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SEARCHING FOR SUSTAINABLE LAND USE PRACTICES IN HONDURAS: LESSONS FROM A PROGRAMME OF PARTICIPATORY RESEARCH WITH HILLSIDE FARMERS

Sally Humphries, Juan Gonzales, Jose Jimenez and Fredy Sierra

Abstract

Participatory Research in Central America (Investigación Participativa en Centroamerica, *IPCA*) *is a project established by the International Centre for Tropical Agriculture, and coordinated through the University of Guelph, Canada, to support farmers in community-based agricultural research in the region. Local agricultural research committees, known by the Spanish acronym CIALs* (comités de investigación agricola local), *are found in eight Latin American countries at the present time. The IPCA project has been monitoring the development of CIALs in Honduras for the past five years. This paper presents the results of the evaluation to date and considers these in light of current debates around farmer participatory research.*

The experience of IPCA shows that teaching formal research methods to poor hillside farmers is viable and has served to link farmers to formal-sector researchers in innovative technology development programmes that directly meet users' needs. Farmers have not only benefited through access to new technologies, but they have also learnt new ways to manage their environments and have been empowered in the process. However, evaluation of the project has shown that unless research has relatively short-term payoffs, farmers are apt to lose interest. Thus, complex research – in particular research involving natural resource management – needs to be framed within the context of social programmes that can provide more immediate benefit to farmers. Technology-led development must be supported by other development initiatives that aim to build social capital as widely as possible across the community.

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Acronyms

ASOCIAL	*Asociación de los CIAL*/CIAL Association
CGIAR	Consultative Group on International Agricultural Research
CIAL	*comité de investigación agricola local*/local agricultural research committee
CIAT	International Centre for Tropical Agriculture
CORPOICA	*Corporación Colombiana de Investigación Agropecuaria*/Colombian Agricultural Research Corporation
FPR	farmer participatory research
FSR	farming systems research
IDRC	International Development Research Centre
IPCA	*Investigación Participativa en Centroamerica*/Participatory Research for Central America
IPRA	*Investigación Participativa con Agricultores*/Participatory Research with Farmers (CIAT)
Lps	Honduran Lempiras
NGO	non-governmental organisation

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1 INTRODUCTION

During the eighties and nineties, farmer participatory research in 'complex, diverse and risk-prone areas' (Chambers, 1990) in developing countries was increasingly acknowledged as necessary (see Ashby, 1990; Conway 1997; Scoones and Thompson, 1994; Uphoff and Fernandes, n.d.). Researchers who support farmer participatory research stress that poor farmers who live in marginal areas have been excluded from the benefits of Green Revolution technologies, which are designed to improve production in resource-endowed zones. Concern for the welfare of the rural poor has been further supported by concern for the preservation of biodiversity. Since the niche occupied by poor people's crops is limited by the diversity of the environments in which they are found, engaging local farmers as research partners is potentially cost-effective, as well as a means to better understand and conserve this biological complexity.

The coalescence of ecological and sociological interest around farmer participatory research (FPR) is helping to elevate the concept to a position of prominence in the field of agricultural research. It has also helped to unleash a healthy debate amongst FPR supporters on the respective roles of farmers and scientists in the research process. One area of debate concerns the appropriate level of farmer participation with the formal sector and the degree of formality necessary in on-farm research. We will address these issues in this paper, based on our experience of working in FPR. Ultimately, the value of FPR is likely to be judged from a cost-benefit vantage point. Whether the parameters are drawn broadly enough to include environmental and social outputs, or narrowly to exclude them, will certainly be contested in the coming years. We hope that this paper will contribute to a broader definition and understanding of those outputs.

This paper reports on the findings of a farmer participatory research project in Honduras. The project, which goes by the Spanish acronym IPCA (Participatory Research for Central America) is one of the initiatives that the International Centre for Tropical Agriculture (CIAT) has spearheaded in Latin America in recent years through its programme of Participatory Research for Agriculture (IPRA) (see Ashby et al., 1995; 1997). With financial support from the Kellogg Foundation, CIAT-IPRA developed a methodology to foster community-based research through the formation of local agricultural research committees known as CIALs (*comités de investigación agricola local*). Committee members are taught how to use controlled comparison for simple testing purposes. By 1999, 249 CIALs had been formed in eight Latin American countries – Colombia, Venezuela, Brazil, Bolivia, Ecuador, Nicaragua, El Salvador, and Honduras (Ashby et al., 2000). Colombia and Honduras had the largest number of CIALs in 1999, with 89 and 57 respectively. In Honduras, the IPCA project – which supports more than half of the country's CIALs – is financed by the International Development Research Centre, Canada through the University of Guelph. The project is run on a day-to-day basis by three Honduran agronomists and coordinated by a Canadian rural sociologist at the University of Guelph, who was formerly a member of CIAT's hillsides programme in Central America. The project is currently in the process of incorporating itself as a non-profit organisation.

2 SOME DIFFERING POINTS OF VIEW ON FARMER PARTICIPATORY RESEARCH

There is a good deal of debate about the wisdom of teaching farmers scientific methods of research. The critics charge that such formality suppresses local experimentation, contributing to the devaluation of local knowledge systems. In particular, they argue that power relations make it difficult for researchers to enter the very different worlds in which farmers' ideas and conceptions exist, effectively excluding them from the scientific realm (see for example, Salas, 1994; Van der Ploeg, 1993; Fairhead and Leach, 1994). Much of what is considered to be farmer research is embedded in daily practice as part of the craft of farming (Stolzenbach, 1994; 1997) and takes the form of what has been described as agricultural 'adaptive performance' (Richards, 1993) or 'move-testing' experiments (Stolzenbach, 1994; 1997). In these experiments, the research design is likely to shift during the course of the experiment, depending on what is occurring and what the farmer perceives as his/her best options to make it successful. Thus, not only is farmer experimentation likely to be missed by researchers but the particular form that it takes is so different from what occurs in agronomic trials that involving farmers in formal testing means teaching them what amounts to a different language. This 'language', the critics argue, has the potential to stifle the local idiom of ideas and practices. Much of the literature rejecting formal research methods uses an increasingly postmodern rhetoric which eschews scientific positivism for its false sense of objectivity in a world where all knowledge is shaped

by the context in which it is produced (see Scoones and Thompson, 1994).

While supporters of informal farmer experimentation criticise positivist approaches to FPR, some of those arguing from a normative farming systems position – and indeed some social scientists – have found fault with it as well. They argue that FPR has gone too far in elevating the contributions that farmer research has to offer. In essence, they charge that romanticism is pervading much of the FPR literature and that reports of *synergistic* effects derived from a 'collegial research relationship' with farmers are greatly exaggerated (Sumberg and Okali, 1997; Bentley, 1994). These critics do not deny that farmers frequently engage in experimentation, but they insist that the farmers' experiments are generally of the tinkering, or adaptive sort, which are unlikely to yield an important overall impact. Farmers' experiments, they contend, do not provide the significant *extra* benefits or *synergies* between formal and informal research systems upon which proponents of FPR insist. However, this lack of synergy is not neutral because the current wave of support for FPR is draining scarce resources away from the scientific community. They advocate 'agricultural research with farmer participation' (Sumberg and Okali, 1997) or a return to the more 'consultative approach' of farming systems research. Their interests lie squarely with the technological development agenda, not with social development. Thus organisations which advocate FPR as a means of empowerment and self-reliance are 'muddying the waters' by mixing development- and research-driven agendas (Sumberg and Okali, 1997). This, in the end, will inevitably lead to disappointment when participatory research fails to deliver the promised research outputs.

Okali and Sumberg's position is that farmers' experiments are *complementary* to formal sector research; they are not *synergistic*. Since FPR is unlikely to yield a wealth of data for scientific endeavour, farmers need not be involved at every stage of the research cycle as proponents of FPR insist. Nor, they argue, are there any benefits to be had from teaching formal research methods to farmers. Instead, farmers should be encouraged through agricultural extension to adapt technologies to their needs, according to their own ideas and economic possibilities. Sumberg and Okali's concept of agricultural research with farmers boils down to a reiteration of the consultative relationship between researchers and farmers envisioned by traditional farming systems research (FSR) – long criticised for its vertical character (see Ashby, 1990). In this relationship farmers are routinely excluded from the planning process and are instead relegated to validating technologies. Alternatively, their land is used in on-farm research though the farmers themselves are frequently sidelined altogether. One of the benefits derived from the large body of FPR literature is that it has succeeded in putting farmers at centre stage. The question is whether we really want to turn back the clock as Sumberg and Okali seem to be suggesting, or is there some sort of middle ground?

3 THE CIAL METHOD

The CIAL method, unlike either FSR or postmodern positions, involves teaching farmers the tools of formal research. Specifically, it supports the involvement of farmers in planning and executing research, including conducting trials using controlled comparison. CIAT-IPRA's position is that farmers constantly draw conclusions by comparing results spatially and temporally e.g. comparing the output of one harvest against another, or the crop in one field versus another sown elsewhere. Therefore, controlled comparison is simply an extension of traditional practice (Ashby et al., 1995). Moreover, research using controlled comparison means that the scientific community is much more willing to take seriously farmers' experiments and ideas in general. For those working within agricultural institutions, such as CIAT, where the research culture is dominated by positivist paradigms, this is a critical step in overturning the bias towards the kind of Green Revolution solutions offered in the past.

FPR based on formal methods does have payoffs both for farmers and for scientists. From the researchers' point of view, benefits lie in the continual feedback on technology that is afforded them by farmers who are acquainted with more positivist research methods. Farmers, for their part, get to interact with and – more importantly – influence the research establishment. This leads to a more responsive research relationship and to a more empowered and ultimately better resourced rural sector. For these reasons, the CIAL method constitutes a viable and, indeed, valuable middle ground in FPR.

4 FARMER INNOVATION IN HONDURAS

Accounts of promising innovations and adaptations of technologies produced by Honduran and other Central American farmers are numerous. They include the spontaneous spread of *Mucuna* (a cover crop) as an alternative to burning amongst north coast maize farmers; improved fallows using *Gliricidia sepium* and other legumes; cultivation of 'good weeds' for improving mulches; adapting in-row tillage and contour hedgerows to local conditions; and the widespread use of intercrops of beans and maize[1]. Nevertheless, the literature shows that, although some local practices do offer partial solutions to the loss of soil fertility associated with the decline in fallow time between crop cycles, they are rarely sufficient on their own to stem the tide of degradation currently occurring in the hillsides. Importantly, the labour input required in these systems (unless associated with high value crops) often makes them too costly to be acceptable to most farmers. For example, Bunch estimates that in-row tillage done by hand costs about US$130/ha to establish and $45–65 to

maintain thereafter (1998). According to a study conducted in Honduras, these costs were too high to sustain unless farmers had access to irrigation for high value vegetable crops (Arellanes, 1994). Likewise, *Mucuna*/maize intercrops are declining on the north coast because of competition from higher value palm oil and dairy cattle industries (Humphries, 1998) and because of invasion by a persistent weed (*Rottboellia cochinchinensis*) that undermines the productivity of the system and increases labour costs (Neill, 1999). Thus, despite the excitement generated by some of these local innovations and adaptations, on their own they have been unable to halt degradation in the region. This conclusion is echoed by Jansen (1998), who dismisses the idea that an 'undiscovered peasant rationality' will provide an antidote to environmental degradation associated with the fallow crisis in Honduras. Another reason why local practices may fail to provide the hoped-for store of knowledge that postmodernists allude to is that Honduran farmers are commonly from areas other than those where they are currently living and working. Farmers migrate out of necessity in the search for more or better land. At the very least, they move up the hillsides where they are forced to work on poorer quality – and often less – land than before because of increasing pressure on resources. Under such changed conditions, farmers do not have generations of local experience on which to draw. On the other hand, one might expect such newness of experience to prompt farmers to conduct fact-finding experiments (see Rhoades and Bebbington, 1991). We encountered evidence of such experiments in north coast frontier communities, although they were less prevalent than might be supposed. Moreover, they frequently amounted to deductive reasoning following successful or unsuccessful planting – they did not constitute proactive experiments specifically designed to test out a new practice or technology. Similar to Jansen (1998), we found that farmers frequently cite very contradictory evidence depending on what occurred at last planting. Most farmers did not see these as 'experiments' at all, but this may have been because respondents were CIAL members familiar with formal experiments and therefore more likely to discount their own observations from the ranks of 'true' experimentation.

5 EMPLOYING THE CIAL METHOD IN HONDURAS

The number of local agricultural research committees or CIALs which utilise the CIAT-IPRA method of controlled comparison has increased rapidly over the past few years in Honduras. In 1999 there were 57, as compared to the two pilot CIALs established in 1993/4 when the project first began. These CIALs are located in distinct agroecological zones, ranging from very humid conditions in the Atlantic coastal hillsides (3,000mm precipitation per annum) to drier conditions with seasonal rains in the south (1,400mm per annum). The CIALs are made up of poor hillside farmers, supported by a variety of non-governmental organisations (NGOs) and research programmes. Each organisation/programme supports a different quantity of CIALs with differing economic and human resources. All, however, were trained by CIAT-IPRA and have received regular follow-up and support.

The IPCA project supports 29 CIALs, more than half of those in existence in Honduras. Some of these CIALs have been 'adopted' by IPCA in the absence of consistent support from some of the NGOs. The formal nature of the methodology, involving the application of carefully controlled comparisons through split-plot trials and replications, requires a significant amount of agronomic support – at least at the outset. Unless the organisations supporting farmers are prepared to provide such support, or are in a position to invest resources in providing support, then the methodology is unlikely to be successfully applied. For example, we found that several of the paratechnical staff in one NGO resented the creation of CIALs in their area as they were expected to support them on top of their regular duties. The low salaries paid by the NGO had encouraged staff to set up small businesses on the side, and the CIALs took time away from these activities. As a result, setting up the CIALs within the economic framework of this particular NGO resulted in an uneasy partnership between IPCA and local staff. Other Honduran NGOs have faced similar kinds of problems resulting from the high demands of the CIAL process.

IPRA estimates the annual cost of running a CIAL to be in the area of US$500 (after set-up). However, other organisations employing the methodology are finding that the set-up period may be quite prolonged, implying higher costs. In Colombia, the national agricultural research agency, CORPOICA, estimates that four or more experiment cycles are necessary to permit more than 60 per cent of CIAL members to fully grasp the methodology. Costs during this period are in the area of US$830–1,250 (Ashby et al., 2000). In Honduras, the set-up period is likely to be longer because illiteracy in the countryside is much higher than in Colombia, so farmers are likely to take longer to fully understand the CIAL methodology. Ashby et al. (1997) report that heads of household in Colombia typically have three years of primary school, while 42.4 per cent of the rural population of Honduras is illiterate according to the 1988 census (Cano, 1990). Thus, unless organisations supporting the CIALs are reasonably well financed and dedicated to research, the CIAL method is unlikely to find easy acceptance. Of the 12 organisations trained by IPRA in Honduras in 1996, only three can be said to be practising the methods in a serious manner with six or more CIALs. Each of these organisations has a research focus or, at least, personnel who are *personally* interested in conducting research.

6 THE IPCA PROJECT

Participatory research has been undertaken by IPCA in three distinct agroecological zones of Honduras – in very humid north coast hillsides where widespread clearing of tropical forests for food crops and pastureland continues to be undertaken (Humphries, 1998); in much drier central/north-eastern hillsides in Yorito where small-scale production of maize, beans and coffee predominates (Beaudette, 1999); and in the humid lacustrine environment affecting hillsides surrounding Lake Yojoa in north-central Honduras where the cultivation of maize, beans and commercial coffee prevails. Notwithstanding environmental differences, residents in all three areas share a common characteristic: they are mostly very poor.

Baseline data gathered in interviews at each of the sites in the early years of the project showed total income from grains (including imputed income from consumed crops) to be in the range of US$500–900 per year. Families growing coffee earned more than this (sometimes as much as US$1,000–2,000 more) due in particular to strong coffee prices. Livestock owners also earned above this. By contrast, landless families are generally situated at the bottom end of the income range.

In a study of welfare ranking coordinated by CIAT researchers in three watersheds in Honduras, the authors found 38 per cent of the population to be 'extremely poor', 36 per cent to be 'not so poor' and 26 per cent were classified as 'least poor' (Escolan Rodezno et al., 1998; Munk Ravnborg, 1999). Each of these welfare categories comprises bundles of criteria selected by local people to classify the different ranks. Thus, amongst the poorest group, one is most likely to find: wage labouring households; the landless or those with very little land; families with bad housing who often do not own their homes; those who face difficulties in guaranteeing household food security, etc. Since the majority of IPCA-supported CIALs are located in the Tascalapa watershed (one of the watersheds included in the CIAT study) these findings are very germane to our own work. In this watershed, more than half of the families were unable to meet their food needs adequately and more than half did not own their own houses or had very poor quality homes. In Rio Saco, a north coast watershed where another CIAL has been operating for three years, 30 per cent of households face problems meeting food needs and 42 per cent of households have poor or rented housing[2] (Escolan Rodezno, et al., 1998). In the Lake Yojoa area – not included in the CIAT study – welfare levels are similar or possibly worse as a consequence of high levels of landlessness in the region. In general terms, low welfare levels are characteristic of the areas where CIALs have developed. Wealthy farmers, such as large coffee growers or dairy cattle producers, may own land in the hillsides, but few of them actually reside there, preferring the towns and cities in the valleys and lowlands where services such as electricity, secondary schools and transportation are available.

Baseline data collected in CIAL communities by the IPCA project suggest that CIAL members come disproportionately from the middle and least poor welfare categories, while the lowest ranked group is under-represented.[3] The sample consisted of 113 individuals drawn from 11 communities spread across the three regions of study[4]; 55 individuals, or just under half the respondents, were CIAL members (elected and volunteer members). In our sample, the landless (commonly amongst the 'extremely poor') are under-represented in the CIALs, while the 'not so poor' with five *manzanas*[6] or less are over-represented. Analysis of land ownership amongst members showed that only seven per cent were landless (19 per cent in the non-member group), 47 per cent had five *manzanas* or less (34 per cent in the non-member group), while 45 per cent had more than five *manzanas* (47 per cent in the non-member group). These landownership categories are correlated with diet, another important component of welfare ranking: 63 per cent of those who have above five *manzanas* of land consume meat/dairy products once a week or more; for the landless and those with five *manzanas* or less the figures are nine per cent and 28 per cent respectively.

That landowners are over-represented in the CIALs and the landless are under-represented is not surprising – landowners are likely to be the most powerful and therefore have the means to get themselves elected by the community, if they consider this to be advantageous. By contrast, the landless must work regularly as wage labourers so do not have the time to become involved in voluntary research activities. Nor are they likely to have the political standing to get themselves elected.

A key characteristic of CIAL members – specifically members elected to the executive committee – is that they are 'joiners'. Amongst elected members, 85 per cent have been involved in past projects and 81 per cent have served as community leaders of one kind or another (N=41). By contrast, non-members are infrequently involved in projects – only 35 per cent have previously been in projects and only 40 per cent have held community leadership roles. Amongst CIAL volunteer members (N=14 individuals), 50 per cent have experience in past projects, but only 21 per cent have served in a community leadership capacity. Literacy rates are key in explaining these differences: in our sample, 60 per cent of heads of household were literate (approximately the rural average); amongst elected members 81 per cent are literate; but rates drop to 52 per cent among non-members and 42 per cent among non-elected, volunteer CIAL members. Literacy is key to being elected to a committee or assuming a local leadership role, although it has not prevented a group of individuals with below average literacy from becoming involved in the work of the CIAL in a volunteer capacity.

7 GENDER

Most of the women's CIALs were formed after the baseline data were collected. However, two theses produced by graduate students at the University of Guelph focus on gender in Honduras and several other studies in the region also provide us with information dealing with gender (Gregoire, 1996; Beaudette, 1999; Sturzinger and Bustamante, 1997). In rural Honduras, as in other poor Central American countries, gender relations are strongly affected by machismo, characterised by excessive male jealousy and a delicate ego. They are also affected by the very different daily activities performed by men and women in largely different physical spaces.

The women's domain in Honduras is the home and patio garden; men take primary responsibility for the cultivation of basic grains, generally conducted a good distance from the house. It should be pointed out that the nucleated structure of communities in Honduras, combined with the tendency for agriculture to spread up the hillsides in recent decades, has probably increased the physical space between men's and women's activities. Outside the home, women's work is more likely to be limited to harvest activities, coffee picking, pulling up beans, etc. These different activities constitute distinct gender roles, as highlighted in a study by Sturzinger and Bustamante (1997) conducted in 63 communities.

For many Honduran women, movement outside their homes is severely restricted by their husbands' sense of a woman's rightful place and fear of unwanted attention from other men. Women who have joined the CIALs, or who were previously members of other projects, have frequently had to endure long struggles with their husbands over their right to associate. Others have more open-minded partners who often belong to organisations themselves. Nevertheless, these women still had to combat community disapproval around the 'appropriate' female role. CIAL members reported that women who participate in organisations are faced with comments such as: '*no tienen quien responda por ellas*' (they don't have anyone to answer to and therefore have weak and, implicitly, impotent husbands); '*andan paseando de gusto*' (move around at will) or '*andan como vagas*' (loafers or tramps, with the implication that these are women with loose morals); '*que no tienen que hacer en la casa*' (those who have nothing to do in the home). The implication is clear: women who join organisations have feeble husbands who are unable to call the shots at home, and whose virility is questionable. Some of the Protestant groups further discourage membership because of the fear of the anti-Christ emerging in the midst of organisations. In contrast to such negative stereotyping, the Catholic Church has generally been a staunch supporter of community organisations, including women's groups. Most female CIAL members have been, or are, very active in the Catholic Church. Through church organisations, or as catechists, they have been able to take on community posts (such as health guardian, water committee secretary, etc.) and become involved in projects such as the CIALs. Women involved in such organisations report much higher levels of personal freedom than other women in the community.

8 BROADENING THE CIAL PROCESS

Baseline data collected in the first three years of the IPCA project through in-depth interviews in 11 communities led project staff to adopt a new tactic in the formation of CIALs. Through open-ended interviews with CIAL and non-CIAL members, it became clear that people outside the CIAL often felt resentful of those inside. Those outside the CIAL tended to feel that members were receiving help (*ayudas*) through the project, which non-members were being denied. Since the survey data showed that CIAL members – particularly elected members – came from amongst the more privileged households, it was necessary to address this perceived and, indeed, real inequality in the membership. As a project, we have attempted to remove the elite bias that previously existed in the CIALs when communities were encouraged to elect only experts to the team. Thus, while the CIAL methodology urges the community to elect members who are experts in the area of experimentation and innovation (not necessarily a well defined role in Honduras), IPCA has encouraged those interested to become volunteer members in the CIAL. To achieve this, the project has sought to increase the number of people present at the initial motivation and CIAL election meetings. IPCA now visits a community where a CIAL is being considered prior to the motivation event in order to personally invite each household and help obviate any bias in attendance. This has led to a larger turnout of people at the initial meetings and has permitted a broader cross-section of people to be included in the CIALs. The increase in the participation of women in the Yorito area – where most of the CIALs were formed after 1997 – is likely to be a consequence of this change of orientation since women have been personally invited to the meetings with the knowledge that they may form CIALs independent of men. It is easy to maintain the fiction that only men may join the CIALs if only men attend the motivational meetings, as was frequently the case early on in our experience in Honduras. Average membership in the newer CIALs is 12; in total, there are six all-women's teams, 13 all-men's teams and 10 mixed teams. Two of the groups are composed entirely of indigenous Tolupan people.

Opening up the CIAL process is likely to increase the amount of time involved in acquainting people with the methodology, particularly as volunteer members are more likely than elected members to be illiterate. This of course will increase the costs of establishing a CIAL; on the positive side, a larger CIAL provides continuity when people leave for one reason or another. In areas where there has been a good deal of instability in the

CIALs, such as in the Lake Yojoa area where landlessness and near-landlessness are high and a burgeoning foreign-owned assembly or *maquila* sector is located close by, institutional stability provided through higher membership is important.

9 SELECTION OF CIAL ACTIVITIES

CIAL research activities are selected by participants at a community diagnostic session. The more open CIAL process being pursued in Honduras, which has helped to foster the growth of gender-differentiated CIALs, has also contributed to the emergence of gender preference patterns for research. After a brainstorming session and discussion, participants cast their votes in favour of research themes singled out by the community. Not surprisingly, given the distinct gender division of labour, men consistently identify problems in grain production, whereas women mainly identify problem areas in vegetable cultivation. Where women have elected to work with different crops such as cassava and beans, they have generally requested help (or even hired someone) for the heavier work. Recently – and after much discussion – two of the first all-women CIALs in Yorito elected to become mixed groups. Members report that mixing men and women in a single CIAL has permitted the women to become involved in areas of work normally considered to be outside their domain, although the men continue to undertake the heavy work. In another mixed CIAL, the women take care of the replication plots close to the community while the men look after the other plot which is further away. The rather strict gender division of labour does not automatically limit women to experimentation in vegetables, and it may be argued that mixed CIALs are helping to break down the gender division of labour, permitting men and women to better appreciate each other's work (Beaudette, 1999).

As in other countries, the most common theme of CIAL experiments in Honduras has been varietal selection (Braun et al., this issue). Of 81 experiments conducted by the CIALs in Honduras since their inception, 52 per cent have focused on beans, 32 per cent on maize, and 16 per cent on other cultivars and themes (soya, cassava, onions, chemical and natural insecticides, organic fertiliser, different green manures, soil conservation, planting dates) (IPCA, 1998a). The heavy emphasis in the men's and mixed CIALs on basic grains research reflects the subsistence focus of farmers, combined with concern for marketability. Escolan Rodezno et al. (1998) found that almost no Honduran hillside farmers were interested in grains for commercial purposes only. It may be argued that the repetitive nature of the experiments across so many communities is redundant. From a research point of view, this may be true. However, the CIAL methodology permits each community to make its own decision around which line of inquiry to pursue, and until the time comes when CIALs are sufficiently well organised as a group to permit collective decisions that better maximise diversity of experience, such repetitiveness is bound to occur.

The recent organisation of regional groupings of CIALs within the federated framework of the CIAL Association (ASOCIAL) should help to promote such unity of action. Moreover, as CIALs become more experienced, they also become more innovative. For example, one of the CIALs formed in 1996 recently decided to experiment in planting by lunar phase to provide scientific evidence to verify their own individual hunches about the timing of planting. This CIAL had already experimented extensively in different maize and bean varieties as well as in organic fertilisers. The members' decision to acquire scientific evidence on lunar effects rather than rely on their *ad hoc* ideas demonstrates the maturity of this CIAL, its faith and, indeed, profound interest in formal testing. One can easily imagine other CIALs moving in a more innovative direction once they have gained confidence in their own abilities to conduct research through basic grain experiments. As Bunch (1998) and others have pointed out, we have found that it is important to try to involve farmers at the outset in an experiment likely to show some success. If farmers continually experience failure they will lose confidence in their own, as well as the agronomist's, ability to look for alternatives. And since some of the improved germplasm has been successful across a wide geographical area, the incorporation of these varieties into local trials has been a good tactic to strengthen interest in the CIALs at the outset. The longest-standing CIALs have only been in existence since 1996 and therefore have had at most four years' experience in formal experimentation[5]. Most IPCA-supported CIALs have functioned for considerably less time than this. Indeed, two-thirds were formed after 1997. Thus, the lack of variety of research themes is not surprising.

Experiments consist of a first round test (*prueba*) on a very small scale, a second round re-test (*comprobacion*) on a larger scale, and finally, the setting up of a commercial-sized plot once the CIAL is assured of the suitability of the cultivar or practice. These three testing rounds may take three years to complete. New materials are tested against the local variety(ies) which serve as the control(s). It is not uncommon to find that the farmers' own varieties out-perform improved germplasm (IPCA, 1998b), underscoring the importance of the CIALs as a community research service provider that prevents the introduction of unsuitable materials.

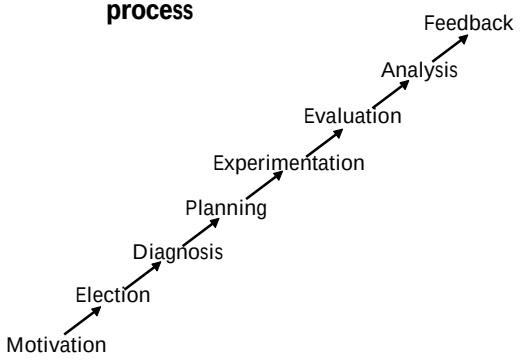
The finding that local materials frequently rank higher than exotic cultivars in CIAL evaluations has led to efforts to improve landraces through the CIALs, rather than continuously searching for new materials. One component of this effort to improve local germplasm is the joint project between the Panamerican Agricultural School at Zamorano and the University of Guelph/IPCA Project, which is funded through the Participatory

Table 1 Breakdown of CIAL costs, Yorito, Honduras*

Activity	Cost/CIAL/Year ($US)
Agronomist's salary	420.00
Agronomist's food in field	80.85
House rental in field	21.30
Motorbike depreciation	25.00
Motorbike maintenance	35.50
CIAL experiment costs	30.00
Paraprofessional salaries	187.20
Office materials	8.55
TOTAL	**808.40**

* These are minimum costs prorated against the 20 CIALs located in Yorito, Honduras and include three-week field visits, the use of a motorbike in the field, etc.

Figure 1 Methodological framework of the CIAL process



Research and Gender Analysis Programme of the Consultative Group on International Agricultural Research (CGIAR). The objective of the project is to improve local bean varieties through participatory breeding with the CIALs. More recently, Zamorano and IPCA have begun collaboration on a participatory maize breeding programme with the CIALs through a Norwegian-supported project. The limited number of improved varieties suitable for hillside communities underlines the desirability of increasing germplasm diversity through the improvement of landraces. While the initial crosses of local germplasm with improved materials is being done at Zamorano, the CIALs will work with segregating lines at local sites to select progeny with characteristics that members deem desirable. Key members of the CIALs and technicians are being trained by the agricultural school at Zamorano in how to work with segregating materials. This approach to breeding (which has not been undertaken by Zamorano before) is a response to the new opportunities offered by the CIALs and represents a clear example of demand-driven technology development.

Another response to the lack of suitable improved germplasm has been the effort to improve cultural practices involving the management and use of local cultivars. Rather than testing out new varieties, farmers work to improve what they already have. This mainly involves plant selection in the field for architecture, number of pods or cobs per plant, seed selection and storage practices. Cultural practices such as land preparation, planting densities, planting regimes, soil conservation and fertiliser use also affect how seed performs. These practices are not necessarily the substance of CIAL experimentation, but are best addressed by an educational process which is most effectively communicated through problem-based learning. Farmers learn through practical experience in the CIAL which becomes, as one CIAL member put it, 'a little school for learning' ('*una pequena escuela para aprender*'). Therefore the CIAL process necessarily goes further than just research and instead becomes a field school. The same CIAL member continues by explaining:

In the CIAL we have learned to sow maize, to give as much priority to improved varieties as to local ones, because amongst the landraces there can be good varieties. We have learned to select, to store [seed], to identify characteristics, to use chicken manure and to collect weeds and leave them between the rows to stop erosion.

As another CIAL member put it:

The CIAL methodology means to learn about the different bean blights, [it means to make] little plots – to learn on a small scale; it is the school of learning. [We've learnt] to select seed – different classes of seed, sowing distances, to sow in rows, to use two seeds instead of four, not to burn, [to use] weeds to fertilise the soil and [to understand] the problem of losing soil.

While most CIAL experiments have focused on grains, farmers have learnt about a range of components associated with sustainable land management in the process of carrying out these experiments. The experiment is simply the focal point of learning about good land use; it is through the process of conducting the experiment that problem-based learning occurs. This makes it difficult to judge the efficacy of farmer participatory research apart from assisted learning about sustainable land use. Farmers, for their part, do not distinguish between the two.

The assisted learning approach that IPCA has chosen to pursue means that agronomists and paratechnical staff will spend more time assisting farmers than might normally occur in the CIAL process. We have not attempted to reduce visits to two to three per cycle within four research cycles, as was IPRA's goal (Ashby et al., 1995). Rather, farmers have been receiving visits every two weeks from an agronomist or para-professional. Costs associated with the programme are presented in Table 1.

IPCA's costs are below those of the Colombian agency *Corporación Colombiana de Investigación Agropecuaria* (CORPOICA) whose set-up costs have been estimated at US$830–1,250 per CIAL per year, but above CIAT's estimate of US$502 per CIAL per year to be achieved within the first four cycles of research (Braun et al., this issue; Ashby et al., 1995). The question to be asked is whether the goal is to make CIAL's farmer-led adaptive testing as low cost as possible, or whether the work of the CIALs should be broadened to include assisted learning for sustainable land use and social development. IPCA has elected to do the latter.

10 ASSISTED LEARNING THROUGH THE CIAL

Learning to do research

A questionnaire was employed to gauge CIAL members' understanding of the CIAL method and to ascertain its impacts. Thirteen CIALs were visited and interviewed in the three geographical areas in 1998, and a further nine were interviewed in Yorito in 1999. The CIAL method is illustrated using a step sequence that takes members through the logical stages required to conduct research (Figure 1).

In 1998, when we evaluated 13 CIALs that had already carried out more than four cycles of experimentation, only five of them had more than 60 per cent of members who could recount the CIAL step process. The majority had only a couple of members, if any, who could be said to understand and recount it. In the 1999 survey, conducted only in Yorito and amongst some of the newer CIALs, the large membership present at the group interview made individual understanding of the methodology impossible to measure. As a group however, each was able to recount the process, meaning that at least one person had memorised the methodology. The higher rate of CIAL stability in Yorito compared to those in the other two regions has probably facilitated learning. Most people in Yorito have land, and out-migration appears less common than in the other two areas (Escolan Rodezno et al., 1998). In the last year, paraprofessionals have begun working with CIALs to help instill the methodology by reading through the CIAL books with small groups of members. Finally, if the large number of requests for CIALs made to IPCA is used as an indicator of levels of interest, the CIAL concept seems to have taken off in Yorito. Communities that solicit a CIAL on their own are more likely to be successful because the capacity for collective action is already in evidence, as demonstrated by the request.

The practice of research, as opposed to the methodological framework, is much easier for farmers – especially illiterate farmers – to internalise. Most farmers interviewed understood 'research' and 'experimentation' and expressed them through the synonym of 'small parcels' (*pequenas parcelas)* rather than as abstractions. Farmers generally understood that these small parcels were where they tried out unknown things to see how they fared, to minimise risk. They understood that it was necessary to have a control (*testigo*) alongside the new practice or variety in order to gauge whether it performed better or worse. The rationale for having replications could not generally be well articulated, and frequently an insufficient number of replications were conducted to verify findings. For example, farmers regarded replications as 'a means to test out different soils', 'a means to allow everyone to have an experiment on their land', 'as a security measure in case experiments were lost' or 'to see if everyone had the same disease', rather than a way to see how the treatment fared under different conditions. Such responses underline the difficulties that poor and often illiterate farmers may have with abstract concepts, and why the presence of an agronomist may be necessary over a prolonged period to help in the planning and analysis phases of an experiment.

The evaluation of the experiment and analysis of results are recognised by farmers as having taught them valuable new information and skills. Farmers have learnt how to assess whether one variety or practice was better than another, and they have learnt how to distinguish one disease from another – in terms of both the causes and symptoms. They have learnt to be curious and to assess different options for dealing with their problems. The development of these faculties has led to shifts of understanding and the mastering of new skills and aptitudes. For example, in Honduras it is well known that farmers typically lump all bean diseases and pest infestations under the heading of *hielo* (literally 'ice') without any attempt to distinguish the different causes and symptoms (Bentley, 1990). That CIAL members can now differentiate between bean diseases and pest symptoms and are learning some preventative methods represents an enormous step forward. Farmers have acquired this new knowledge through the pedagogy inherent in the CIAL process. The CIAL method of working from diagnosis through to planning a solution, evaluating and analysing the results has stimulated farmers' curiosity in a way that straight extension could never have done. As one eloquent farmer described his perception of this change:

We were almost blind as far as agriculture goes. Now we see things – our minds have been woken up. [It has been] an almost total change. In the CIAL project, our minds have been altered in the way that we think – we have learned about agriculture and the process of managing research. It is worth the effort to work based on such a process. Research has helped me. Now I work in an ordered fashion. I plan, I figure out the costs, I do a diagnosis and say to myself, 'I'm going to plant maize and not beans this time around'. Before I didn't rotate my crops. But the brain is a little fresher these days because of the CIAL books…

Of course not all farmers develop the same critical faculties and skills at the same time. Some may never truly master them but they derive benefit by contributing to a group process that is collectively acquiring new knowledge and building social capital. They also learn from the ancillary processes associated with the research.

Learning good land management practices

Along with problem identification and problem-solving skills (e.g. searching for new varieties to meet specific community-defined objectives) CIAL members have gained a host of new ideas and information. For example, if farmers are to be able to compare one experiment treatment with another, both must contain

the same amount of seed sown in equal amounts at equal distances. In 'traditional' planting, many farmers sow grain, often purchased at a local store, rather than seed. To overcome low germination rates, farmers plant upwards of five seeds per hole in the hope that one or two will emerge. Higher germination rates with improved seed mean that smaller amounts of seed are required per hole, and higher seed efficiency permits closer spacing than is customarily practised. Similarly, while farmers traditionally plant down the slope in a square (*al cuadro*) or triangular (*pata de gallina*) pattern, improved practice recommends contour planting across the slope to mitigate erosion. Traditional planting regimes may have made sense under extensive production when fallow periods were long and the land used possibly less steep, but they do not make ecological sense under present conditions, and farmers need assistance to switch to more sustainable regimes. Successful experiments help to make the transition to more sustainable farming more likely.

Farmers working in the CIALs consistently reported using smaller amounts of seed and closer spacing than traditionally practised on their own plots. Not all had switched to contour planting because of the extra labour time involved in sowing across the slope, or because they claimed that their land was too rocky to make this feasible. This is an area where more assisted learning is required. Farmers need to be sensitised to the problem of soil loss, either through experiments which can demonstrate this, or through more intensive education than has hitherto been provided.

Other techniques learnt through the CIAL process – elicited by asking 'What have you learnt through the CIAL (new things that you didn't know or do before)?' – include the following:

- ceased burning;
- planting more on less land;
- producing more with less work;
- use of organic manure (chicken manure, cane bagasse, liquid manure, coffee pulp, *Gliricidia* leaves);
- zero and minimum (in-row) tillage;
- use of legumes (*Mucuna*, *Canavalia*, pigeon pea, *Erythrina*);
- ability to recognise different soils;
- use of live and dead barriers;
- covering soil and incorporating weeds to slow erosion and increase fertility;
- working with herbicides and a machete instead of burning and using a hoe;
- how to select seed;
- improvement of landraces through plant and seed selection practices; and
- judicious use of chemical and natural insecticides.

These different components of the assisted learning process, reported by CIAL members, demonstrate how the CIAL is functioning as a '*pequena escuela de ensenanza*' or field school. They are the building blocks of more sustainable land use and offer a partial solution to the fallow crisis. The CIAL method makes farmer adoption of sustainable practices more likely.

11 LEARNING FROM CASE STUDIES

The selection by the CIALs of research topics that involve natural resource management present some obstacles that need to be considered carefully. Primary amongst these are the long-term nature of the research and the opportunities for CIAL members to privatise the social benefits of research. Two case studies are presented which illustrate some of the problems and some of the opportunities in soil conservation work. The IPCA project is taking a learning process approach to CIAL development and is incorporating ideas acquired from successes as well as learning from failures.

The first case, CIAL Rio Santiago, Yorito, Honduras, illustrates the tendency for personal interest to take priority over community interests under certain conditions (Box 1).

CIAL research on crops or practices that yield long-term payoffs, such as green manure testing, runs the

Box 1 CIAL Rio Santiago

The community of Rio Santiago identified soil improvement as their research priority in 1996. As one of the first CIALs established in Yorito, the focus was on forming an expert group and the CIAL comprised only four elected members. The experiment involved testing maize yields using different fertilisation regimes – specifically, organic chicken manure and chemical fertiliser combined with different green manures (*Canavalia*, *Mucuna*, pigeon pea). Each CIAL member had a replication of the experiment on his land and although other members of the community subsequently showed an interest in joining the CIAL, they were deterred by the fact that there were insufficient funds for further replications. Indeed, one person who did join the CIAL left quickly on learning that his land was too far away to make it practicable to have a replication there. People's interest in the research was highly motivated by their potential personal gain – in this case receiving agronomic advice and having their land fertilised for free. Broadening the process to include other community members was made more difficult as the treasurer made off with a portion of the CIAL research fund.

In a nutshell, there was no commitment to serving the community or producing a public good by the four elected CIAL members. A community survey in 1999 conducted by the paraprofessional supporting the CIAL found that almost no one in the community knew about the research being undertaken. In the end, the community ousted all the members and a new committee was elected. The current CIAL has 16 members, nine of whom are women; only one of the previous members has stayed on as a volunteer.

When research yields a private benefit of this nature, it may be in the interest of CIAL members to continue excluding others in the community so that they may capture a larger portion of the benefits.

risk of losing sight of the public goods it is intended to produce. Likewise, chicken manure experiments which produce beneficial effects for up to three to four cycles present landowners with the opportunity to privatise some of the benefits of the research, and early experiments led to competition between members to have the experiment located on their land. We overcame this tendency by ensuring that the same piece of treated land was reused in subsequent experiments. From the perspective of those outside the CIAL, inputs such as legumes and chicken manure are seen as perks, making IPCA no different to any other development project – namely it was helping those who were already amongst the more privileged members of the community. This commonly held perception was one of the factors that propelled IPCA to open up the CIAL process so that anyone might join. Varietal selection, in contrast with soil conservation, produces a good which is almost, by nature, public: after harvest, the seed can either be resown, sold or divided up in some way – the owner of the land where the seed was grown does not benefit because of some residual effect (unless he/she manages to monopolise the seed). While the environmental effects and knowledge produced by soil conservation work may be of public benefit, the actual process of research is much more likely to yield private benefits to landowners. Agroforestry research is even more liable to produce such results.

The second case, located in the Lake Yojoa region of Central Honduras, serves to counterbalance the previous case study by demonstrating how research focusing on natural resource management may be made to serve the community and maintain group interest (Box 2).

In the case of the La Palma CIAL (Box 2) we see that, apart from long-term soil conservation testing and short-term varietal research, members are united around a very tangible social project. The decision to collectively raise funds for a community store is a good example of how self-interest and altruism may be mixed in people's minds to stimulate the development process (Uphoff, 1996; Uphoff, 1999). We have found that getting the right mix between long-term goals and shorter-term payoffs is essential to maintaining farmers' commitment to the CIAL process. This was not achieved in the pilot phase of the IPCA project leading to a decline in farmer enthusiasm over repeated trials.

12 BUILDING SOCIAL CAPITAL THROUGH THE CIAL

Longer-term research, such as that involving natural resource management, requires that a certain level of social capital be present in the community at the outset. In this paper, social capital is taken to refer to the social networks that result in collective action, civic responsibility, community vitality, shared positive-sum relations, etc. (see Wall et al., 1997; Uphoff, 1996). CIAL

Box 2 CIAL La Palma

Interested farmers in the community of La Palma in the Lake Yojoa area approached IPCA after learning about the project from another CIAL in the same municipality. La Palma contains 37 households and forms a small annex of the main municipal town. Nineteen people from the community attended the diagnostic session where the majority voted in favour of soil conservation research, though nine people chose not to join the CIAL because of the long-term nature of this research. Amongst the 10 CIAL members, three do not own land, which probably makes the choice of topic less appealing for them than for the other team members. One of the landowning members agreed to donate one *manzana* of his land for CIAL use for the full duration of the experiments. It is worth comparing this case to that of the neighbouring CIAL. In the latter case, none of the members has sufficient land to put any forward for experimental use and the CIAL rents from a cattle rancher. Clearly, in this case, research into soil conservation is limited by the nature of land tenure. In contrast, CIAL La Palma has been granted access to land by a member for an indefinite time, making long-term soil conservation research possible.

The experiment consists of testing different live barriers – pigeon pea, valerian, king grass, *Erythrina* and pineapple – and measuring crop yields and soil losses associated with the different kinds of barriers. The experiment began in spring 1998 and some results became available by the end of 1999. The commitment to this work demands a stable membership and a long-term social commitment from the CIAL members. However, short-term research is also being carried out in the form of a bean varietal experiment being conducted in the centre of the plot.

The long-term commitment to soil conservation was obtained by the CIAL at the beginning. The 10 members agreed between themselves to accept certain rules and regulations, the strictness of which may have deterred others from joining. Each member is charged 5 Lempiras (Lps) (US$0.36) for failing to show up at a meeting, while members of the executive are charged 10Lps. For failure to show up at a planned day of work, members are charged 40Lps, and 50Lps if the rest of the group works all day. Moreover, the group will not accept stand-ins for members (i.e. the hiring of labourers). On the benefit side, each member has the right to small loans (up to US$20) from the group's capital at five per cent interest.

While strong leadership from the executive and a shared commitment to the research have helped to forge a united group, these are not the only reasons for success. Apart from the experimental plot, members have cultivated commercial crops of chilli, cabbage and maize for sale. In this way, they managed to save US$1,000 in one year. This money has been invested in a community store located in rented premises in the main municipal town. Within three months of opening the store, the group's capital had grown to approximately US$2,300. CIAL members agreed to leave all profits in the store until the end of 1999. They hope to be able to purchase a store building in the near future. The group is also planning to turn the store into a distribution centre for other community stores in the area. They need to organise a minimum of 11 local stores in order to acquire this status and be able to bulk purchase goods through a local cooperative organisation associated with the Catholic Church. This organisation also provides administrative training to members. The community store is currently selling goods below prevailing local prices and this is helping to bring local prices down.

members involved in natural resource management need to be united around agreed goals from the outset; they need to have good leadership, to adhere to clear rules and regulations regarding members' obligations to the group and to the community. If these are not in place, the experiment is unlikely to produce public benefits successfully; more likely, the benefits will be privatised by one or more of the members. Achieving unity of action amongst group members is much simpler if the group process is driven by the members from the outset, e.g. proactive behaviour in requesting a CIAL. A high degree of pre-existing social capital in a community makes the link between group goals and community goals easier to achieve. In our survey we tried to ascertain levels of pre-existing social capital in communities through the following questions (adapted from Krishna and Uphoff, 1999):

1. In your opinion, is your community united compared to other communities around here? Are there conflicts between people/families in the community?
2. If you need to work to construct, for example, a school, a road, etc., does everyone participate or only a few?
3. If a teacher does not show up at school over a prolonged period, how does the community deal with this? Who takes action? Where are complaints directed?
4. If a house burns down, would the community help? If not, to whom would the victims turn for support?
5. If someone is sick, does the community help with the cost of medicine, hospitalisation, etc.?

These questions were fairly consistently answered within communities: responses were generally either wholly positive on items or wholly negative. Thus, for example, low social capital in a community led to little or no help for sick people or for those whose houses burned down, little or no action for dealing with dilatory teachers or contributing to public works of one kind or another, etc. In one actual case, people were reported to have laughed as someone's house burned to the ground, while the sick and poor were reportedly left to suffer and die. By contrast, other communities responded positively to all community concerns raised by the questions. Needless to say, the CIALs are much more likely to be successful in meeting local objectives if they operate in a climate characterised by high levels of social capital. In such cases, people take public office seriously and generally treat the CIAL as a vehicle for community improvement. Where social capital is low, absconding with the funds is almost to be expected. There is a strong correlation between high social capital and CIAL success; the reverse is also more likely to be true. This does not imply that CIALs should never be located in communities where social capital is low, but that one should not expect things to go smoothly. Here, more than in communities where social capital is high, the rules and regulations governing activities must be firmly in place from the beginning. Even with these in place, longer-term experiments with the potential for monopolisation of benefits should probably not be undertaken too early in the process.

While CIALs operate most effectively in those communities where there is a certain level of social capital in existence, they are also effective institutions for building social capital. Thus, along with the agricultural skills and practices listed earlier, people in our survey also reported that they had learnt:

- how to manage funds;
- how to make savings plans;
- to use the CIAL step process to diagnose and analyse social problems in the home and in the community;
- how to plan time – something particularly important to women who said since becoming involved with the CIAL, or other organisations, they had learnt how to manage their time in the home so that there was time for their activities outside of it;
- public speaking skills; and
- not to be intimidated by outsiders, such as agronomists and other professionals.

In addition, women reported earning greater freedom for their activities outside the home. They also said that men had learnt to be more respectful of their work and to lend them a hand. These comments regarding skills and changes in gender and family relationships demonstrate that agricultural research is but one element of a broader process of social change leading to empowerment, which the CIALs are helping to stimulate in the communities. We would add that the organisational and leadership skills required to conduct the weekly/monthly meetings serve to involve members in a number of social and economic activities other than research. These skills are evidence of organisational maturity and a capacity for collective action within the CIALs, which is helping to build social capital more broadly in the communities.

13 THE CIAL: A LEARNING VEHICLE FOR THE IPCA TEAM

As members of the IPCA team, we have learnt the importance of the social components of the CIAL process. This was not something that had been anticipated at the outset. We are aware that to some, these social components – including the incorporation of collective commercial plots (alongside the experimental plots), savings and credit schemes, community stores, etc. – represent a watering down of the research focus of the CIALs. However, CIALs are located amongst some of the poorest people in the Americas: research, though important, cannot be the sole priority whilst household food security remains an ever-present concern. An anecdote serves to illustrate why it is vital to keep this firmly in mind (see Box 3).

The case serves as a reminder that even though some of the farmers may have become excellent researchers,

as this one was, they are poor farmers first and foremost. We must keep at the forefront the social development component of the project: technology-led development is too narrowly conceived for a group of poor people in a poor country such as Honduras.

14 THE CIAL–COMMUNITY NEXUS

As illustrated in Figure 1, the CIAL methodology provides research information to the community after each experiment cycle. In theory, the group puts itself at the service of the community. In practice, it is not difficult for a CIAL to hive off from the community and become quite self-serving. However the larger the CIAL, the less likely it is that this will occur: each member will not be able to have a replication plot on his/her land with the concomitant tendency to privatise the benefits. The larger the group, the more likely it is that the knowledge will spread into the community, via the feedback sessions after each cycle as well as through the widespread participation of people from different households.

Those who eschew organisation in the CIAL and in other projects are known locally as *conformistas.* Such people adhere to traditional activities and ideas without questioning other possibilities or the need for change, and their attitudes can be a real disincentive for CIAL members. For example, all CIAL members report that the establishment of the small experimental plots initially led to ridicule from the *conformistas*, and comments such as 'it's rubbish', 'a waste of time', 'just playing around with little parcels' and 'there was nothing to see' were widespread. Some CIAL members reported almost leaving the CIALs because of the taunting they had to endure. The gap between members and non-members, especially the *conformistas*, may make it difficult to disseminate information gained in the CIAL process to non-members, particularly when the CIALs are small. As the CIALs have become larger and more integrated in the community, the monopolisation of knowledge has ceased to be an issue, although the rejection of new ideas by the *conformistas* is not so easily overcome.

15 FEDERATING THE CIALS

A decision was taken in 1998 by the various organisations supporting the CIALs to support a federation of CIALs across Honduras. IPCA has led the federation process that has resulted in the Association CIAL (ASOCIAL). The ASOCIAL comprises four regional chapters supported by a committee of technicians from local organisations. CIAT donated US$25,000 that has been invested in perpetuity for the Honduran CIALs. At present, the fund is not sufficiently large to permit the interest earned to underpin all CIAL operations, although this is the long-term goal. In addition, CIALs are attempting to raise their own funds: e.g. CIAL savings, maintained in community CIAL funds, are being used to finance the bulk purchase of goods to be resold locally in small quantities, with profits going into the CIAL fund. Members may also use both CIAL and ASOCIAL funds for savings and small loans purposes. For example, each ASOCIAL chapter is supporting mini-projects through small loans to the CIALs (e.g. chicken improvement programmes for the women's CIALs, artisanal seed production for the formation of micro-enterprise). The money is repaid with interest at the end of the project period. Such opportunities for collective action through the CIALs serve as powerful cohesive agents, permitting longer-term research to be undertaken and ensuring economic sustainability of the CIALs as local research organisations.

The ASOCIAL is also responsible for organising the annual CIAL meeting, the *encuentro,* when farmers share the results of their research with one another. To date, there have been three meetings held in Honduras, involving CIALs from Nicaragua and Honduras. Since there are now 57 CIALs operating in Honduras alone, selection of presentations by the different ASOCIAL chapters takes place prior to the event. Diversity of research topics was a key factor in the selection process in 1999. These meetings have been attended by researchers from the national agricultural programmes, the Panamerican Agricultural School at Zamorano and international centres and programmes. They represent an excellent opportunity for farmers and researchers to exchange information. It is not unreasonable to imagine that as the CIALs become more experienced and their research more diversified, key CIALs and formal sector researchers will link their research more closely together. Indeed, partnerships between those CIALs most committed to research, or even individual CIAL members, and scientists may be one way to efficiently undertake difficult and more lengthy research involving natural resource management.

Box 3 CIAL members are poor farmers first and foremost

A star CIAL member, certainly the most high profile of all the collaborating farmers, recently abandoned his replication of the group experiment without a word of explanation. This farmer played a leading role in the establishment of a watershed committee and in the annual national CIAL meetings. He is the foremost CIAL spokesperson, frequently called upon to explain the methodology to outsiders, to discuss the trials, help form new CIALs, and is known locally as *el doctor* because of his ability to diagnose and analyse agricultural problems. The abandonment of the experiment left IPCA agronomists flabbergasted. How was it possible that the main CIAL ambassador had let them down, without even a word? Even more wounding was the fact that he had managed to harvest all of his own maize crop which encircled the replication. What we had forgotten was that our star performer was still a very poor farmer with a family to feed. The CIAL experiment was ready to harvest just as he was about to plant a tomato crop with an associate. While he made time to harvest his own maize crop, the experimental plot required careful weighing and evaluation: it would not serve to feed his family, whereas the tomato crop – which was waiting to be planted with the aid of a rather impatient partner – would. However, he was too ashamed to admit his decision to us, maybe because we held him in such high esteem. So he said nothing and, by doing so, jeopardised the entire CIAL experiment.

16 CONCLUSION

This paper began by reviewing some of the current literature on farmer participatory research. The debate between those who support a postmodern perspective on the value of indigenous knowledge in research versus those who adhere to the more technological agenda of farming systems research was examined. The latter position, as put forward by Sumberg and Okali (1997), argues for 'research with farmers', or a more limited role for farmers than participatory research would suggest. Their position is that farmers' research is complementary to formal research, but there are no extra benefits or synergies to be had from including farmers as partners. In contrast, those who support the farmer-led research school of thought do indeed expect to achieve synergistic effects by getting researchers to 'join farmers' experiments'. In this paper we have examined a different approach: namely, teaching farmers to conduct formal trials to test out new technologies that meet farmers' needs and, simultaneously, to influence the research of scientists.

Our findings do not lend support to the farmer-led, postmodern position. We found no real evidence that indigenous knowledge *on its own* is capable of addressing the very serious and complex environmental problems facing Central America, although we would certainly agree that farmer innovations have contributed to mitigating these. The difficulty of involving farmers in longer-term environmental research – unless it is tied to research that has more immediate payoffs – has been evident throughout the course of our work in Honduras. This lends some support to Sumberg and Okali's concerns about the value of teaching formal research methods to poor farmers: on its own, participatory research using formal methods was not found to be sufficiently engaging for very poor farmers whose primary concerns were more likely to be achieving immediate household food security. Without modifying our programme to include short-term benefits and/or tangible social development goals, farmer interest in formal research would have – and sometimes did – wane.

While our research does not support the postmodern position on participatory research, neither does it lend credence to Sumberg and Okali's normative position, which argues that farmers be excluded from planning and only brought in to validate research results. Farmers and researchers need to work side by side if solutions are to be found. The complementary nature of farmer and formal-sector research cannot be overlooked; farmers must be in a position to influence research. Teaching farmers formal research methods is an effective means of making researchers attentive to the results of farmers' experiments. Greater complementarity between farmers and researchers might be achieved through a farmers' federation, such as the ASOCIAL, permitting a few farmer experts in each region to play an even more collaborative role with scientists than has been achieved to date through the CIALs. This may be the most cost-effective way to involve farmers in longer-term and more difficult research, such as that required for experimentation associated with natural resource management. Alternatively, effective social programmes will have to be designed to maintain farmers' interest over the long term. The cost of such programmes would dictate whether farmer participatory research is an economically viable option for researchers for anything other than short-term research where outcomes are more readily achievable.

The findings in Honduras contrast somewhat with those of the earlier CIAL work reported in Colombia (Ashby et al., 1995), which demonstrated that the CIALs are very rapidly capable of carrying out adaptive research using formal research methods. In Honduras, where education levels are considerably lower than in Colombia and poverty is considerably higher, acquainting the majority of CIAL members with formal research methods is likely to take more than a few cycles, with higher costs for supporting agencies. This will likely deter all but the most committed of NGOs. However, as we have demonstrated in this paper, the process of teaching farmers to do research involves much more than research alone (Box 4). It becomes an assisted process of problem-solving which helps farmers learn about sustainable land use practices. The challenge for the future is to broaden this process still further so that the CIALs become learning institutions or field schools for environmental management. This is not an argument for

Box 4 Lessons learnt from the Honduran CIAL experience

- The CIAL process involves more than just research; it is a field school in which farmers learn through practical experience.
- The experiment is simply the focal point of learning about good land use; it is through conducting the experiment that problem-based learning occurs. This makes it difficult to judge the efficacy of farmer participatory research separately from assisted learning about sustainable land use.
- Is the goal to make farmer-led adaptive testing through the CIALs as low cost as possible, or to broaden the work of the CIALs into a wider process of assisted learning for sustainable land use and social development? IPCA has elected to do the latter.
- To maintain farmers' commitment to the CIAL process it is essential to balance long-term goals with shorter-term payoffs.
- It is necessary to maintain the social development component at the forefront of the project; technology-led development is too narrowly conceived for a group of poor people in a poor country such as Honduras.
- The process of teaching farmers to do research involves much more than research alone; it is an assisted process of problem-solving which helps farmers to learn about sustainable land use practices. The challenge for the future is to broaden this process still further so that the CIALs become learning institutions or field schools for environmental management.

a return to more agricultural extension, separate from research, but rather a call for institutional change that permits assisted learning with farmers at one level to be more fully integrated with formal research at another. Evidence from the IPCA project, particularly in the field of participatory plant breeding, strongly suggests that the current emphasis on participatory research is helping to encourage the emergence of innovative arrangements and research restructuring in Honduras. Institutional partnerships such as those between the Panamerican Agricultural School, IPCA and the CIALs, are generating technologies for poor hillside farmers that could not be produced by the formal sector alone. Such collaboration in technology development is arguably synergistic in nature.

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ENDNOTES

1 The use of *Mucuna* as a mulch has been described by Buckles et al. (1992; 1998), Triomphe (1996) and Flores (1987; 1992). The Quezungual System provides an example of improved fallows (Hellin, 1999; Mercado et al., 1992). The use of 'good weeds' in mulches has been studied by Schlather (1997) and forms the basis of a conservation practice known as *frijol tapado* (literally meaning 'beans covered') (Bellows, 1992; Rosemeyer and Gliessman, 1992). Roland Bunch (1998) describes other soil conservation strategies and intercropping.

2 Differences in the quality of housing in the Saco watershed are strongly affected by remittances from the United States. Many families have children and relatives working there as a consequence of networks established through El Salvador prior to migration to the north coast from former communities near the Salvadorean border.

3 Our study used different variables to those elected by participants in the CIAT study. Hence the two are not directly comparable.

4 The sample consisted of four CIAL communities located on the north coast in frontier communities, four located in the Lake Yojoa region and three in the Tascalapa watershed, Yorito. In general, north-coast landholdings in frontier communities are larger than average, probably accounting for the larger size of holdings in our study relative to those of CIAT (see Humphries, 1998).

5 The two pilot CIALs established in 1993/4 elected to discontinue their research activities. Instability amongst migrant farmers on the north coast was a key factor, as was the early emphasis solely on experimentation, with no attention given to social development (see Section 11).

6 One *manzana* is approximately 0.83 hectares.

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