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Participation in Community Landcare Groups: A Social Capital Perspective

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PREFACE

The Philippines-Australia Landcare Project Working Paper Series is intended to disseminate the results of research undertaken in the course of two successive action research projects funded by the Australian Centre for International Agricultural Research (ACIAR):

- ASEM/1998/052 *Enhancing Farmer Adoption of Simple Conservation Practices: Landcare in the Philippines and Australia* (1999-2004)
- ASEM/2002/051 *Sustaining and Growing Farmer-Led Landcare-Type Approaches to Natural Resource Management in the Philippines and Australia* (2004-2007).

For further information about these projects contact the project leader, Noel Vock, at Noel.Vock@dpi.qld.gov.au and about the working papers and other research outputs contact Rob Cramb (r.cramb@uq.edu.au) or Noelyn Dano (noelyn_dano@yahoo.com).

This paper further analyses survey data from the Lantapan evaluation study to assess the factors affecting individual participation in local Landcare groups. The paper was written during a visit to the Department of Land Economy, University of Cambridge, in 2005. It draws in part on an earlier paper presented at the 48th Annual Conference of the Australian Agricultural and Resource Economics Society, Melbourne, February 2004. The current version has been submitted to the *Australasian Journal of Environmental Management*. I am grateful to Zorina Culasero, Delia Catacutan, Josephine Liu, Edith Tejada, Gerardo Boy and Lyndon Arbes, who were all involved in the Lantapan evaluation study.

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ABSTRACT

Membership in community Landcare groups in the Philippines can be seen as an accumulation of social capital on the part of farmers in order to improve their access to and ability to implement soil conservation and agroforestry technologies. An improved understanding of the factors affecting farmers' decisions to invest in such forms of social capital is likely to be helpful to agencies concerned with supporting these collective conservation farming efforts. A logistic regression model was developed using household survey data from one municipality in central Mindanao to analyse the factors influencing farmers' investment in social capital, particularly the form of social capital embodied in membership of a local Landcare group. The results indicate that the assumption of homogeneous and cooperative communities that underlies many community-based resource management approaches may not be valid in practice. Both individual and group-level characteristics lead to different degrees of investment in community-based activities such as Landcare. Differences between individuals affect their willingness to invest time and resources in social capital formation – middle-aged farmers with somewhat less education but more land and a greater focus on farming were more likely to participate in Landcare groups. Differences between communities further affect individual incentives to accumulate social capital – some local communities were more likely to encourage individual members to augment their stocks of social capital, including through Landcare membership. Programs to assist rural communities in the formation of social capital for beneficial collective action need to allow for such individual and community differences.

INTRODUCTION

The role of "social capital" in facilitating collective action for rural development and natural resource management has received considerable attention in the past decade (Ostrom 2000; Pretty 2003; Quibria 2003; Meinzen-Dick et al. 2004). The formation of community Landcare groups in Australia, the Philippines, and elsewhere can be seen as an investment in social capital on the part of farmers with the aim of collectively promoting the development, dissemination and adoption of conservation farming practices. An improved understanding of the factors affecting farmers' decisions to invest in such forms of social capital is likely to be helpful to agencies concerned with supporting these collective conservation efforts.

This paper arises from an evaluation of the Landcare Program in three provinces in the southern Philippines undertaken in 2002-3 as part of an action research project funded by the Australian Centre for International Agricultural Research (ACIAR). Household survey data from Lantapan Muncipality in Bukidnon Province, Central Mindanao, are used to explore the factors influencing the form of social capital embodied in membership of a local Landcare group. The paper begins by briefly reviewing the concept of social capital from an economic perspective. This is followed by a consideration of the importance of investment in social capital and collective action in the pursuit of soil conservation, particularly in developing countries such as the Philippines. The origins and progress of the Landcare Program in Lantapan Municipality are then described, emphasising the rapid formation of local-level Landcare groups and the resultant widespread adoption of conservation farming practices. The main empirical section reports regression analysis of farm survey data that examine the factors affecting individual farmer participation in Landcare groups. A concluding section summarises the practical implications of the study.

THEORETICAL PERSPECTIVES

The Concept of Social Capital

The concept of "capital" has been broadened considerably in recent decades. The literature on sustainable rural livelihoods distinguishes five forms of capital – natural, physical, financial, human, and social (Scoones 1998; Ellis 2000). In crude terms, natural capital is what you find, physical capital is what you make, financial capital is what you save, human capital is what you know, and social capital is "not what you know but whom you know". Two distinguishing features of all these forms of capital are: (1) maintaining and building capital entails sacrifice (i.e., foregone consumption), and (2) capital can enhance the productivity of other factors of production, thereby generating a return to the sacrifice incurred (Bannock et al. 1972, p. 56). In other words, they each involve "investment of resources with expected returns in the marketplace" (Lin 2001, p. 3), where "marketplace" is interpreted very broadly to include a variety of social arenas.

It is important to recognise differences as well as similarities between forms of capital. For example, stocks of physical capital depreciate with both use and time, stocks of natural capital typically depreciate with use but can appreciate with time due to natural processes of growth and regeneration (Gaffney 1965), while stocks of human and social capital typically appreciate with use and have complex relationships with time (Woolcock 1998; Ostrom 2000; Glaeser et al. 2002). The mobility of capital also varies within and between the five types, with human capital, for example, being typically highly mobile, while various authors have emphasised the essential immobility or community-specificity of social capital (Woolcock 1998; Glaeser et al. 2002; Bowles and Gintis 2002). A related point is the variation in the susceptibility of different forms of capital to alienability or private ownership. For some (e.g.,

Bowles and Gintis 2002; Quibria 2003), this rules out "social capital" as a form of capital, but there are many examples of natural capital that are not alienable or privately owned, and human capital, though privately owned, is not alienable.

Arguing that various natural, human and social phenomena have an economic dimension that can be usefully analysed as "capital" is not to suggest they can be reduced to merely economic categories. These phenomena have intrinsic as well as instrumental value – natural landscapes, good health, education, friendships, and community life are all valued for their own sake, above and beyond their importance for economic production (Sagoff 1988; Woolcock 1998). With this proviso, it seems clear that the concept of capital can be usefully extended to analyse a range of phenomena that are traditionally outside the bounds of economics. In particular, the concept of social capital can be used to shed light on questions of collective action in rural development and natural resource management of special interest to agricultural and resource economists (Ostrom 2000; Pretty 2003; Meinzen-Dick et al. 2004; Cramb 2005a).

Social capital can be broadly defined as "the information, trust and norms of reciprocity inhering in one's social networks" (Woolcock 1998, p. 153), or "the norms and networks that enable people to act collectively" (Woolcock and Narayan 2000, p. 226). The concept was invented (or reinvented) by various writers from the 1950s onwards, but received its greatest impetus from the seminal work of Coleman (1988) on education and Putnam (1993, 1996) on civic participation and governance. As Coleman (1988) suggests, social capital is not a single entity. Woolcock (1998) distinguishes different forms of social capital and examines the changing combinations between them in the context of economic development. At the micro level (the level of individuals, households, small groups, and communities) he distinguishes two types. "Integration" or "bonding social capital" refers to the intra-community ties that enable poor people in a village setting to "get by" (e.g., monitoring of property rights, labour exchange, emergency assistance, rotating savings groups, provision of communal facilities). "Linkage" or "bridging social capital" refers to the extra-community networks that enable individuals and groups to tap outside sources of information, support, and resources, not just enabling them to "get by" but to "get ahead" (e.g., links to traders and financiers, extension agents, NGOs).

Focusing on only one kind of social capital, and assuming that more is always better, can be seriously misleading (Woolcock 1998; Woolcock and Narayan 2000; Rodriguez and Pascual 2004). In particular, a community with a high level of bonding social capital, while it may provide essential support to its members, may also be holding them back in other ways (e.g., by restricting opportunities for innovation, education, or engagement with markets) or imposing costs on other groups (e.g., those excluded from membership on ethnic or religious grounds, or those on the receiving end of an environmental externality). For development to proceed, Woolcock and Narayan (2000) suggest there is a need, not only to mobilise bonding social capital, but also to develop new linkages, or bridging social capital, opening up new opportunities for individuals and communities. The dilemma is that the formation of this latter type of social capital may well undermine the former type over time, as success increases demands on existing social bonds and as individuals within the community pursue a greater diversity of linkages and activities.

An Investment Approach

As the above definitions suggest, social capital can be interpreted from both an individual and a group perspective. Economists have tended to emphasise individual social capital. Glaeser et al. define individual social capital "as a person's social characteristics … which [enable]

him to reap market and non-market returns from interactions with others" (2002, p. F438). They see social capital as the social component of human capital, and assume that it includes both intrinsic abilities and the results of social capital investments over time. Lin highlights the investment aspect, defining social capital (in line with his broader definition of capital cited above) as "investment in social relations with expected returns in the marketplace" (2001, p. 3).

Other social scientists have rejected the individual approach, emphasising social capital as an attribute of a group. For example, Krishna defines it as "the quality of human relations within some well-defined social group that enables members of this group to act in cooperation with one another for achieving mutual benefits" (2004, p. 292). However, the two perspectives are not mutually exclusive. While the economic approach highlights the expected payoffs to individual investment in social relations, it is recognised that there are pervasive interdependencies or externalities involved and that the investment decisions are strategic in nature, hence group or "aggregate" social capital will be a complex function of the individual investment decisions of group members (Glaeser et al. 2002; Bowles and Gintis 2002). A cohesive, cooperative group will comprise many members with high levels of investment in individual social capital, and one person's investment and disinvestment decisions will likely depend on the aggregate level of social capital in the relevant group.

Glaeser et al. (2002) develop an investment model in which the individual's stock of social capital (and the flow of investment in social capital formation) is a function of his or her age, discount rate, expected mobility, opportunity cost of time, and occupational returns to social skills, as well as the aggregate stock of social capital in the specific community and the rate of social capital depreciation (including that due to relocation). They compare the predictions of the model with available evidence, using data from the General Social Survey, a repeated cross-sectional survey in the US. To measure individual social capital they use membership of organisations rather than subjective measures of trust, arguing that the latter do not necessarily reflect trusting behaviour in practice, while the membership measure is reasonably well correlated with other measures of community-mindedness, such as working to solve a local problem, forming a new group to solve a local problem, or contacting local government regarding a local problem.

Their results indicate that social capital (1) first rises then falls with age, (2) declines with expected mobility, (3) rises in occupations with greater returns to social skills, (4) is higher among homeowners, (5) falls sharply with physical distance, and (6) is correlated with investment in human capital. However, their prediction that social capital investment falls with the value of time is not supported by the available data. Moreover, while their model allows for group-level effects on individual investment decisions, they find no robust evidence for such effects. Their overall conclusion is that "individual incentives, not group membership, drive social capital accumulation decisions" (Glaeser et al. 2002, p. F456). A similar set of hypotheses is developed below for the Lantapan survey data, but with somewhat different results.

THE RELEVANCE OF SOCIAL CAPITAL TO SOIL CONSERVATION

Pretty (2003) and Pretty and Ward (2001) have documented the beneficial impacts of social capital on rural development and resource management as evidenced by group activity in a wide range of areas, including watershed management, irrigation, micro-finance, forest management, integrated pest management, and farmer experimentation. However, it is cannot be taken for granted that investment in soil conservation requires or is enhanced by investment in social capital. Historically, soil conservation programs emphasised the

implementation of large-scale engineering works designed to manage surface run-off on a catchment basis (e.g., the US and Australian model of contour banks and grassed waterways). This approach certainly required coordination among landholders but typically the policy was to rely on legislative means rather than community action to achieve this. Legislation (such as the Queensland Soil Conservation Act) provided for areas of soil erosion hazard to be declared, resulting in obligations being imposed on landholders within those areas to implement conservation works according to a plan specified by a technical soil conservation agency. In some versions both positive incentives (subsidies) and negative incentives (penalties) were put in place to induce conformity with the plan (Coughenour and Chamala 1989).

The problem with this approach in Australia is that it was only selectively enforced, hence soil conservation remained essentially voluntary, while land degradation proceeded largely unabated (Bradsen and Fowler 1987; Coughenour and Chamala 1989). More generally, Pretty and Shah (1994) conclude: "By all performance measures, conventional SWC [soil and water conservation] programmes have been remarkable failures. Little has changed this century.... Few farmers benefit, structures rarely persist, and inadequate implementation by outside technical teams causes erosion rather than prevents it" (p. 18). They emphasise three factors that have undermined success, namely "the high cost of project packages, the selection of inappropriate technologies, and the lack of incentives for farmers to maintain conserving measures and practices" (pp. 11-12). See also Blaikie's (1985) classic review of conventional or old-style soil conservation efforts in developing countries.

However, there has been a major change in recommended soil conservation practice in recent decades, particularly in developing countries such as the Philippines, involving a trend away from the implementation of engineering works on a catchment basis towards the utilisation of a combination of contour-based biological and physical measures designed as far as possible to retain run-off within individual farmers' fields, while at the same time providing short-term production benefits (Hudson 1992, 1995; Norman and Douglas 1994). The new approach involves a change in emphasis from erosion control as an end in itself to improved soil and water management for crop and livestock production, or "land husbandry" (Hudson 1992; Shaxson et al. 1997). Within this new approach to soil conservation, the potential role of agroforestry measures such as contour hedgerow intercropping has been given special prominence (Kang and Wilson 1987; Young 1989; Nelson and Cramb 1998).

The point to make here about this new approach is that it places the emphasis on adoption of conservation measures by individual smallholder farmers, thereby circumventing the need for complex land-use planning on a catchment basis, which in densely populated developing countries may entail attempting to coordinate the actions of hundreds of farmers over several villages. Once again, a question arises about the need for investment in social capital, given that a patchwork of individual adoption, if sufficiently extensive, is expected to have the desired landscape effect. Yet, notwithstanding the seriousness of the land degradation problem in the Philippine uplands and elsewhere in the developing world (Cramb 1998), the adoption of these more divisible soil conservation measures has been generally disappointing (Cramb et al. 1999). Such measures do not "diffuse" through a population in the manner of classic innovations such as hybrid maize (Rogers 1995; Cramb 2000).

Examination of the few successful examples of widespread and sustained adoption in the Philippines (Granert 1990; Fujisaka 1993; Stark, 2000; Cramb et al. 2000; Mercado et al. 2001; Garcia et al. 2002; Cramb and Culasero 2003; Cramb 2005a, 2005b) suggests that collective action at the community level is indeed required in order to:

- raise awareness of soil degradation and conservation within a farming community (including the development or reinforcement of conservation norms);
- develop and test locally adapted soil conservation measures;
- provide effective farmer-led, group-based training in soil conservation practices;
- implement soil conservation measures on individual farms (e.g., small labour-exchange groups to mark out contours and plant hedgerows on individual farms, group nurseries to raise hedgerow species and fruit and timber trees);
- disseminate measures within and beyond the community (e.g., cross-farm visits, farmer-field schools, farmer training groups, extension networks);
- maintain links to government and non-government technical agencies.

These activities involve aspects of both bonding and bridging social capital. Thus recent experience suggests that, although adoption of soil conservation measures such as contour hedgerows is a decision taken by individual households, the rate of adoption is considerably enhanced where appropriate forms of social capital are either already in place or are being developed. The Landcare approach to soil conservation is premised on such investments in social capital.

THE LANDCARE PROGRAM IN LANTAPAN

The Landcare approach emerged in the mid-1980s in Australia (Campbell 1994; Lockie and Vanclay 1997; Cary and Webb 2000) and in the mid-1990s in the Philippines (Mercado et al. 2001; Arcenas 2002; Sabio 2002) as an important strategy for developing collective action at the local level to deal with problems of agricultural land degradation. The approach centres on the formation of community Landcare groups, supported to varying degrees through partnerships with government and non-government agencies. Such groups identify problems at the local level and mobilise information, community effort, and finances to help improve the management of their soil, water, vegetation, and other natural resources. They can thus be viewed as a means of investing in both bonding and bridging social capital.

Independently of the Australian Landcare Program, Landcare in the Philippines grew out of efforts by a succession of agencies to promote soil conservation innovations, especially contour hedgerows, among smallholder maize and vegetable farmers in the upland municipality of Claveria in Northern Mindanao. In the early 1990s the International Centre for Research in Agroforestry (ICRAF) began to conduct field trials on contour hedgerow systems in Claveria and identified a low-cost, less labour-intensive farmer adaptation of contour hedgerows – the use of natural vegetative strips (NVS) (Fujisaka 1993; Nelson and Cramb 1998; Stark 2000; Mercado et al. 2001). An extension team was formed to promote the NVS technology to other farmers. The interest was such that group sessions were organised and at one such session in 1996 it was decided to form the Claveria Landcare Association (CLCA) to promote the technology throughout the municipality. By early 2000 the CLCA had grown to include 16 village-level groups, 105 sub-village groups, and about 800 individual farmer-members. Adoption of NVS technology also increased dramatically, from about 75 ha in 1996 to more than 300 ha in 1999. This rate of expansion was almost unprecedented in the Philippines. The success of Landcare in Claveria encouraged ICRAF in 1998 to introduce the approach at its Central Mindanao field site in Lantapan as well as other locations that shared similar conditions and farming systems.

The Municipality of Lantapan occupies 33,000 ha in the upper reaches of the Manupali River, which flows from the environmentally significant Mt Kitanglad Range (Coxhead and Buenavista 2001). The landscape rises from river flats at 400-600 m in the south of the municipality to mountainous terrain at 1,100-2,200 m in the north. Soils are generally clayey,

moderately acid, of low fertility, and susceptible to erosion. Rainfall averages 2,500 mm, 70 per cent falling in the wet season from May to October. Lantapan has experienced major demographic, agroecological, economic, and institutional changes over the past half century. In that time, the indigenous Talaandig have become a minority as immigrants from the central and northern Philippines have taken up land and introduced more intensive farming practices. The population increased from under 1,000 in 1948 to over 43,000 in 2000, resulting in a population density of 136 persons per sq. km and a modal farm size of 1-3 ha. Hence shifting cultivation of rice and other crops for subsistence has given way to continuous cultivation of maize for both subsistence and sale, and the production of an array of vegetable crops such as beans, tomatoes, cabbages, and potatoes, destined exclusively for urban markets to the north. More recently, the spread of sugarcane cultivation and the establishment of three large banana plantations have further transformed the landscape in the more productive and favourably situated parts of the municipality. The net effect of changes in land use is that forested land has declined while annual cropping has expanded as the agricultural frontier has been pushed higher in the landscape. This has resulted in loss of forest biodiversity as well as the rapid degradation of soil and water resources.

The Landcare Program in Lantapan built on ICRAF's experience in Claveria and the prior interventions of an array of organisations under the USAID-funded Sustainable Agriculture and Natural Resource Management (SANREM) Program (Coxhead and Buenavista 2001; Cramb et al. 2003). The ICRAF Landcare team comprised two experienced facilitators and four "intern" facilitators. The program began with a broad information campaign on environmental issues and conservation technologies, especially NVS. This campaign was implemented in all 14 villages of the municipality. A survey was then conducted to determine the level of farmers' interest. As a result, seven villages in the upper part of the municipality were given priority. Major activities in these villages included slide shows, cross-farm visits, and training. The training involved half-day or whole-day sessions that usually began with hands-on training in establishing NVS or with training in nursery management. This training was supported by visits to farms where the practices had been adopted.

Following these efforts there was rapid formation of Landcare groups and a Landcare Association (Cramb et al. 2003). The formation of a sub-village Landcare group usually followed the first training event. The first Landcare group was formed six months after the information campaign, in May 1999. The Lantapan Landcare Association, linking these groups at the municipal level, was registered in June 2000 with 840 members. By 2001, 58 Landcare groups had been formed and four existing farmer groups were affiliated with the Landcare Association, making 62 groups in all. These groups were an important source of information on conservation practices for their local community and encouraged members and others to work together, especially in the establishment and maintenance of communal Landcare nurseries. Table 1 shows that the main motivation in joining a Landcare group was to obtain better access to these conservation farming technologies. Many groups became less active once the initial adoption of NVS and/or tree planting had occurred, and especially in those villages where plantation development and other agribusiness ventures had led to the demise of smallholder farming. Nevertheless, in most cases the groups and their links to the municipal Landcare Association and ICRAF continued to be valued.

The recorded rate of adoption of NVS and tree planting during the implementation of the Landcare Program was impressive (Cramb et al. 2003). By the end of 2002 there were about 400 adopters of NVS – 7% of all farm households. Based on the household survey, the perceived impacts of NVS adoption at the farm level were that soil erosion was reduced, soil fertility was maintained, and terraces were formed. There was no perceived short-term impact on crop production or farm income. In the longer term, these impacts were likely to come

Table 1 Reasons for joining a Landcare group, Barangay Sungco, Lantapan (n=58)

Reason	Current members		Intending members		Total	
	No.	%	No.	%	No.	%
Learn technology	18	64.3	26	86.7	44	75.9
Like the program	4	14.3	1	3.3	5	8.6
Plant trees	2	7.1	2	6.7	4	6.9
Improve livelihood	1	3.6	1	3.3	2	3.5
Influence the group	2	7.1	0	0.0	2	3.5
Follow others	1	3.6	0	0.0	1	1.7
Total	28	100.0	30	100.0	58	100.0

about, first, because yields of field crops were maintained relative to yields from unprotected land and, second, because of a transition to agroforestry as NVS were progressively enriched with productive crops, including timber species (Cramb et al. forthcoming). In addition, by 2002, 64 community nurseries had been established and 162,000 trees planted on farms. This reflects the particular interest of farmers in the income-earning potential of various fruit and timber tree species and hence the early emphasis on training in nursery management techniques. Combining adopters of the two main conservation measures – contour barriers and agroforestry – there were about 862 adopters by the end of 2002, or 16% of the total number of farm households in Lantapan (though not all households were potential adopters). The total area under conservation measures was about 1,150 ha (43% under NVS and 57% under agroforestry). This was 7% of agricultural land, 14% of maize and vegetable land, and 23% of "environmentally critical" land, suggesting a significant impact at the landscape level.

FACTORS AFFECTING PARTICIPATION IN LANDCARE GROUPS

The preceding paragraph suggests the positive influence of landcare membership on adoption of conservation measures in Lantapan. There is, of course, an endogeneity problem in that both landcare membership and adoption of conservation practices may have been jointly influenced by one or more other factors, such as a personality trait of the individual member/adopter and/or the degree of exposure to the Landcare Program. Moreover, there is a close (but not complete) link between landcare membership (an investment in social capital) and participation in training in conservation practices (an investment in human capital), both of which are likely to have encouraged adoption. These connections have been partially analysed elsewhere (Arcenas 2002; Cramb 2005a, 2005b), providing reasonably strong confirmation of the hypothesis that participation in landcare groups has beneficial consequences for adoption of conservation measures. Here the focus is on the antecedent factors affecting individual investment in this kind of social capital in the first place.

In this section, data from a questionnaire survey of farm households in one village (*barangay*) in Lantapan are used to examine the factors affecting the level of individual investment in social capital at the micro level – in particular, the social capital embedded in landcare groups. The survey was conducted in Barangay Sungco, which occupied a representative transect of the topography in the municipality, had responded well to the Landcare Program, and was less affected by large-scale agribusiness developments than other parts of the municipality (Cramb et al. 2003). The survey was conducted in August 2002. A stratified random sample of 104 households was drawn from all but one sub-village (*sitio*) in the barangay (a remote community whose members all belonged to an exclusive sect), giving a sampling fraction of 19 per cent. Two research assistants administered a one-hour questionnaire in Cebuano, the local lingua franca, to each selected household. Twenty seven per cent of the respondents

were landcare members and 60 per cent had adopted contour farming measures (NVS or contour hedgerows) on at least part of their farms.

Landcare membership being a binary variable, logistic regression was used to estimate the influence of the independent variables on the likelihood of membership. It was hypothesised that the likelihood of membership would:

- first increase then decrease with age (given that younger community members are busy getting established and need time to build up their social capital, while older members are allowing their capital stocks to depreciate);
- increase with years of formal education (enhancing awareness of group benefits and the skills required to engage in group activity);
- increase with the longevity and strength of ties to the local community (assuming that recent immigrants would have had less time and resources to acquire social capital);
- be higher among those whose primary occupation was farming (given the importance of group activity to agriculture, farm forestry and natural resource management);
- be lower among those who had an additional (usually non-farm) occupation (meaning a higher opportunity cost of time hence less time available for group activity);
- increase with farm size (an indicator of income and wealth, hence the ability to invest in social capital);
- be higher for land owners (assuming this meant having a greater and more permanent stake in the community, hence a longer planning horizon);
- be higher among those who had steeper land (implying a greater need for landcare technologies and group support);
- be higher among those who had received training in contour farming methods, especially NVS (due to greater awareness of the benefits of landcare participation);
- be influenced by the local neighbourhood or hamlet (*sitio*) in which the household resided (i.e., a group-level effect, reflecting that individual investment in social capital is contingent on the aggregate stock in the relevant community).

The independent variables were measured as follows. To allow for the hypothesised rise and fall of social capital with age, five age brackets were used, hence four dummies were specified with the age bracket 60+ years as the reference category. Education was measured by the number of years in school. Several variables measuring ties to the community were considered – a dummy for place of origin (1=born in the *barangay*), total years resident in the community, and ethnic category (1=indigenous). However, as might be expected, these variables were highly inter-correlated, with Pearson pair-wise correlation coefficients exceeding 0.5, and years resident was also highly correlated with age. Hence only the place of origin dummy was included. Dummies were also defined for the main occupation (1=farming), the presence or absence of a secondary occupation (1=secondary occupation undertaken), land ownership (1=full or part owner), topography of the farm (1=moderately to steeply sloping land), and training in contour farming (1=respondent had received such training). Farm size was measured in hectares.

The measurement of local neighbourhood was problematic. Because the estimation of a logistic regression uses a maximum likelihood approach, the sample size was too small to allow the use of separate dummies for each hamlet. Instead, hamlets were classified according to their position in the landscape, with 1=lower, 2=middle, 3=upper. This variable thus had a dual interpretation. In part it captured a community-level effect (indicating if joining a landcare group was affected by one's neighbourhood) and in part a landscape effect

(indicating if landcare membership was more likely in the more environmentally sensitive zone).

As described above, training in contour farming occurred independently of landcare membership, though the experience of such training often encouraged trainees to form or join a landcare group, hence its inclusion as an explanatory variable. Occasionally, however, this training followed the act of joining a group, raising a question about the direction of causation. Consequently two models were estimated, one with and one without the training variable.

The results of the logistic regressions are presented in Table 2. The equations for both models were significant at the one per cent level (as indicated by the model chi-squared) and provided an acceptable fit of the data, with Model 2 providing the better fit (as indicated by the Hosmer-Lemeshow goodness-of-fit test, the Nagelkerke R^2, and the percentage of correct predictions).

Table 2 Logistic regression of Landcare membership on characteristics of household head, Barangay Sungco, Lantapan (n=104)

Variable	Model 1			Model 2		
	Coeffic.	St. error	Odds ratio	Coeffic.	St. error	Odds ratio
Constant	– 2.865	2.268	0.057	– 0.650	2.463	0.522
Age 20-29	0.754	1.184	2.124	1.708	1.491	5.516
Age 30-39	0.071	1.147	1.074	0.189	1.602	1.208
Age 40-49	1.039	0.895	2.827	2.037*	1.215	7.664
Age 50-59	2.068**	0.992	7.912	3.396**	1.348	29.850
Education	– 0.175	0.110	0.839	– 0.656***	0.217	0.519
Local origin	– 0.833	0.607	0.435	– 2.115**	0.974	0.121
Main occpn.	– 1.483	1.226	0.227	– 4.141**	1.776	0.016
Other occpn.	– 0.983	0.754	0.374	– 2.659**	1.197	0.070
Land owner	0.965	1.151	2.624	1.659	1.470	5.252
Farm size	0.273**	0.119	1.314	0.353**	0.170	1.424
Location	1.074***	0.404	2.928	1.190**	0.521	3.286
Slope of farm	0.024	0.635	1.024	– 0.050	0.761	0.951
Training				4.493***	1.202	89.349
Model chi-square		34.759***			62.358***	
Nagelkerke R^2		0.413			0.655	
H-L chi-square		7.215			3.837	
% correct		81.7			85.6	

* $P < 0.10$, ** $P < 0.05$, *** $P < 0.01$.

In Model 1, the significant factors were age, farm size, and location. Specifically, respondents aged 50-59 years were more likely to be landcare members than those in other age groups. An increase in farm size also increased the likelihood of landcare membership. There were probably two reasons for this: farmers with more land were generally better off, hence had more time to be involved in a landcare group; farmers with more land had greater potential to adopt the technologies (NVS, tree planting) being promoted by the Landcare Program, hence had more incentive for group participation.

Location higher in the landscape also increased the likelihood of membership, reflecting both the greater need for the services of a landcare group in the upper slopes of the catchment and that local communities in this zone responded more readily to the Landcare Program, thereby encouraging individual community members to participate. This latter point again highlights the importance of community-level effects in individual decisions about social capital.

In Model 2, which included the training variable, the significant factors were age, education, local origin, main occupation, other occupation, farm size, location, and training. Once again landcare membership was much more likely among those in the 50-59 age group (followed by the 40-49 age group) and among respondents with larger farms located in communities higher in the landscape. The significant but negative coefficient for education implied that those with more education were less likely to be landcare members, perhaps because they felt they could access improved practices without having to participate in group activities. The significant but negative coefficient for local origin implied that those born outside the *barangay* were more likely to be landcare members, perhaps because they had less local knowledge and hence greater need for the information flows provided by the Landcare network.

The significant but unexpectedly negative coefficient for farming as the main occupation was probably an artefact of there being few respondents (6) for whom farming was not the main occupation (hence a small absolute number of Landcare members in this category could result in a relatively high proportion). Omitting this variable did not noticeably alter the coefficients or their standard errors. However, the significant and negative coefficient for having a secondary occupation was expected, as this generally meant less focus on farming and less time for Landcare activities.

While location in the landscape was a significant and relatively important factor, the presence of sloping land in the farm was not. This suggests that the location variable was largely capturing community-level rather than topographic effects.

The training variable was highly significant and had a high odds ratio, indicating that this was the most important variable in explaining Landcare membership. This was presumably because training in contour farming was conducted on a group basis and highlighted the need to work together to implement the practice (at least initially). In addition, much of the training was provided by Landcare facilitators, who also encouraged group activity and networks. As discussed above, however, there was also an element of reverse causation in that some members of Landcare groups underwent training as a consequence of joining the group.

CONCLUSION

Social capital is a complex phenomenon with many dimensions that can be viewed at both the individual and group levels. In this study, the concept was interpreted to mean investment in semi-formal group structures at the local level that could facilitate collective action for improved farming outcomes. Landcare membership was assumed to reflect investment in social capital relevant to conservation farming, and included both bonding and bridging elements. Given this interpretation, the research question was: What individual and local community characteristics influenced the accumulation of such (beneficial) social capital?

The analysis of household survey data showed that Landcare membership increased then decreased with age (peaking at 50-59 years) and was related to education, local origin, occupation, farm size, location, and training. That education was negatively related to Landcare membership suggests that investing in this form of social capital was seen as a way to augment farmers' human capital. Similarly, the negative correlation with local origin

suggests that those from outside the area perceived a greater need to access locally-relevant information and skills through the Landcare groups. The last two factors captured community-level effects – location was primarily reflecting the aggregate stock of bonding social capital in the local community, and training the community's propensity to invest in bridging social capital. That is, contrary to Glaeser et al. (2002), an individual's investment in social capital depended on his or her local community as well as on individual characteristics.

The results indicate that the assumption of homogeneous and cooperative communities capable of inclusive collective action that underlies many community-based resource management approaches may not be valid in practice. Both individual and group-level characteristics lead to different degrees of participation in community-based activities such as Landcare. Differences between individuals affect their willingness to invest time and resources in social capital formation – middle-aged farmers with somewhat less education but more land and a greater focus on farming were more likely to participate in Landcare groups. Differences between communities further affect individual incentives to accumulate social capital – some local communities, perhaps due to the influence of key personalities or prior experience of cooperation, were more likely to encourage individual members to augment their stocks of social capital, including through Landcare membership. Programs intended to assist rural communities in the formation of social capital for beneficial collective action need to take such differences into account.

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