Translation in Development. *In* Development Brokers and Translators: The Ethnography of Aid and Agencies. David Lewis and David Mosse, eds. Pp. 1-26. Bloomfield, Conn.: Kumarian Press.

Nelson, Rebecca, Ricardo Orrego, Oscar Ortiz, José Tenorio, Christopher Mundt, Marjon Fredrix, and Ngo Vinh Vien
2001 Working With Resource-Poor Farmers to Manage Plant Diseases. Plant Disease 85(7):684-695.

Orlove, Ben
2002 Lines in the Water: Nature and Culture at Lake Titicaca. Berkeley: University of California Press.

Pinker, Steven
1994 The Language Instinct. New York: Penguin.

Pretty, Jules N.
1991 Farmers' Extension Practice and Technology Adaptation: Agricultural Revolution in 17th-19th Century Britain. Agriculture and Human Values 8(1-2):132-148.

Rhoades, Robert E.
1987 Farmers and Experimentation. Discussion Paper 21. London: Agricultural Administration Unit, Overseas Development Institute.
1998 Participatory Watershed Research and Management: Where the Shadow Falls. Gatekeeper Series 81. London: International Institute for Environment and Development.

Richards, Paul
1986 Coping with Hunger: Hazard and Experiment in an African Rice-Farming System. London: Allen and Unwin.
1989a Agriculture as a Performance. *In* Farmer First: Farmer Innovation and Agricultural Research. Robert Chambers, Arnold Pacey and Lori A. Thrupp, eds. Pp 39-43. London: Intermediate Technology Publications Ltd.
1989b Farmers Also Experiment: A Neglected Intellectual Resource in African Science. Discovery and Innovation 1(1):19-25.

Saad, Nadine
2002 Farmer Processes of Experimentation and Innovation: A Review of the Literature. Working Document No. 21. Cali, Colombia: CGIAR Systemwide Program on Participatory Research and Gender Analysis.

Sillitoe, Paul
1998 The Development of Indigenous Knowledge: A New Applied Anthropology. Current Anthropology 39(2):223-252.

Stone, Glenn Davis
2004 Biotechnology and the Political Ecology of Information in India. Human Organization 63:127-140.

Sumberg, James E., and Christine Okali
1997 Farmer's Experiments: Creating Local Knowledge. Boulder, Colo.: Lynne Rienner.

Van Mele, Paul
2006 Zooming-in, Zooming-out: A Novel Method to Scale Up Local Innovations and Sustainable Technologies. International Journal of Agricultural Sustainability 4(2):131-142.

Van Mele, Paul, Jeffery W. Bentley, Kalifa Yattara, Rosaline Maiga Dacko, and George K. Acheampong
n.d. Attitude Counts: Participatory Learning and Action Research (PLAR) With Rice Farmers in West Africa. Development in Practice. In press.

Van Mele, Paul, Ahmed Salahuddin, and Noel Magor, eds.
2005 Innovations in Rural Extension: Case Studies from Bangladesh. Wallingford, Conn.: CABI Publishing.

Van Mele, Paul, A. K. M. Zakaria, Hosne-Ara-Begum, Harun-Ar-Rashid, and Noel Magor
2007 Videos That Strengthen Rural Women's Capability to Innovate. Communication for Development and Social Change 1(3):79-99.

Winarto, Yunita T.
2004 Seeds of Knowledge: The Beginning of Integrated Pest Management in Java. New Haven, Conn.: Yale Southeast Asia Studies.

Wolpert, Lewis
2000 The Unnatural Nature of Science. London, United Kingdom: Faber and Faber Ltd.

Zossou, Espérance, Paul Van Mele, Simplice D. Vodouhe, and Jonas Wanvoeke
2009 The Power of Video to Trigger Innovation: Rice Parboiling in Central Benin. International Journal of Agricultural Sustainability 7(2):119-129.