

research highlights

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How Farmers Learn

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What do farmers in Bangladesh know and how is their knowledge organised? How does their understanding evolve, and how is this affected by local interactions and wider connections? Do wealth and gender influence the extent to which learning takes place? What does all of this imply for interventions to support the livelihoods of poorer households and women?

For more than a decade, CARE has been working with rice and vegetable farmer field schools in Bangladesh as a means of supporting the livelihoods of poorer households. The schools seem to have done quite well, but in common with other extension providers, the organisation has never really stopped to ask how farmers are already learning and how this might affect the outcomes of specific interventions. Answering these questions is important in order to make sense of what has already been accomplished and to decide how to move forward.

This paper summarises the key findings of a more extensive study conducted with these ends in mind, which in turn forms part a larger programme of research (see Boxes 1 and 5). Starting with a brief account of how the investigation was carried out, it goes on to outline the main findings on the nature of agricultural knowledge; to explore the respective importance of learning processes taking place within and at the frontiers of communities; to show how opportunities to extend what is known are shaped by gender and class; and to sketch possible implications for future work. Key points are complemented by a small number of illustrative boxes.

Coverage and approach

Fieldwork lasted for four weeks and covered four communities, all of which had previously been the site of CARE farmer field schools. Two were drawn from relatively low lying areas in Dinajpur district, where irrigated winter *boro* and rainfed monsoon *tamon* rice was the main rotation, and the other two

from medium highland areas of Thakurgaon, where a greater diversity of crops was grown and vegetables figured more prominently. The Dinajpur communities were longer established, with most households tracing their descent from one or two common ancestors, whilst those from Thakurgaon were much more recently settled and comprised households from a number of different locations¹.

Individual case studies, plot and crop histories, and more loosely structured interviews were used to determine what people knew and how they learned. Maps, well-being analyses and kinship charts were prepared with local people to establish the context within which agriculture was taking place.

Box 1: The series

CARE Bangladesh is transforming itself into a rights-based organisation that will identify and address the underlying causes of poverty. This is one of several studies designed to aid the transition by clarifying the nature of the context in which the organisation works and showing how this affects the activities undertaken. Further details of the series appear in Box 5.

Types of agricultural knowledge

The study confirmed that rural people have an intimate knowledge of the physical environment. They can classify soils and

¹ Data was collected and analysed by Anowarul Haq, Mukti Majumder, Bipul Chandra Dev, Murad Bin Aziz and Apurba Deb Roy from CARE's Social Development Unit, with assistance from other project staff.

topography and understand how the landscape can be modified for different purposes. They have their own calendar and way of identifying seasons, which they have traditionally drawn on to structure and communicate information about the timing of key activities. They have at least some understanding of frequently occurring pests.

They also have a detailed knowledge of crops and apply a much wider range of criteria than agricultural scientists in deciding what to grow. With regard to paddy, for example, these will include: the length of the growing season; liability to chaffing, lodging and shattering; pest resistance; ease of threshing; taste; suitability for making puffed rice; and the number of seasons for which seed vitality can be maintained.

This knowledge is accompanied by a detailed understanding of the production process, including seed selection and storage, plant spacing, fertiliser application, use of pesticides, harvesting and post-harvest processing. All of this is underpinned by an appreciation of the way in which particular crops behave in relation to different soils and topography, and of how they may be combined and rotated in order to maintain soil fertility. To an ever increasing degree, rural people are gathering and utilising market information in order to obtain appropriate inputs and to select the crops offering the best returns.

The circumstances under which production takes place are changing rapidly. Climatic conditions are undergoing a fundamental shift as global warming takes hold. Much of the physical environment is modified on a regular basis by deposits of alluvium, and large areas are subject to the more occasional but also more dramatic effects of rivers changing course. The closing of the land frontier and the intensification of cultivation are leading to reductions in soil fertility. Traditional local varieties, which could go on being used almost indefinitely without loss of viability, are rapidly being replaced by High Yielding Varieties (HYVs) that must in turn be replaced after only a few years of use. Growing commercialisation of production and frequent changes in the relative market values of crops mean that calculations about profitability must be revised on a regular basis. What rural people need to know in order to survive is continually evolving in the light of all these changes.

Ultimately, all the types of knowledge that people possess feed into a diversity of livelihood strategies, each designed to meet the specific requirements of different households with their varying capital endowments.

Learning within communities

Early learning occurs mainly within the immediate family group. Parents normally perform the dominant role in teaching their children, but elder siblings, grandparents, aunts and uncles may also sometimes play a part. Direct observation, learning by doing and specific instruction in particular tasks are the primary means by which knowledge is transmitted. Gender plays an important part from the outset in determining what is passed on, although there are no hard and fast boundaries between what boys and girls learn. Many children continue to rely upon their parents for advice as they themselves become adult, although in the case of women, who generally move to their husband's home communities (*para*) on marriage, such links are less easily maintained.

After marriage, men and women begin to share knowledge with their spouses. Increasingly, as women enjoy better opportunities for training, this is becoming a more reciprocal affair. But family circumstances may also constrain learning. In a joint household, a new bride may find herself unable to apply what she already knows or blocked from participating in activities that would be new for her, and may have to wait until an independent household can be established before being able to explore her potential. Marriages can also break down, leaving wives to fend for themselves and denying them access to the resources they need to practice agriculture and learn on their own account. But, at the same time, the need to survive alone can create new opportunities to learn.

A wider circle of kin may also play an important part in the learning process. This applies especially in the lowland, predominantly rice-producing communities with their strong lineage structures, and is seen most clearly of all amongst the members of the dominant founder lineages.

Neighbours and the wider community take over as a source of knowledge where family

Box 2. The initial adoption and subsequent dissemination of two rice varieties

These examples of new HYV rice varieties arriving in Azimuddin Shah para show how wealthier farmers are best placed to conduct the initial experiments in a community. The rate at which dissemination then takes place varies according to the ease of processing and other factors.

Ahmed Ali, comes from a sub-lineage that owns much of the land in his *para*. He had been cultivating BR16 on a medium high plot of land, but this had proved unsatisfactory and Ali was on the lookout for an alternative. One day, whilst visiting a local market, he met somebody who told him about the new BR29 variety, which was said to be suitable for his type of land and to offer potentially high yields. Seeds were available at the government store in Parbatipur, and Ali decided to try it out in the season beginning early in 2000.

Initially everything appeared to be going well, and the yield promised to exceed that being achieved with other varieties. But the stems proved hard to cut, which meant that more labour had to be taken on than usual. They were also difficult to thresh, and ultimately a machine had to be hired from another *para* to complete the work. A further setback was encountered when the new variety turned out to be relatively unpopular with consumers, and initially only attracted a rather lower than normal price.

Together, these difficulties deterred Ali from continuing with BR29 in 2001. But in 2002, his father decided to try it on land near to his home, where he had been experiencing problems with the existing BR16 variety. This time, the experiment proved to be a success, with high yields more than making up for the harvest and post-harvest problems.

networks end, with two broad types of transfer taking place. The first links households of roughly equal status. The second takes the form of downward transmission from the better off to those in inferior economic positions.

In the case of transfers between equals a number of mechanisms are found. These include simple observation, and the giving

In the following year, Ali's brother, Aminul purchased a new threshing machine. Having seen the yields that could be achieved and with at least part of the post-harvest problem now solved, both brothers decided to cultivate BR29 in 2004. With the variety gaining acceptability in local markets, and prices appreciating, this has proved to be a good decision for them, but others in the *para* have not yet adopted the new variety.

Ali was also responsible for introducing BR28 into the *para*, starting in 2000, the same year as his first attempts to cultivate BR29. The land on which it was grown had previously been used to cultivate a China *boro* crop, but this had been associated with a number of problems which BR28 promised to overcome.

The variety also compared favourably with BR29 in certain respects. It was of shorter duration that meant it required less irrigation and was less susceptible to late season pest attack. In addition, it was much easier to harvest, could be threshed manually without any difficulty, and commanded a rather higher price.

Set against these advantages, however, was a much lower yield. But because BR28 was superior to China and avoided the initial constraints associated with BR29, it was to spread much more rapidly.

From a situation where Ali was the sole cultivator in the first year, 20 new users from Azimuddin and nearby *para* were able to adopt in 2001 as a result of his breakthrough. They were drawn from all cultivating classes, with the better off purchasing Ali's seeds, and the slightly poorer, who typically lacked sufficient land and time to attend to the various cultural operations, going to him to purchase seedlings.

and taking of advice on a one to one basis, sometimes across the gender divide. Many people also participate in informal meeting groups. These are more likely to involve men, but women network informally too, and their opportunities to do so are being extended as a result of linkages first established in the context of NGO groups.

"Downward" transfers from bigger to smaller farmers tend, however, to be more

significant, especially in the lower lying rice based communities (see Box 2). Those who know most here, and are most prepared to push forward the frontiers of what is known within their *para*, are generally surplus farmers and their sons. Such individuals normally have the widest range of contacts and the best sources of information, and are visited first by external agencies coming to the community. They are also best able to procure inputs and to experiment.

Smaller, more vulnerable farmers cannot afford to take risks to the same degree and will normally wait to see what their better off counterparts do first. But whilst they are not secure or confident enough to be early innovators themselves, the amount of land owned is normally sufficient to allow them to grow more than one variety at a time, and thus to try out new possibilities whilst retaining an element of insurance.

For marginal farmers, on the other hand, there is often little alternative other than to conform to what others are doing in order to ensure availability of irrigation and avoid exposure to pests and predators at the end of the season. Tenants and labourers only get the chance to learn something new when the owners of the land they work decide to make a change.

The "downward" transmission of knowledge is, however, less marked in communities on higher land. In part this reflects the smaller number of surplus farmers and the likelihood that those in dominant positions will be less heavily engaged in agricultural pursuits. It is also a function of more diversified cropping patterns and of the greater significance of vegetable production, where the crops preferred by the better off tend to diverge from those of the poorer households, and where poorer cultivators appear more willing to take risks. (See Box 3)

But even in the mainly rice-based communities, not all innovators are drawn from the highest social class. In most communities, gifted individual cultivators of more limited means have always been found.

More recently, the increasing significance of labour gangs, who are recruited from among the ranks of the landless, and who travel extensively in their search for work, has opened another front for the "upward" transmission of knowledge.

Learning from beyond the community

Whilst personal encounters with new knowledge occur regularly in individual families and locations, more significant interactions tend, increasingly, to take place at or beyond communal boundaries.

Movements of groups of people over shorter or longer distances form a part of the picture here. So do incoming individuals, although those in this category are normally of a lower economic status, enjoy far less command over resources once they arrive, and are therefore unlikely, under most circumstances, to have much effect.

But by and large, it is the new ideas that established residents themselves bring back to their home communities that appear most important. Visits to local and more distant markets appear especially critical in accessing new information and obtaining the inputs that represent the first step in the re-creation of external knowledge at the local level. Generally speaking, it is the better off who have the time to travel locally and make these initial contacts. They are also in a better position to attend more occasional events, like *shalish* (informal local adjudications) or Union *Parishad* meetings, where new ideas may be informally discussed. At the same time, men continue to enjoy much greater mobility than women, whose access to markets and other public events remains severely constrained. This, however, is less of a problem for poorer women, who are forced by economic circumstance to be more mobile, and who may, as result, be more rapidly exposed to new ideas. (See Box 4).

Reference should also be made to the role of local dealers in seed, fertiliser and pesticides, who may be contacted through markets, or may themselves visit more locally. Whilst they did not emerge as a particularly significant source of knowledge in the present study, it has been suggested elsewhere that their role can be important. Any advice that they give may, however, be motivated by considerations of short-term commercial self-interest, and has, as such, to be treated with caution.

The role of external agencies

The government was the major actor in the introduction of new HYV rice and wheat varieties from the 1970s onwards, and whilst

Box 3. Azizul: a small farmer experimenting with vegetable cultivation

This case demonstrates the extent to which even small farmers are prepared to experiment with commercial vegetable production, and illustrates the key factors affecting the crops selected for cultivation.

Azizul is a small farmer from Chakhaldi. He mainly grows wheat, but the focus here is on a small vegetable plot that he has cultivated for the past 20 years. Cultivation began in 1984 with snake gourd, but this was adversely affected by irrigation from an adjacent plot and replaced by pointed gourd. This was a success, and a small area was again devoted to the crop in 1986. But, in the meantime, Azizul had seen others growing cauliflower, and encouraged by the low input costs, decided to try it himself, but the crop was attacked by pests and was not repeated.

In 1987, Azizul decided to try to grow ridge gourd for the first time, attracted by the possibilities for continuous production over an extended period, the high prices that could be obtained in the middle part of the season, and its pest resistant qualities. This, however, was quickly abandoned in favour of yard long beans, which had recently arrived in the area and appeared to offer higher yields and prices; but pests again proved to be a serious problem.

By 1989, potatoes were commanding high prices in local markets, and the installation of a deep tubewell nearby suggested that the soil would be moist enough to give good yields. But the irrigation required turned out to be greater than had been expected, increasing costs and cutting into profits, and like many of its predecessors, the crop was again abandoned after a single attempt.

now somewhat diminished, its position as a source of new knowledge remains significant. In particular, it is still the primary producer and initial multiplier of high quality rice seed, and several farmers spoke of the significance of training programmes they had attended or advice they had received about new varieties and pest treatments.

NGOs have focussed mainly on vegetables and on working with women, with an emphasis on those from poorer households. Many of the recommendations they have

There then followed a period of four consecutive years when only yard long beans were grown. Costs were relatively low and prices relatively high, and it was only the belief that soil fertility would be adversely affected by continuing with a single crop indefinitely that led to them eventually being abandoned.

In 1994, Azizul experimented with an improved variety of potato that had been introduced by the Block supervisor, but returns were again disappointing. The following year he switched to chilli, having observed the success enjoyed by other local farmers, and the good returns that could be achieved for a fairly small investment.

In 1996, following a neighbour, and taking the advice of the block supervisor, Azizul decided to switch to an improved variety of brinjal that had recently become available, but this did not work very well. He turned instead to tassel gourd, which he had learned about on a Department of Agricultural Extension course, using some seed they supplied. The crop did well and was retained for a second year. In 1999, Azizul reverted to chilli but was deterred from continuing by a combination of fruit borer attack and disease.

By 2000, a new and supposedly improved variety of yard long bean was being promoted by an NGO as a part of a training course attended by his wife and Azizul decided to test it, but the results were not very good. He switched to bottle gourd in 2001 but only for one season since the cost of trellis was quite high and it was believed that yields tended to decline in a second year. Chilli was repeated in 2002, and in 2003 brinjal was tried again with a loan from Grameen Bank being used to cover the input costs.

made have revolved around the need for greater precision in timing, spacing, scale and input quantity. NGOs also typically assisted with inputs, especially seeds, in the course of promoting new ideas, and more generally with credit. There is substantial evidence of the uptake of new ideas coming through this channel, both among men and women. But there are also occasions where lack of resources has constrained those in poorer positions from adopting the ideas that have been promoted. A further limitation is that the dissemination that has occurred has

been on a comparatively modest scale. The relatively small level of vegetable production, the diversity that exists within it, the differing requirements of individual producers, and the relative difficulty of networking among women all help to explain why this should be so. Another difficulty derives from the short-term project approach characteristic of such NGO interventions, which by contrast to government extension, precludes continuing backup and assistance in adjusting to changing circumstances.

Formal education could potentially play a part in transmitting new agricultural knowledge. Most children now receive some formal schooling, but whilst there is some coverage of related matters such as nutrition, agriculture itself hardly features in the curriculum. Any current effect therefore takes place less directly through the contribution to basic literacy and numeracy, and their contribution in areas such as the transfer of the more precise measurement-based skills.

The media provide another potentially significant source of knowledge. Radio has been available in rural communities for some time and efforts have been made to establish listeners clubs in certain locations. Access to television is also increasing. Newspapers are not widely read, but more specialist print materials, in the form of advisory pamphlets or posters are quite common, although it is unclear how influential these are.

Other sources that appear important in certain instances are employment in or access to companies engaged in agricultural activities such as sugar production. Finally, mobile phones are now beginning to appear in substantial numbers in rural communities, improving access to information about prices.

How learning occurs and how it varies by gender and class

The way in which people learn is not only a function of their "encounters of horizon". It also depends on their cognitive structures, and the more specific mechanisms they employ to absorb and process new information.

The study revealed that farmers' experiments were generally adaptive in nature, most commonly involving side-by-

side comparisons rather than trials extending over more than one year or season. Trial and error was employed in the case of selecting appropriate chemical inputs and dosages. New varieties were compared with old ones and on different types of land. The performance of seeds of the same variety but from different sources was assessed. Experiments were more commonly undertaken with cash crops than with subsistence crops and seemed particularly common in the case of vegetables. But as will already be apparent from the earlier discussion, opportunities to learn vary considerably by class and gender.

Surplus farmers are much more likely to be innovators than their poorer counterparts, and certain communities have much stronger cores of leader/innovators than others. Poorer households have less resources with which to innovate, and are less able to take risks. They also have less extensively developed external networks, generally lower mobility, less education and poorer media exposure: all of which constrain their access to new ideas. Sometimes they may be forced to follow the decisions of the rich even if it is not in their ideal interests to do so. On occasions, they may suffer from innovations suiting the rich, for example through loss of employment opportunities.

But when pursuing crop preferences that differ from those of the better off, poorer farmers are more inclined to innovate in their own right. At the same time, the increasing mobility of poor men and women sometimes exposes them to knowledge that will not yet have reached wealthier households in their home communities. It should also be recognised that economic status is far from static, and individual access to learning opportunities may vary markedly through time.

Men and women have separate areas of responsibility and expertise, and this is reflected in what they learn about as children. There are, however, significant areas of overlap, and these may become quite substantial, and afford women a wider range of opportunities, under certain family circumstances. After they marry, women in nuclear family structures generally have more access to resources and capacity to explore new ideas than women in joint family structures. At the same time, those marrying inside their home communities

Box 4. Lutfa: a divorced woman relies on her knowledge of agriculture to survive

Lutfa's story challenges common assumptions about women's role in agriculture, and provides indications of how to promote the livelihoods of very poor women through agricultural interventions.

Lutfa was born in 1970 into a family that owned an acre of land. She did not go to school, and when she was 11 she started to help on the farm. Her contribution became increasingly significant as her father aged and became less able to work himself.

She married when she was 17 and moved to her husband's *para*. He owned two acres, and in addition to the normal domestic tasks, Lutfa made an important contribution to the management of the farm. She was also able to earn a small amount of money processing paddy for other people.

During this period, Lutfa noticed a new variety of sweet gourd growing nearby. She collected some seeds and passed these on to a friend. Initial attempts at cultivation proved successful, and the crop then spread to other communities in the area.

Despite her best efforts, Lutfa's marriage was not a success. Her husband was a gambler who had to sell off land to settle his debts, and after two years, she decided to leave him and return to her father. With no resources of her own, she was obliged to labour on nearby farms. Her main employer

was a neighbour, from whom Lutfa learned a good deal, and to whom, in turn, she was able to pass on new ideas she had obtained independently from a block supervisor.

Later, after her father died, she returned to her husband, and subsequently had two daughters. She now found regular work labouring in the farm attached to a sugar mill, preparing seedlings, transplanting, applying fertiliser and watering the crop. But during this period, her husband continued to gamble and finally lost all his remaining land.

Lutfa now left him for the second time, and again returned to her original *para*, where she set up home with her sister and her husband. To support herself, she found a job on the seed farm of a local NGO. Training received made her aware of the potential of yard long bean, and she obtained a small number of seeds for her aunt to grow. The experiment proved successful and encouraged several other women to follow suit.

More recently, Lutfa has formed a labour gang with other landless women which now has eight members. It operates in nearby *para* and is able to find work for about half of the year. Payments received range from 25-45 taka per day, and have risen significantly as the group has become established. The increment is largely a function of Lutfa's skills, some of which, in turn, derives from her membership of a CARE Farmer Field School. Her most recent enterprise involves leasing land to cultivate water melon.

enjoy greater social capital in the form of retained links with parents and male siblings, and hence more opportunities to network and learn.

Because women have much more limited access to resources, it is more difficult for them to experiment than men, and this is reinforced by their greater likelihood to be engaged in subsistence activities. At the same time, their generally lower mobility and the constraint on them visiting markets make it harder for them to access new knowledge. Changes in official extension policy and the pro-woman emphasis of NGOs have, however, served to counteract these biases to some extent. But women still have less extensive social networks than men, and this helps to explain why innovations with which

they are associated spread less far than those moving through male channels.

Supporting poor people's livelihoods

What conclusions can be drawn from all of this for CARE's future work?

The first, and most obvious, is that it will always be relatively hard for an agriculturally based approach to reach and significantly benefit very poor households with little or no access to land. Similarly, the agriculture route may not be the most promising way of supporting the endeavours of poor women, given that they tend only to perform a subsidiary role in relation to major crops, and that vegetable cultivation, which they dominate, takes place only on quite small

areas of land. The picture changes somewhat if livestock is also taken into account, but this has not been considered in the present exercise.

Much, however, will depend upon precisely who is to be regarded as poor, and it is also critically important to recognise that who is poor today only gives the most approximate sense of who might be "tomorrow's poor". But even if today's poor, and especially today's poor women, are to remain the focus, the study suggests a number of possibilities within the agricultural sphere that might still profitably be explored.

In the first place, the scope of former field schools could be extended to provide more opportunities for the marginal and to include the landless. Crops and innovations relevant only or primarily to the poor, could be identified and poorer people provided with opportunities to network and learn from each other. Separate schools might be offered to labour groups where knowledge drawn from wider geographical areas could be pooled and evaluated for its local relevance. Plans might be developed for negotiating enhanced contracts with landowners where it could be demonstrated that new skills could deliver extra value through the labour process. Gifted landless and marginal men and women could be brought together into cadres of "barefoot extensionists" who would then either be employed by CARE or deliver services for direct payment to different types of farmer. Women's traditional skills as storers and multipliers of quality seed might, with training and credit, be developed into commercial micro-enterprises.

Local partnerships might be formed with government and non-government agencies. The expertise of organisations like BRAC in poultry and other forms of livestock production could be tapped and might be used to promote barefoot vets, feed suppliers and egg buyers. The experience of Proshika, BRAC and others might be used to further strengthen existing initiatives around common land resources such as roadsides, where the landless can grow trees. These might include mulberry and provide a starting point for a sericulture initiative. More systematic links to credit providers could be formed to improve access by poorer landowners to currently promoted technologies. Duplication of effort

between different agencies could be reduced, and mutual learning promoted.

Further options may exist to extend access by the marginal and landless to productive resources. Tenants with particular skills could be supported in efforts to secure more favourable and longer-term leases. Landless groups might be supported in attempts to lease land and engage in seedbed management and commercial seedling supply. Poor men and women might establish commercial nurseries to supply saplings and seedlings along the lines of past and ongoing initiatives by organisations like Helen Keller International and Proshika. Efforts might be made to build on existing initiatives to collectively access and utilise government (*khas*) land and water bodies

Finally, attempts might be made to extend commercial and learning opportunities in other ways. Experiments could be conducted to establish local sub-markets that might be easier and more comfortable for women to reach, and offer them better access to commercial information. Extending mobile phone and internet access might offer an alternative or complementary route to the same end. Building on experiments already taking place elsewhere in CARE, links might be formed with formal and non-formal educational institutions to develop more effective mechanisms for the absorption and transmission of agricultural knowledge.

Box 5. The series

1. Institutions and Rights
2. Social Capital in a Rural Community
3. Securing Access to Water Bodies
4. Land Policy and Administration
5. The Changing Role of Women
6. How Farmers Learn
7. Gender Roles and Relations

Full versions of these papers will be posted at <http://www.carebd.org/publication.html>.

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