FARMER PARTICIPATION IN ON-FARM TRIALS

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That farmer participation is mandatory to quality Farming Systems Research few would deny. Indeed, farmer participation as expressed in models of farmer-first-and-last and farmer-back-to-farmer, dominate our rhetoric. But it is also a very different way of doing agricultural development research. Achieving such, necessitates intimate farmer involvement in processes of understanding existing systems, diagnosing their problems, designing solutions, and testing them. In method development considerable strides have been made to involve farmers in understanding systems and in diagnosing problems. Unfortunately, on-farm testing did not receive such attention. Researchers simply transplanted conventional 'on-station' research designs onto farms.

Conventional designs hinder meaningful farmer participation. Previously I talked about weakness of farmer participation inherent to complex trials (Lightfoot, 1984). At that time I stressed that complex treatment structures and layouts are hard for farmers to understand and implement because they are foreign to their experience. This opens the door to many potential errors. I gave examples of how misunderstood implementation can result in lost data, a considerable risk when only a few experiments can be established. I gave examples of how necessary experimenter planting causes many logistical difficulties that can result in confounding the treatments. Another interesting source of confounding arises from relationships between degree of farmer participation and treatment yields. It has been found that treatment yields fall with increasing farmer participation; thus, conclusions about treatment performance diverge "substantially" depending on the level of farmer participation (Ashby, 1984). There are also many socioeconomic considerations. For example, because of the excessive area required cooperators tend to be larger farmers not representative of the resource poor farmer target group (Kirkby et al., 1981).

Difficulties such as these lead many to believe that simple indigenous farmer research designs could be a valuable resource for developing on-farm experimental methods, particularly, for adapting technologies and providing feedback on basic research needs (Biggs, 1980). Some go so far as to say that getting farmers to design and manage trials can, "..qualitatively improve information feedback from farmers to researchers about how to evaluate technology, and can materially improve the effectiveness of on-farm testing in identifying new technical options for the small farmer consistent with the value judgments farmers themselves make about innovations." (Ashby, 1984). Indeed, as Gilbert, Norman and Winch (1980) note, "The concept of FSR explicitly recognizes the value of the farmers experience and their traditional experimentation as inputs into developing strategies for improving the productivity of existing farming systems.". Moreover, there is a trend away from complex experiments and towards smaller less formal simple experiments; finding that this removes the bias of large trials to larger farmers, and increases farmer participation to improve interpretation of results and feedback of future research needs (Kirkby et al., 1981).

Farmers understand the concept of experimentation, and that there is no lack of indigenous research. In support of this contention Johnson cites many instances of farmer experimentation including H.Conklin's 1957 classic on Hanuoo agriculture in the Philippines. Conklin witnessed that, "cultigens of all sorts especially new or unfamiliar varieties are grown experimentally in small homeyard gardens as single objects of great horticultural interest." (Johnson, 1972). Moreover, Richards (1981) found that in rural Sierra Leone there was no lack of indigenous research and farmers understood the idea of controlled input-output trials. He even went on to say "..that expensive supervised on-farm trials for demonstration purposes are unnecessary." It was also Biggs' (1980) experience that agricultural communities in Bangladesh operate a dynamic and productive informal research system that interacts with any new technology introduced from outside. He went on to say that farmers try out new practices such as fertilizer use on small plots next to their own normal crops, which he equated to researchers' simple yes/no trials. Furthermore, indigenous research systems have generated viable technologies: one striking example for its dramatic impact in Bihar, India, was the farmer development of a bamboo tube well (Dommen, 1975).

Farmers feedback can improve basic research. Brammer (1984) describes how farmer research, carried out by the farmers themselves, exposed the importance of blue-green algae as a source of nitrogen for seasonally flooded rice. Similarly, Ashby (1984) found that farmer participation in Phosphate fertilizer trials produced feedback that led to new basic research, "..because new questions were raised about the chemical reactions of rock phosphate with organic fertilizers and in mixtures with conventional Phosphate sources.".

All this is not to say that complex experiments to unravel biological responses are not needed rather, that they are difficult to conduct inside the concepts of FSR. One often hears of researchers removing farmers completely so that variation can be controlled and treatment effects detected. It maybe research, but is it FSR? This paper argues that combining conventional and indigenous research methods exploits farmer participation in roles of: (1) adapting technologies to specific farm conditions; and (2) providing feedback on more appropriate basic research needs. In the former case a farmers' experiment in the adaptation of upland rice to lowland conditions will be examined. In the latter case, a farmers' evaluation of sweet potato varieties will be examined.

THE STUDIES

In regard to these two roles, farmer adaptation and feedback to basic research, The Farming Systems Development Project, Eastern Visayas (FSDP-EV) has had interesting experiences with farmer adaptation of an upland or dryland rice variety to lowland flooded conditions, and farmer evaluation of sweet potato varieties giving rise to new breeding objectives. I use the term experience rather than experiment because the work was rather informal and after the event. Nevertheless, both experiences showed us methods worth building on in the future.

In the case of farmer adaptation, the problem they wished to solve arose as a consequence of flash flooding during November 1983 that destroyed much of their lowland bunded rice crop. This destruction left their seed supplies of conventional lowland varieties, IR36 and IR42, short. To solve this problem of inadequate seed farmers decided to try the upland rice variety UPL-Ri5, that had grown poorly in their FSDP-EV experimental upland plots, in their lowland bunded plots. UPL-Ri5 was also obtained from other farmers and from a Ministry of Agriculture and Food relief effort. Because these farmers were selected for their adaptation "experiment" in lowland areas, they are not typical of our 'small upland rainfed' target group. Half of the farmers did not have any upland parcels at all. Notwithstanding, they could still be described as 'small'. Incomes were derived mainly from farming just under one hectare of lowland. Forty percent of the farmers had title to this land while the remainder were sharecropping. In addition, half the farmers had one hectare of upland which 90% of them had some kind of title. How to adapt this upland variety and what its performance would be like were the central research questions these farmers sought to answer.

To adapt upland rice to lowland conditions farmers generally followed lowland rice husbandry practices shown in Table 1. With the exception of one farmer who grew his crop during the upland season of May to September because he did not get seed on time, upland rice was grown during the traditional lowland rice season of December and April. Transplanting dominated the planting technique with about half the farmers planting wetbed and half drybed. Similarly, on all plots between four to five plants were randomly planted on each hill at about 15 to 20 cm apart. Thus, plant populations ranged from 100 to 220 m-1, more than twice the typical upland plant populations. Other husbandry practices rarely differ between locations, for instance, no fertilizer was applied and weeding practices varied from none to twice.

Generally, farmers assessed UPL-Ri5's performance to be comparable with lowland varieties IR36 and IR42. Specifically, for production aspects, shown in Table 2, farmers noted that UPL-Ri5 produced from 6 to 10 tillers which is less than the IR's, and a disadvantage of this upland variety. All farmers commented on the favorability of UPL-Ri5's good panicle exertion for judging ripeness and yield; except for its susceptibility to bird damage if it is the only crop around. Again, all farmers reported good head fill except one farmer whose crop was damaged by flooding after flowering. Maturity periods between three and five months were comparable with IR36's three months and IR42's four months. In terms of grain yield, a comparison of farmers estimated actual yields of UPL-Ri5, while farmers expected yield of IR36 and IR42 showed no significant differences (mean difference of 192kg ha-1 with 't' of 1.29 at df.11). Indeed, there was a great deal of overlap in likely yields; for instance, at 80% confidence level UPL-Ri5 yields range from 3.4 to 2.6 t ha-1 while IR expected yields range from 3.2 to 2.5 t ha-1. From the stability point of view all farmers agreed that UPL-Ri5 can tolerate weeds and is a better competitor than the IR's because of its taller habit. In addition, most farmers, even though they observed no diseases, think UPL-Ri5 is strong. Significant here was the absence of Tungro to which UPL-Ri5 is reported susceptible. Of the farmers who did experience pests they said UPL-Ri5 tolerated the attacks. Farmers also included milling recovery, cooking quality, and palatability in their assessment. All farmers agreed that UPL-Ri5 had a high, some said very high, milling recovery that was superior to the IR's. Farmers also agreed that UPL-Ri5 had a good sticky cooking quality and was soft and palatable. On balance, these largely favorable assessments were supported by continued use or adoption of UPL-Ri5 in lowland bunded conditions. However, farmers defined specific strategies for this practice. UPL-Ri5 is grown in rotation with IR's because farmers note declining yields when the same variety is grown continuously on one piece of land. UPL-Ri5 is grown on the driest parts of the parcel because it is less tolerant of waterlogging than IR's.

This kind of farmer adaptation is probably quite common. Several people have recounted similar experiences from elsewhere in the Philippines. It is certainly similar to that reported by Biggs (1980) who found that, "after official demonstrations were made in farmers fields to show the potential of the new seeds, often under optimal or high input conditions, it was frequently the farmers themselves who adapted those packages to their own conditions.". Still, farming systems researchers have yet to exploit this or build on-farm experimental methods around it.

Turning from adaptation to the role of providing feedback on basic research brings us to our farmers' evaluation of sweet potato varieties. Here, however, farmers had several reasons for growing different varieties beyond evaluation. They were also maintaining lines and a drought in mid 1983 left them unusually short of planting material most especially as a recent typhoon had destroyed many crops. So they planted whatever varieties they could find. Our purpose was to follow up on what varieties were grown, what evaluation criteria were being used, and how varieties were assessed. This was of particular interest as all 12 farmers had received from the Project at least one improved variety. These farmers, even though they differed in key characteristics, could still be considered within the 'small upland rainfed' target group. For instance, although cultivating one upland hectare was typical, areas varied from a 1/4 to 7 ha. Half the farmers had no lowland areas while the remainder had slightly less than 1 ha. Even though half the farmers were tenants and half were owners, farming supplemented by casual laboring provided most of their cash income.

In all, 16 varieties were grown, though most farmers only grew 6 of them. These they described by leaf shape and color, and color of tuber skin and flesh. As shown in Table 3 each variety was unique. Leaves were red and/or green, heart shaped or irregularly tri lobed, digitate, or triangular. Tuber skin and flesh colors were white, yellow, or orange, except for some skins which were red.

While there was hardly any variation between farmers in the way they described varieties variations in evaluation were more numerous, as shown in Table 4. Farmers evaluate varieties by: taste, preferring sweetness and dryness; ability to store for long periods in the soil without rotting; maturity period being preferably short; high yield and large tuber size; pest and disease tolerance, particularly for weevil; rapid vining to cover the soil; and long duration of harvesting. Thus, we find the farmers' top staple and marketed varieties, Karingkit and Kadulaw, have a good sweet dry taste, high yield class of large 10 cm diameter tubers, and rapid vining covering the soil in one to two months. In addition they can be harvested for up to one year because they store well in the soil, not easily being attacked by weevil. Long maturity period is their main disadvantage. Conversely, the improved VSP-1 and -2 have considerable disadvantages in the inability of their vines to cover the soil, their short harvesting period, and their sweet wet taste which only has snack value. The most significant implications of this work is that conventional breeding objectives of high yield with long maturity periods, sweet taste, and single harvest are inappropriate. Indeed, farmers demand both different breeding objectives and a greater range of types for the many different strategies they have. They seek rapid vining to suppress weeds and reduce soil erosion, prolonged sequential harvesting with good production off the vine, and weevil tolerance during underground storage. Nevertheless, at times of calamity they are prepared to compromise taste and yield for short maturity.

Again, this kind of farmer 'experiment' is probably not uncommon. Johnson (1972) noticed in Northeastern Brazil several cases of experimentation among illiterate swidden farmers: "One old man was experimenting with a new strain of manioc he had received from a friend living somewhat distant: he had set aside a small portion of a manioc field to test the new variety..". Still, farming systems researchers design, manage and implement their own on-farm variety trials without turning to see what farmers are doing.

A NOTE ON METHOD

Having farmers dominate experiments leaves researchers with a different set of activities. Both these pieces of work went through three activities. First, research topics were detected by informal consultations and observations. In the case of the sweet potato work many different varieties were seen on one farmers lot, and he was questioned why he was growing so many different types. Similarly, UPL-Ri5 was seen growing in bunded plots and farmers were questioned. After the discovery on one or two farms more farmers were questioned to determine if such practices were widespread and worthy of study. It was at this time that connections were made with Project provision of planting material as relief from floods in one case and typhoon in the other. Due to the nature of our experiences, identification of cooperators and provision of planting material, our second activity was largely 'unconscious'. That is, planting materials were distributed as part of another effort and cooperators were those who engaged in adaptation or evaluation. In future work, however, factoring in farmer typology when selecting cooperators would be included in this important second activity. The third and last activity was to develop and administer an informal survey using a checklist to guide the dialogue. Checklists provided guidelines for gathering information on farmer typology, nature of problems or farmer purpose, description of practices, and farmers' assessment. Several farm visits were required to gather all the information. Unfortunately, our late timing did not permit any biological measurement to corroborate the farmers' assessment; something that would be included in any improved method. These activities are not given as finalized methods but more a place to begin to combine indigenous and formal research methods that adapt technologies on farms and provide feedback on basic research needs.

CONCLUSION

Even though our methods were mainly descriptive and sometimes superficial researchers and farmers gained new knowledge. We now know how to grow UPL-Ri5 in bunded lowland conditions such that its performance is comparable with IR36 and IR42. We now know VSP's inadequacies in taste, vining habit, underground storage, and duration of harvesting. Furthermore, researchers now know that vigorous vining, extended underground storage, and sequential harvesting are important breeding objectives if varieties that better meet farmers needs are to be produced. The questions to be asked are: Can we now think of dropping formal randomized block trials as farmers have methods for looking at and adapting technologies which are far more comprehensive than conventional methods? Can we now think of no need for formal screening as farmers have techniques that are far more comprehensive than conventional on-farm variety trials that only assess plant habit and yield? Can we just give the planting material or train for a practice to the farmers, monitor what they do, measure some biological parameters, and consult them on assessment? The answer is probably not while there are still outstanding problems with using indigenous experimentation. For instance, farmer knowledge is hard to elicit. This will require researchers to develop new skills and new procedures for documentation and interpretation. In addition, indigenous experiments are slow. This will require researchers to facilitate, risk sharing on inputs and time, replication across farms for quick definite answers, and transfer of answers and ideas to increase farmers' technical options. Difficult though these tasks maybe, others urge as I do, for researchers to seek solutions in an optimum mix and balance between farmer and researcher participation using indigenous and formal techniques rather than a choice of either or (Howes and Chambers 1979).

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Table 1. How farmers adapted UPL-Ri5 to bunded conditions.

FARM	PLANTING METHOD	PLOT SIZE(ha)	SPACING (cms)	PLANTS /HILL	WEEDING	FERTILIZER
1	T.DRY	.11	15-20	4-5	2x	none
2	T.WET	.22	15-20	4-5	1x	none
3	T.WET	.25	15-20	4-5	1x	none
4	T.WET	.49	15-20	4-5	1x	none
5	D.DRY	.24	15-20	3-4	1x	none
6	T.WET	.22	15-20	4-5	none	none
7	T.DRY	.44	15-20	4-5	1x	none
8	T.DRY	.11	15-20	4-5	none	none
9	T.DRY	.05	15-20	5	none	none
10	T.DRY	.11	15-20	4-5	none	none
11	T.DRY	.49	15-20	4-5	none	none
12	T.WET	.44	15-20	3-4	none	none

PLANTING METHODS: Transplanting (T) in either dry or wetbeds, and direct seeding (D).
SPACING: Random at approximate dimensions given.

Table 2. How farmers assessed UPL-Ri5

FARM	1	2	3	4	5	6	7	8	9	10	11	12
TILLERING	6-10	L	L	L	6-9	8-10	L	8-10	L	L	8-10	8
PANICLE EXERSION	OP	OP	OP	OP	OP	OP	OP	OP	OP	OP	OP	OP
HEAD FILL	GO	GO	GO	GO	GO	GO	GO	GO	GO	GO	GO	PO
MATURITY PERIOD (mo)	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	4.0	3.5	3.5	4.0
ACTUAL YIELD(t/ha)	1.7	3.1	3.7	2.1	3.8	3.8	2.6	2.7	3.3	5.1	3.4	1.5
EXPECTED YIELD(t/ha)	1.9	2.1	3.0	2.1	2.9	3.8	2.2	2.7	2.9	5.1	3.4	2.4
WEED TOLERANCE	GO	GO	GO	GO	GO	GO	GO	GO	GO	GO	GO	GO
DISEASE RESISTANCE	NO	NO	NO	YES	NO	NO	NO	NO	NO	YES	YES	NO
MILLING RECOVERY	HI	VHI	HI	VHI	HI	HI	HI	HI	HI	HI	HI	HI
COOKING QUALITY	ST	ST	ST	ST	ST	ST	ST	ST	ST	ST	ST	ST
PALATA-BILITY	SO	SO	SO	SO	SO	SO	SO	SO	SO	SO	SO	SO

TILLERING (L) less than IR's. PANICLE EXERSION (OP) open display. HEAD FILL (GO/PO) good/poor. WEED TOLERANCE (GO) good can stand weeds. DISEASE RESISTANCE (NO/YES) to infestation. MILLING RECOVERY (V/HI) higher (very) than IR's. COOKING (ST) sticky, PALATABILITY (SO) soft.

Table 3. Sweet potato varietal characteristics

VARIETIES	LEAF SHAPE	LEAF COLOUR	TUBER SKIN COLOUR	TUBER FLESH COLOUR
KAAPOG	TRIANGULAR	RED	WHITE	WHITE
KANGISI	HEART	RED & GREEN	RED	WHITE
KASIMA	HEART	RED,d	RED	YELLOW,d
BNAS 51	HEART	GREEN & RED	WHITE	YELLOW
KADULAW	LOBED	RED & GREEN	WHITE,ORANGE	WHITE,ORANGE
KABUSAG	LOBED	GREEN	WHITE	WHITE
VSP-1	HEART	GREEN	YELLOW,ORANGE	YELLOW,1
VSP-2	DIGITATE	RED	ORANGE	ORANGE
INALEGRIA	HEART	RED	RED	YELLOW,1
INANAHAW	HEART	RED	WHITE	YELLOW
KAULPOT	TRIANGULAR	GREEN	RED	YELLOW,1
KASAPAD	HEART	GREEN	YELLOW,1	YELLOW,1
BINASAYNON	HEART	RED,d	RED	WHITE
KARINGKIT	LOBED	GREEN	WHITE	YELLOW
BANO	HEART	GREEN	WHITE	YELLOW
KAMAMON	LOBED	RED,1	ORANGE	ORANGE

for COLOURS: ,d = DARK, ,1 = LIGHT

Table 4. Farmers' assessment of sweet potato varieties

VARIETY	TASTE	STORAGE IN SOIL	MATURITY PERIOD (mth)	YIELD CLASS	VIN-ING (mth)	DURATION HARVEST (mth)	TUBER SIZE (cms)	PESTS WEEVIL
KAAPOG	NS/D	GOOD	4,6-7	2,3	2,3	7-8	4,6-8	RES,SUS
KANGISI	S/D,W	POOR	3-5	2	1-3	2,7-8	4-8	RES,SUS
KASIMA	S,NS/D,W	POOR,GOOD	3,4	1-3	1-3	4-8	6-10	RES,SUS
BNAS 51	S	GOOD	4-5	2	0	7-8	6	SUS
KADULAW	S/D	GOOD,POOR	3-5	1,2	1-3	7-8,12	6-10	RES
VSP-2	S/W	GOOD,POOR	2-3	2-4	0	1,2	4-8	SUS
KABUSAG	S/D	POOR	7	2	1	12	6	RES
VSP-1	S/W	GOOD,POOR	2-3	2,3	0	1	5-6	SUS
INALEGRIA	S	POOR	2	3	2	2	3-4	SUS
KAULPOT	S/D	GOOD	2-3	2	1	7-8	5-6	SUS
KASAPAD	S,NS/D	GOOD,POOR	3-4	3-2	1,2	2	4-6	SUS
KARINGKIT	S/D	GOOD	4-7	1	2	12	10	RES
BINASAYNON	S/W	POOR	3-5	2,3	1	5,8	6-8	SUS
KAMAMON	S/D	GOOD,POOR	3-5	2	2	2,8	5-6	RES,SUS
INANAHAW	NS/D	GOOD	4-6	2	2	12	6-8	RES
BANO	NS/D	GOOD	4-5	2	1	8	6	RES

TASTE: S=SWEET (N)NOT, D=DRY, W=WET. STORAGE: GOOD/POOR=EASILY ROTTING.
VINING: TIME TO COVER GROUND. TUBER SIZE: DIAMETER.
PESTS: RES=RESISTANT SUS=SUSCEPTIBLE TO WEEVILS.